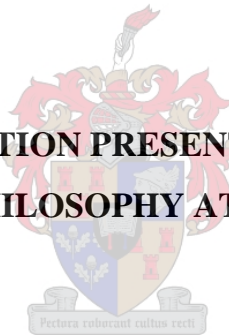


**GENDER DIFFERENCES
IN THE PUBLICATION PRODUCTIVITY OF
SOUTH AFRICAN SCIENTISTS**

by

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**DISSERTATION PRESENTED FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY AT STELLENBOSCH UNIVERSITY**



**SUPERVISORS: Prof A S Kritzinger
Prof J Mouton**

December 2006

DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.



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Signature

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Date

SUMMARY

This dissertation is aimed at describing gender difference in publication productivity among South African academic authors, and to develop an understanding of possible reasons for these differences. It is argued that the lack of empirical knowledge of publication productivity of academics in South Africa needs to be addressed, as scientific communication through publication is one of the most central social processes in science. Moreover, one form of scientific publication, the peer-reviewed article, has become the single most important aspect according to which academics in South Africa and abroad are rewarded. The focus on gender differences is motivated by the fact that women have been strengthening their representation in South African HEIs, but not their proportional contribution to our country's output of accredited research articles.

A review of the past four decades of empirical and theoretical work on the gender gap in publication productivity leads the author to identify three sets of factors that may account for its existence: gender-socialised differences between women and men, women's greater family responsibilities, and gender-related deficits in the academic workplace. However, none of these sets of variables by themselves satisfactorily account for gender differences in publication productivity, and they should not be considered independent from each other. The literature review is followed by a review of methodological considerations that need to be taken into account when studying gender differences in publication productivity. Against this background, the advantages and limitations associated with the first empirical project of the dissertation - a secondary analysis of SA Knowledgebase, an existing bibliometric database - are identified.

This analysis is aimed at quantifying gender differences in the publication productivity of South African academic authors; at controlling for relevant variables (race, age, highest qualification, rank, institutional affiliation and scientific domain); and at investigating gender differences in the tendency towards joint authorship. The results show that South African male authors publish almost twice as many articles in accredited journals than women authors do, but that the latter's contribution to the total scientific publication output of South Africa has increased from 16 percent in 1990 to 24 percent in 2001. Part of the gender gap in publication productivity can be explained by women's younger age, lower qualification level and lower rank as a gender group, but not by any tendency among women to co-author less than men do.

This project was complemented by the analysis of primary data collected from the CVs of and qualitative interviews with sixteen highly productive South African academics. This second project contributes to the development of a more in-depth understanding of the way in which men and women's publication productivity is differentially affected, in a predominantly male milieu and across the span of their careers, by their family responsibilities, non-research academic roles, and gender-socialisation. The dissertation concludes with an integration of the literature review with the main findings of the two projects, on the basis of which recommendations are made for future research, and proposals are made towards rendering the measurement of publication productivity more sensitive to the gender differences highlighted by the dissertation.

OPSOMMING

Hierdie proefskrif het ten doel om genderverskille in publikasieproduktiwiteit van Suid-Afrikaanse akademiese outeurs te beskryf, en om 'n begrip te ontwikkel van moontlike redes vir dié verskille. Daar word aangevoer dat 'n gebrek aan empiriese kennis oor die publikasieproduktiwiteit van akademici in Suid-Afrika aangespreek behoort te word, aangesien wetenskaplike kommunikasie deur middel van publikasie een van die mees sentrale prosesse in die wetenskap is. Daarbenewens het een vorm van wetenskaplike publikasie, die eweknie-beoordeelde artikel, die enkele belangrikste aspek geword waarvolgens akademici in Suid-Afrika en oorsese beloon word. Die fokus op genderverskille word gemotiveer deur die feit dat vroue hul verteenwoordiging in Suid-Afrikaanse hoër-onderwysinstellings versterk het, maar nie hul proporsionele bydrae tot ons land se uitset van geakkrediteerde navorsings-artikels nie.

'n Oorsig van die afgelope vier dekades se empiriese en teoretiese werk oor die gender-gaping in publikasieproduktiwiteit lei tot die identifisering van drie stelsel faktore wat die bestaan daarvan sou kon verklaar: gender-gesosialiseerde verskille tussen vroue en mans, vroue se swaarder gesinsverantwoordelike rol, en gender-verbandhoudende tekortkominge in die akademiese werkples. Opsigself verklaar geen enkele van hierdie stelsel veranderlikes egter gender-verskille in publikasieproduktiwiteit op 'n bevredigende wyse nie, en hulle behoort nie onafhanklik van mekaar beskou te word nie. Die literatuur-oorsig word gevolg deur 'n oorsig van metodologiese oorwegings wat in ag geneem behoort te word ter bestudering van genderverskille in publikasieproduktiwiteit. Teen hierdie agtergrond word die voordele en beperkinge verbonde aan die eerste empiriese projek van die proefskrif – 'n sekondêre ontleding van *SA Knowledgebase*, 'n bestaande bibliometriele databasis - geïdentifiseer.

Hierdie ontleding van is daarop gemik om gender-verskille in die publikasieproduktiwiteit van Suid-Afrikaanse akademiese outeurs te kwantifiseer; om vir relevante veranderlikes te kontroleer (ras, ouderdom, hoogste kwalifikasie, rang, institusionele affiliasie en wetenskaplike domein); en om gender-verskille in mede-outeurskap te ondersoek. Die resultate toon dat Suid-Afrikaanse man-outeurs bykans twee maal soveel artikels in geakkrediteerde vaktydskrifte as vroue-outeurs publiseer, maar dat laasgenoemde se bydrae tot die totale wetenskaplike publikasie-uitset van Suid-Afrika vanaf 16 persent in 1990 tot 24 persent in 2001 toegeneem het. Deel van die gender-gaping in publikasieproduktiwiteit kan verklaar word aan die hand van vroue se jonger ouderdom, laer kwalifikasievlak, en laer rang as 'n gender-groep, maar nie aan die hand van enige neiging by vroue om minder as mans met andere te publiseer nie.

Hierdie projek is aangevul deur die ontleding van primêre data wat ingesamel is vanuit die CV's van, en kwalitatiewe onderhoude met sestien hoogs-produktiewe Suid-Afrikaanse akademici. Hierdie tweede projek dra by tot die ontwikkeling van 'n meer in-diepte begrip van die wyse waarop mans en vroue se gesinsverantwoordelike rolle, hul nie-navorsingsverbandhoudende akademiese rolle, en hul gendersosialisering in 'n oorwegend manlike milieu en oor die bestek van hul loopbane heen differensieel op hul publikasieproduktiwiteit inwerk. Die proefskrif sluit af met 'n integrasie van die literatuur-oorsig met die hoofbevindinge van die twee projekte, op grond waarvan aanbevelings vir toekomstige navorsing gemaak word, en voorstelle aan die hand gedoen word vir die meting van publikasieproduktiwiteit wat sensitief sou wees vir die genderverskille wat in hierdie proefskrif uitgelig is.

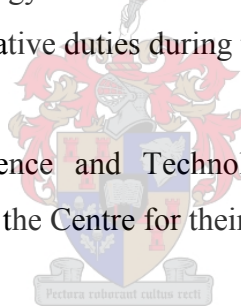
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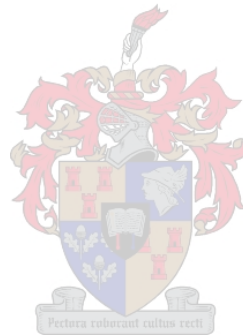
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ACRONYMS AND ABBREVIATIONS

A&HCI	: Arts and Humanities Citation Index
CENIS	: Centre for Interdisciplinary Research
CHE	: The Council on Higher Education
CREST	: Centre for Research on Science and Technology
DACST	: Department of Arts, Culture, Science and Technology
DoE	: Department of Education
DST	: Department of Science and Technology
HAI	: Historically Advantaged Institution
HAU	: Historically Advantaged University
HBU	: Historically Black University
HDI	: Historically Disadvantaged Institution
HDU	: Historically Disadvantaged University
HEI	: Higher Education Institution
HEMIS	: Higher Education Management Information System
HWU	: Historically White University
IBSS	: International Bibliography of the Social Sciences
ISI	: Institute for Scientific Information
NACI	: National Advisory Council on Innovation
NPHE	: National Plan on Higher Education
NRF	: National Research Foundation
NRTA	: National Research and Technology Audit
R&D	: Research and Development
S&T	: Science and Technology
SAPSE	: South African Post-Secondary Education
SCI	: Science Citation Index
SET	: Science, Engineering and Technology
SSCI	: Social Science Citation Index
SSRD	: Survey of Scholarship, Research and Development
UNISA	: University of South Africa
W-i-R	: Women-in-Research

CHAPTER 1

Research Problem and Objectives

1 Introduction

The following chapter has a twofold purpose. First, it outlines the rationale for an investigation into gender differences in publication productivity. To this end, the increasingly important role that publication productivity plays in the academic reward structure is emphasised and the recent policy changes that reflect this trend in South Africa are sketched. These policy changes are placed in a broader context of research-related concerns in higher education, i.e., the small volume of and even steady decline in the country's publication output as a proportion of world output, as well as women's under-representation in academia, particularly among publishing academics. Given these concerns, it is argued that the general lack of research on factors that influence the publication productivity of both women and men faculty in South Africa needs to be addressed. The second part of the chapter will focus on the main objectives of two sub-projects aimed at addressing this stated research problem. Reference is also made to the research designs and data sources that will be utilised in each. The chapter concludes with a discussion of the possible implications of the findings and the potential contribution of the study, both on a substantive and methodological level.

2 Statement of the research problem

2.1 The role of publication productivity in the academic reward structure

In the early 1940s the father of the sociology of science, Robert K. Merton [1942(1973)], observed that a contribution to scientific knowledge is achieved only by making it available to others. Consequently, the communication and scholarly exchange of research findings and results is one of the most fundamental social processes of science (Fox 1983). The principal medium through which this scholarly communication and exchange takes place is publication. In fact,

“...publication is so central to productivity in research that the work becomes ‘a work’ only when it takes a conventional, physical (that is, published) form, which can be received, assessed, and acknowledged by the scientific community” (Fox 1983:285).

Thus, in a very fundamental sense, research findings that are not in print do not exist, and a scientist who is not publishing is arguably not achieving much, if anything, on the research front. This explains, at least in part, the close relationship between publication productivity and the reward structure in science, particularly in the academic sector, from which most scientific publications emanate. In academia, publications are “coin of the realm” (Haas 1996:364), as they are almost universally employed as the principal basis on which rewards - such as professional recognition, reputation and esteem, promotion and salary - and resources, such as funding grants for future research, are allocated to academics. Under this “merit” ideology of academic research (Persell 1983:33), which finds its clearest expression in the “publish or perish” maxim¹, publishing one’s research is probably the most crucial indicator of academic competence or achievement². It is therefore essential for the career success of academic scientists and scholars.

There is, however, some variation in the extent to which pressure to publish is exerted on faculty in academic systems around the world. According to Teodorescu (2000), in most of the developed world the research productivity of faculty has for some time already been an important criterion for academic personnel decisions at numerous universities, while this has not been the case in so-called “less developed” (201) academic systems. Although some would question the classification of South Africa’s academic system as “less developed”³, there are

¹ According to the merit ideology, which is akin to what Merton [1942(1973)] defined as the ethos of universalism in science, the quality and quantity of one’s scholarly work, rather than functionally irrelevant characteristics (such as gender), determines who is hired, promoted, and tenured. However, some have criticised this purely meritocratic notion of the academic career system. Toren (1993) maintains that it is an illusion and that, “most researchers of the academic scene agree that the ‘publish or perish’ dictum is largely a myth” (444). Such views are to some extent supported by findings that the “merit” system is not operating equally for men and women (Persell 1983) - findings which have led commentators such as Kennedy (1995:15, cited in Jackson 2002) to argue that “the mysterious and mystified ideal of an ungendered, disembodied and academic brilliance” represents one of the central components of the glass ceiling in academia that women hit. It seems that, what specifically works to the disadvantage of women is the fact that advancement up the academic hierarchy is governed as much by length of service and seniority, as by performance (King 1994).

² Given the critical role of research productivity in the academic reward structure, some researchers (e.g., Vasil 1996) even operationalise academic achievement as research productivity.

³ According to Meyer (1997), on the basis of scientific indicators - such as the size of its resources and facilities, or its production figures (e.g., publications or patents) - South Africa “would unquestionably figure as an industrialised country” (184). Internationally, South Africa is known for its technological and scientific capabilities, such as pioneering heart transplants, commercially producing coal from oil, reproducing and dismantling six nuclear devices, and discovering the “extinct” coelacanth (Pouris 1995:74). However, it is not uncommon for a world-class scientific capability to exist in what would otherwise be called a developing country (Wagner *et al.* 2001). Moreover, South Africa is “changing references”, as it sees itself less as a real industrialised country and more in a state of development (Meyer 1997:197). This is reflected in the “pressing need”, identified in the early 1990s by the

some indications that, at least until recently, the level of external, governmental pressure on faculty to publish was more in accordance with that found in less developed countries than developed ones. For example, in the early 1980s Reynhardt (1982) found that South African lecturers “do a lot less research than their counterparts in industrialised countries” (393) – in the physical sciences their research productivity was found to be on average thirty percent of the productivity of their colleagues in industrialised countries. He ascribed this to a lack of interest in research among university lecturers, who neglect their research duties, coupled with the fact that research is not encouraged enough at South African universities.

In 1985, the Department of National Education - which was responsible for the national education system under apartheid - introduced a new funding formula for South African universities (known as the South African Post-Secondary Education, or SAPSE formula) that incorporated a number of incentives to stimulate research output. One of these was the subsidising of research outputs on the basis of the number of scientific articles published (CENIS⁴ 2001). More recently, an even greater emphasis on research productivity in targeted funding mechanisms and incentive systems has become evident in government policy documents. Since 2001 the South African government has been steadily introducing various policy changes designed to improve the country’s research publication record, particularly in the higher education sector, as it is this sector that is responsible for more than eighty percent of the country’s visible research outputs (Pouris 2003). In accordance with policy documents, such as the South African National Research and Development Strategy (DST 2002), in which science and technology (S&T) is increasingly considered as *the* engine for economic growth⁵, the National Plan for Higher Education (NPHE) defines sustaining and promoting research as one of its strategic objectives (DoE 2001). Accordingly, an increase of research outputs is given high priority, coupled with the recommendation that the number of academic publications be a primary criterion for institutional accreditation. Moreover, the NPHE devotes considerable attention to the issue of performance-based funding, as embodied in a new funding framework.

A revised version of this funding framework was recently announced in the Policy for the Measurement and Recognition of Research Output of Public Higher Education Institutions (DoE 2003), which has been in effect since the beginning of 2005. The stated purpose of the

International Development Research Center commission on S&T policy, to “recognise South Africa as an African country rather than a white member of the industrialised world” (CENIS 2000:40).

⁴ CENIS is an acronym for the Centre for Interdisciplinary Studies, which was renamed in 2003 as the Centre for Research on Science and Technology (CREST).

policy is to encourage research productivity by rewarding quality research output at public higher education institutions (HEIs) via government subsidy. Academic research in South Africa has traditionally been funded through a dual support system, consisting of “formula-based” funding and “competitive” funding. The latter is provided by the Department of Science and Technology (DST) via the National Research Foundation (NRF), and involves the allocation of grant support for research on a competitive basis, i.e., based on a peer-review mechanism that rates researchers in terms of the number and quality of their publications. This internationally novel funding mechanism, which was introduced in 1985, is designed to advance excellence in research by providing progressively increasing support, contingent on the track record of researchers (Pouris 1996, 1991b). However, the support of scientists by the NRF can only indirectly influence patterns of scientific publishing⁶.

Formula-based funding, on the other hand, is provided directly to universities by the Department of Education (DoE). It consists of two distinct components that relate to research: a component (traditionally calculated as constituting 15 percent) of the total amount awarded to each HEI as part of their annual subsidy from the state (based on number of students enrolled, the number of students who have successfully completed their studies, and research output); and a subsidy of research outputs, defined as publications in peer reviewed journals accredited by the DoE. It is through the provision of this particular subsidy to HEIs for their research outputs that the DoE aims to promote the publication of scientific articles.

Thus, as is the case in other less developed countries (Teodorescu 2000), there is a palpable shift towards a more competitive, outcome-oriented funding approach in South Africa, which has heightened expectations of research performance among academics. It is becoming increasingly apparent to them that among the three traditionally defined institutional objectives - teaching research and community service - research dominates in terms of status and rewards, and that this situation is not only likely to continue, but to intensify as well.

From government reports it has become apparent that, “all academic staff at academic institutions should be actively involved in publishing on a regular basis” (Maürtin-Cairncross 2003:1). Benchmarks have been set that reflect what the DoE (2002:71) considers to be “reasonable” numbers of research publications that academics are expected to produce. For

⁵ Actually, the link between expenditure on research and development and the potential for development within South Africa was already recognised in the early 1980s by the Research Statutory Bodies. This resulted in more finance becoming available for research in this period (Cresswell 1992)

⁶ In addition, among social scientists the NRF’s rating of research is probably more controversial than any other activities of the Foundation (Alexander 2004a).

universities the benchmark is equivalent to one accredited journal per permanent academic per year⁷, and for technikons it is half of this output. However, at present neither sector meets these output benchmarks. In fact, most HEIs have been described as having “extremely low research outputs”, thus compromising the research and development agenda of the country (CHE 2000:19). The government’s concern with the issue of the research output, and in particular the publication productivity of our country’s academic scientists, is not surprising, especially if one considers recent findings that paint a bleak picture with regard to South Africa’s international standing in terms of publication output.

2.2 The decline in South Africa’s world share of ISI-listed publication output

The late sixties and early to mid-1970s are described as the “golden years” of research in South Africa, as this period was characterised by an exponential growth in the number of published articles (Reynhardt 1982:395). However, by the late 1980s signs of a decline in the country’s research output relative to other (especially developed) countries⁸ were emerging (Pouris 1989c, 1988). This trend continued to characterise South Africa’s science in the 1990s, when a steady decline in comparative output was documented for most scientific fields (Pouris 2003; CENIS 2001; Ingwersen & Jacobs 2002; Jacobs & Ingwersen 2000; Pouris 1996). Measured in terms of peer-reviewed articles in accredited scientific journals listed in the indices of the Institute for Scientific Information (ISI)⁹, South Africa’s publication output has declined from nearly 0.7 of the world’s output in 1987 to less than 0.4 percent at the turn of the century^{10,11}. In summary, the overall picture of South African scientific publication productivity sketched by most research on the issue is described in terms such as “worrying downward trend” (Bawa & Mouton 2002:312) and “deterioration and decline”¹² (Pouris 2003:426).

⁷ Certain universities in South Africa have for quite some time also taken as their benchmark (and ideal) that a scholar produce at least one scientific publication per year (DACST 1998b).

⁸ Compared to its African neighbours, however, South Africa may still be considered a “scientific giant” (Pouris 1995:74). A recent report for the World Bank states that, together with Algeria and Egypt, South Africa “stands out for its scientific abilities” within the African continent (Wagner *et al.* 2001:29), particularly in the specialisation area of life science.

⁹ The ISI is a commercial, multinational corporation that provides a wide variety of international services to scientists and scholars around the world. It is the largest for-profit organisation in the world specialising in secondary information services in the scientific/technical/scholarly area (DACST 1999).

¹⁰ This decline is not necessarily found when output is measured as the absolute number of research articles published. Both Pouris (1996) and Jacobs and Ingwersen’s (2002) bibliometric analyses of South African publications show that the country’s productivity has been relatively stable over the past few years.

¹¹ One indicator of such a decline is the fact that countries that were below or at the same level as South Africa in 1987 have subsequently surpassed her. These countries are Norway, South Korea, Brazil, Taiwan, and the People’s Republic of China (Pouris 1996).

¹² It is not necessarily warranted to conclude on the basis of these findings that this decline will continue in the future, as a recent (but as yet unpublished) analysis of 2003 ISI data undertaken by Tijssen measured South Africa’s

Although it is generally recognised that the current research outputs of the higher education research system is a cause for concern, the reasons for this downward trend are not clearly understood. Some commentators have suggested that South African academic staff lack commitment and a sense of duty, especially with regard to their research function. However, most contend that in the past ten years academics in this country have had to face a bleak institutional environment, characterised among others by ongoing restructuring of universities and academic life (Alexander 2004a), which arguably affected their research productivity. Two aspects of the higher education system are usually referred to in this regard: First, the research capacity of the higher education sector has been under pressure for some time due to funding constraints. These may be traced to the general rationalisation of resources (Pretorius *et al.* 2002; DACST¹³ 1998a) and funding organisations stretching their resources in pursuit of more egalitarian policies to include previously poorly funded institutions (Pouris 1996).

Secondly, during the past decade increased teaching workloads¹⁴ and administrative duties have been a reality that most academic staff had to contend with. The increase in teaching workload is mainly attributed to a dramatic rise in undergraduate student enrolment, which also implied a changing student profile, as many of the increases in student numbers have been from socio-economically and academically deprived backgrounds. Coupled with a continued legacy of a poor secondary education system, this means that most students need special academic support (Gibbon & Kabaki 2002). According to government, this places demands on higher education staff “that may seriously hamper their ability to contribute to research and development” (DACST 1998a:54). In addition, some universities, such as the Universities of Stellenbosch and Pretoria, and the then Rand Afrikaans University (now the University of Johannesburg) have recently shifted from Afrikaans-only undergraduate lectures to providing English teaching as well, thereby sharply increasing the amount of teaching (Alexander 2004a).

With regard to increased workloads, reference must also be made to far-reaching changes in teaching methods (in particular the move towards ICT-based and student centred learning) that have recently been introduced at most HEIs. At least in the first few years after their inception, these initiatives tend to increase the amount of time that faculty invest in teaching. However, not only did most institutions not increase their staff complements accordingly, most HEIs have

share of world output at 0.6 percent in that year (according to private communication from the Director of CREST, University of Stellenbosch).

¹³ DACST refers to the Department of Arts, Culture, Science and Technology. In 2002 it was divided into separate departments: the Department of Science and Technology, which is referred to elsewhere in this dissertation, and the Department of Arts and Culture.

experienced staff cuts and rationalisations (CENIS 2001, 2000). This “academic depression”, coupled with a further loss of staff due to brain drain¹⁵ (Pouris 1991a) and academics taking up positions in government during the mid-1990s (Bawa & Mouton 2002), has further overburdened those who remain, with teaching. In summary, the demand for instructional time has increased, while research is postponed or fitted into an increasingly smaller proportion of the academic year.

2.3 The under-representation of women in academia

Considering the constraints within which the higher education system has to function in order to fulfil what has now become probably its most important charge – research - it is crucial that the sector makes optimal use of the skilled human resources at its disposal. Unfortunately, this does not seem to be the case, particularly if one considers both the representation and publication productivity of women in academia. Although there are already indications of a slow movement toward gender equality, at least in terms of numerical staff representation¹⁶, women, who account for 52 percent of South Africa’s national population, are not proportionately represented in academia.

The under-utilisation of women is even more evident if one compares the percentage of women graduate students with the percentage of women faculty, based on the assumption that the graduate student pool represents potential faculty. In South Africa male enrolments at both undergraduate and graduate levels have begun to decline while female enrolments are growing. Among those receiving a general first bachelor and postgraduate bachelor’s degree, women now constitute 53 percent of students, and thus outnumber men¹⁷ (Shackleton *et al.* 2004; DACST 1998a). In 2001, women represented 43 percent of all master’s graduates (an increase of 77 percent from 1992) and 37 percent of all doctoral graduates (an increase of 18 percent from 1992). In 2001, women constituted 40% of permanent instruction/research staff, (an increase of only 10% from 1992) (Bailey & Mouton 2004), and even three years later, in 2004, women have

¹⁴ The burden of non-research duties is reflected in student to staff ratios, which increased from 13:1 in 1981 to 21:1 in 1988 - a deterioration of 51 percent (Pouris 1991a).

¹⁵ Although the loss of staff abroad has undoubtedly had an effect, empirical evidence is difficult to find (Pouris 1991a).

¹⁶ The fact that women are better represented in the lower age categories of academic staff than in the higher ones is considered to be an indicator in this regard (DACST 1998a). According to 2004 Higher Education Management Information System (HEMIS) data, among instruction/research staff permanently employed at South African HEIs, women represent just more than half (51%) of those who are under the age of 35, but only 27% of those older than 54 (DoE 2004).

¹⁷ In fact, South African girls’ entry into and participation in undergraduate studies are comparable with that of advanced industrial countries (IPET 1994, cited in Walker 1997).

only increased their representation to 41% of permanent academic staff at HEIs in South Africa, reflecting what the DoE (2005:41) refers to as “serious employment inequalities” in the public higher education system.

Thus, when the proportion of graduate women in the labour force is taken into account, women are not only under-represented in the academic profession, but they have not increased their presence in the same proportions as female students¹⁸¹⁹. Moreover, there are some indications that female students generally perform better and are more successful in their studies than their male counterparts at both undergraduate and postgraduate level (Bailey & Mouton 2004; Beyers 2003). From a societal perspective, these figures reflect an under-utilisation of a significant proportion of society’s human capital, and an inefficient use of societal investments in highly trained professionals.

Not only are women scientists under-represented in numbers, but proportionate to their numbers they contribute even less in terms of publications. During the mid- to late-nineties, the male to female ratio in the higher education system was 2:1 both in universities (63 percent male) and technikons (62 percent male) (DACST 1998a), while during the period 1990-1998, the male to female ratio in publications averaged more than 5:1, with women producing less than 17 percent of the publication output in the country (CENIS 2001:61). These figures indicate a gender imbalance in the production of knowledge; a marginalization of “women’s voices, particularly the voices of women outside of the dominant western, northern context of knowledge production” (Maurtin-Cairncross 2003:2), which undermines the gender inclusiveness of academic knowledge, while maintaining the traditional androcentrism of such knowledge (Subotzky 2003).

Moreover, this scenario does not bode well for the long-term viability of the South African research system, if one considers that the future academic labour force in higher education will probably consist of increasing proportions of women. Such an expectation is based on the assumption that two forces are at work. First, formal institutional pressure is exerted on institutions through equity guidelines contained in the NPHE and R&D Strategy to increase their proportion of women researchers. Secondly, it is possible that labour market forces might lead to a decline in the numbers of men in academia, as much higher salaries can be earned by men with similar qualifications outside universities. This will leave a gap that women, who generally make

¹⁸ Although women significantly increased their share of full-time academic staff positions at all institutions, at no institution was the increase in excess of 17 percent (Gibbon & Kabaki 2002).

¹⁹ A similar trend has been observed in South Africa with regard to race: while the black student population on our campuses has increased, black faculty members are few and far between (Bennett 2002).

lesser demands for pay and prestige, will have to fill. In fact, it is very possible that the recent increase of women higher education staff reflects the fact that women are already “filling positions vacated by men who have left higher education for more lucrative positions in government and business” (Gibbon and Kabaki 2002:205).

Do women lack the necessary skills to succeed in academia, or are other gender-related mechanisms at play? Unfortunately, any attempt to answer such a question cannot amount to more than mere speculation, because of a lack of systematic research on the factors influencing publication productivity of academic staff in South Africa. Nevertheless, the disparity between the size of the female higher education workforce and their publication output could be linked to the fact that changes in the academic institutional environment (see section 2.2 above) may impact differently on women and men academics’ ability to compete for increasingly scarce resources, and therefore to conduct research. The reasons for this are threefold:

First, it has been particularly those areas where women are most involved – for example, the social sciences, arts and humanities – that have been subjected to cuts in resources. Secondly, most female academics in this country are clustered in the ranks of junior lecturers and lecturers (Subotzky 2003; Cloete & Bunting 2000), partly because of their more recent arrival in the academic work force²⁰. Consequently, their position at the lower levels of the academic hierarchy places them at a disadvantage from the outset when competing for increasingly scarce resources. Thirdly, in order to cut down on recurring costs, there is an increasing practice of HEIs internationally to make use of part-time, short-term contract positions (Subotzky 2001; Bellas & Toutkoushian 1999) – “soft funding” appointments for which women are disproportionately hired (Maürtin-Cairncross 2003). This so-called “pseudo-participation” (Acar 1991:169) in academia limits women’s ability to access and/or compete for research funds, while the continued uncertainty and ambiguity of these positions are not conducive to planning and conducting research²¹. In addition, the positions of lower rank and/or temporary status that women occupy generally involve more undergraduate teaching obligations, therefore an increased intake of higher education students who place higher demands on academic staff have most probably affected women more than men.

²⁰ Some may argue that lower publication rates are the cause and not the result of women’s lower academic ranks. However, a large body of evidence from primarily the United States (see Chapter 2) supports the counter-argument, i.e., that differences between men and women in publication productivity are not sufficient to explain women’s lower ranks.

²¹ Ironically, research-only staff, particularly those dependent on grant income only, are probably the most vulnerable of this group. Because their salaries are funded from external sources, employers do not always take responsibility for ensuring that their terms and conditions are comparable with other staff (Allport 1998).

Thus, women's publication productivity may reflect important gender-related aspects of their position in the academic labour market. It could further be argued that gendered patterns in this regard reflect the socio-political status of women in the South African society in general, and sets an example to students of the status of women in society. As Salo (2002) notes, female students cannot imagine an academic career unless they are able to identify women scholars who have a visible presence in this field.

2.4 The paucity of research on faculty publication productivity in South Africa

According to Jacobs (2001), regular, independent studies of research publications represent one way in which productivity in S&T in South Africa can be improved. Although quite common in other parts of the world, the systematic investigation of academic publication productivity has not been a widespread activity in South Africa, and our understanding of factors that influence this productivity is severely limited. This seems to be the case in the scientific periphery in general, where little is known about the variety of factors influencing the publication productivity of faculty (Teodorescu 2000). Moreover, cross-national differences in the correlates of productivity suggest that much of the results of the vast literature on publication productivity in the developed world cannot necessarily be applied to less developed academic systems (*ibid.*).

The earliest example of a study of faculty productivity in South Africa is found in Reynhardt's (1982) analysis of publications in the physical and mathematical sciences during the period 1971 to 1980. The first systematic attempt to assess the country's overall scientific performance was undertaken in the late 1980s by Pouris (1989c), who analysed publication trends over the period 1973-1984. Pouris has since undertaken regular research on the performance of the South African scientific system (2003, 1996) and on academic science institutions in this country (1989b). Three smaller studies - each representing only a single institution - have also been undertaken: a research project at the University of Cape Town in 1986/7 investigated the extent to which gender differences in the number of publications produced by men and women at the institution might explain differences between the positions occupied by men and women (White 1989), the citation patterns of scientists at the University of the Orange Free State were studied by Ovens (1995), and Van Staden *et al.* (2001) investigated the extent and nature of research-related activities at the Psychology Department at the University of South Africa (UNISA). Also on a smaller scale, we find the descriptive profile of the publication records of a sample of academic women at three selected Historically Black Universities (HBUs), which was recently provided by Maürtin-Cairncross (2003).

The discipline of psychology was the focus of Seedat's (1992) bibliometric investigation of all the articles published between 1983 and 1988 in two journals: *Psychology in Society* (PINS) and the *South African Journal of Psychology* (SAJP). Not surprisingly, he found that, between 1983 and 1988 the vast majority of contributors to both journals were white males. Only 27 percent of the articles in these journals were authored or co-authored by women, which led him to conclude that women were inadequately represented at the level of knowledge production within psychology during this period. Later, Levett and Kottler (1998) undertook an analysis of articles published in the same journals between 1983 and 1994, revealing that only 5-6 percent of articles concerned gender and/or feminist issues. Also in the discipline of psychology, Duncan (1993, cited in Duncan 2001:125) conducted a study between 1990 and 1993 of a "fairly wide selection" of South African journals serving as publishing media for the discipline during the apartheid years and earlier, with the aim of identifying the dominant discourses on racism emerging from these publications.

A more comprehensive bibliometric study of the publication patterns and trends of academic and research scientists at ten South African universities was undertaken in the late 1990s (Jacobs 2001; Jacobs & Ingwersen 2000). This longitudinal investigation covered the 16-year period of 1981-1996 with respect to four disciplines of science: physics (including mathematics and astrophysics), chemistry, plant and animal sciences, and biochemistry/microbiology²². More recently, the same researchers set out to investigate the entire period of 1981-2000, in order to observe the trends from 1996 onwards (Ingwersen & Jacobs 2002), and Jacobs (2002) studied trends in research and publication specifically in the field of genetic research and technology during the period 1990-2001.

Following the White Paper on Science and Technology (DACST 1996), government has also initiated several initiatives aimed at describing and/or evaluating the current S&T system in South Africa. One of the most prominent and comprehensive studies, the National Research and Technology Audit (NRTA) conducted by the South African government during 1997/1998, was used as a basis for the development of a national S&T policy (DACST 1998a). Of the five studies that comprised the NRTA, two surveys assessed faculty publication productivity. First, the Survey of Scholarship, Research and Development (SSRD) aimed to obtain, organise and analyse data related to on-going research projects in South Africa (DACST 1998b). Secondly, a study of the human resource base in research and technology included a research and scholarship

²² These fields cover approximately seventy percent of the total scientific output from South Africa (Jacobs & Ingwersen 2002).

output survey, which was aimed at establishing the extent to which academics are actively involved in research and development (DACST 1998a). The database that resulted from this survey allowed further analyses of the publication productivity of faculty at HEIs – analyses that were conducted by the then Centre for Interdisciplinary Studies at the University of Stellenbosch (CENIS 2001, 2000).

The NRTA was the first step towards determining current and future scientific manpower needs in South Africa. Based on the findings of the NRTA, the government has defined gender imbalances in South Africa's human resources for science, engineering and technology as a major concern. The Education White Paper 3: A Programme for the Transformation of Higher Education (DoE 1997) specifically requires identifying and rectifying imbalances between the sexes, and the need for a "clearly defined gender perspective" in any human resource development approach for SET is explicitly recognised in the National R&D Strategy (DST 2002:48). Aside from equity concerns, women are also considered as a major untapped resource by policymakers. In order to build research capacity among women researchers, special initiatives for women in research - largely driven through the science councils - have been implemented by the DoE during the past few years. The NRF itself has adopted affirmative action programmes. For instance, the Thuthuka programme to develop young researchers also emphasises women researchers, and 64 percent of their grant holders in 2003 were female. In addition, the NRF has established special funding cycles for women²³, aimed at increased funding awards to women scholars and hence enhancing their productivity. The NRF has also initiated the Women-in-Research (W-i-R) project, aimed at supporting women researchers and increasing the number of women in academia and in leadership positions in South African tertiary and research institutions (Shackleton *et al.* 2004). In 2003 the DST introduced initiatives aimed at addressing the issue of women in science, including (1) a Women's Reference Group in S&T, which is to mainstream gender and women in science in particular; (2) the Women in Science Awards, which is aimed at showcasing and creating recognition of outstanding women in scientific research, and (3) a lecture series on the subject of women in science.

Although these initiatives undoubtedly represent a step in the right direction, it is the author's view that the intelligent, gender-sensitive development of the female component of the human resources potential contained in the higher education system of South Africa requires a clear

²³ Most notable is a new funding category that was recently introduced to accommodate, among others, women who "could not realise the potential or sustain their research ability" by virtue of time spent on maternity leave, or raising a family (NRF 2002:10). Without recourse to such a category, these women researchers' rating would necessarily lapse, rendering them ineligible to apply for NRF funding in the future.

grasp of gender-related factors that currently contribute to and inhibit the publication productivity of both women *and* men. Understanding gender differences in publication productivity in academia as a central dimension of career attainment and among an under-represented group such as women, is critical for understanding stratification in science. And understanding stratification in science by gender is important for addressing the under-utilisation of women.

However, very little reliable data have as yet been produced on gender differences in publication productivity, and research on the reasons for such differences is non-existent. At the time of the present study, only a few research projects could be identified that specifically focus on women scientists and/or academics (see Chapter 2). This may be because the academic profession is perceived as having a set of equalitarian values which is in direct opposition to discrimination, it has been presumed that inequalities between the sexes in the academe should be less pronounced than in other occupational spheres where so-called “masculine” characteristics are involved (Toren & Kraus 1987). Thus, the need for research among women academics has not been accorded a high priority. Although academia prides itself on its meritocratic values, and despite the rhetorical claims to egalitarianism that permeate higher education, institutions of higher learning are deeply imbued with the norms and values of a society, such as South Africa, which is structured through difference and hierarchies of race, ethnicity and class (Walker 1997). Consequently, universities tend to embody some of the most patriarchal values and practices in society. Universities are not only dominated by masculine principles and structures, but the social forces established to uphold male power and privilege are very likely to be represented in academia as well (Bronstein & Farnsworth 1998). Studies in South Africa indeed indicate that, “within the supposed liberal walls of the Southern African ivory tower, institutional cultures that discriminate against women work to actively prevent them from exploring academic careers” (Salo 2002:1).

Of the few investigations involving academic women in South Africa, probably the most relevant to the current discussion are: (1) an audit undertaken in 2001 by the W-i-R project to profile the skills, expertise, needs and opportunities of women researchers in the social sciences and humanities at tertiary institutions (NRF 2001); and (2) a doctoral study that explored the challenges experienced by women academics at HBUs with regard to publishing of academic work (Maürtin-Cairncross 2003). The audit produced several outcomes: a database and a directory of women researchers, a report on teaching and research activities, infrastructure and support services, as well as skills development opportunities for women academics and

researchers. Unfortunately, from a gender perspective the database is of very little use, as it does not offer any comparable data for men; and although the report provides some important insights into the research needs and barriers experienced by South African women in the world of academic research, it does not focus on the issue of publication productivity *per se*.

Maürtin-Cairncross's (2003) research does place publication at the centre of her research, and by doing so, she offers valuable insights into this previously unobserved academic concern, by making women's experiences with regard to publishing more visible. However, her primarily qualitative study did not intend to represent all women at universities in South Africa²⁴. Rather, her sample was selected to provide a range of qualitative experiences of women at HBUs and to gather a descriptive profile of these women's publication records, and therefore the findings reflect *only* data generated by the participants at the three targeted HBUs. As Maürtin-Cairncross's study was primarily located within the paradigm of feminist standpoint theory, she maintained a "woman-centred perspective", which implied that no comparisons were drawn with men (76).

Indeed, most research that draws gender comparisons in terms of publication productivity derives from the mainstream of the world science centres, in particular the United States. A literature review of these studies, as detailed in Chapter 2, shows that even these studies have yet to provide satisfactory explanations for the gender disparities in publication productivity. This in itself provides some justification for further research on the topic. More importantly, however, is the fact that the greater majority of studies on gender differences in publication productivity focus on the Anglo-American cultural environment (Fox 1995; Luukkoonon-Gronow & Stolte-Heiskanen 1983). Indications are that differences among women scientists from various countries in terms of their role and status are stronger than they are among the institutional settings within a given country (Chakravarthy *et al.* 1988)²⁵. Considering the variable effects that different socio-cultural settings may have on the status of women academics, it is necessary to test the conclusions drawn from mainstream studies in other socio-cultural contexts.

²⁴ According to Maürtin-Cairncross (2003), however, there is strong support for viewing the results as representative of HBUs, given the response rate of 30-40 percent, as well as the fact that thirty percent of all South African HBUs were included in the study. Those that were included – the Universities of Durban-Westville, the Western Cape and Venda – also represent the primary categories into which HBUs used to be classified.

²⁵ However, it has to be noted that some researchers have found that, despite variations across cultures, "the communalities of experience among academic women far exceed their difference at either the individual or institutional level" (Lie & O'Leary 1990:21). Sutherland (1985), who reviewed the situation of women who teach in universities in five European countries, found that, "Despite differences of language, of countries, of university systems, there are remarkable resemblances among the women studied...nationality makes little difference" (179).

For instance, South Africa may differ from other countries in terms of the extent to which unspoken pressures are exerted on women – and for that matter, men - to conform to certain “feminine” or “masculine” roles. Our society is still characterised by a strong patriarchy that is especially evident among African and Afrikaans men (Subotzky 2003), and traditional values that demand of women to accord a high priority to their homes, families and husbands²⁶. In such a context it may be argued that women have to manage simultaneously with a multiplicity of roles to a greater extent than their counterparts in countries characterised by more egalitarian gender relations. They also need to contend with the fact that, within such a traditionalist context the presence of women in the academic world is rejected, or at best tolerated²⁷. Indeed, Ward (1998, cited in May 1999:10) argues that in South Africa, “women are having an even tougher time than American women in overcoming attitudinal and organisational prejudices keeping them from promotions and key appointments”. In summary, we need to know more about the institutional factors unique to the South African higher education sector, as well as the personal and professional proclivities, needs and interests that are peculiar to South African women and that may explain their lower publication productivity *in relation to* that of their male counterparts.

This need becomes crucial in the context of a more competitive, performance-based system of research funding that has recently been introduced in South Africa. The assessment of academics’ publication productivity is increasingly becoming a central element of the research funding process and – to a much greater extent than ever before in this country - publication can make or break academic careers. The increased importance of publication productivity for career success and even job security increases competition and in turn exacerbates the dominant masculinity of the academy (Subotzky 2003) and deepens already existing gender inequalities in chances for professional achievement and success. There are even some indications that the introduction of more competitive funding systems may increase gender difference in publication productivity, particularly among young academics, as Prpić (2002) recently found to be the case

²⁶ Recent data provided by the World Economic Forum (Hausmann *et al.* 2006:17) further supports this assertion, as it is reported that South Africa shows relatively “poor scores” on women’s economic participation and opportunity relative to men’s. The country has closed only 56% of its economic gender gap, placing it at 79th position among the 115 countries (while the USA ranks 3rd).

²⁷ This argument is supported by the observation made by Stolte-Heiskanen (1991) that women are more numerous in research work in countries where equality between the sexes is part of the official ideology of equality in society (in Hungary and Poland, for example, as opposed to Austria and Belgium). Women’s high involvement in science in Poland has also been traced back to its “official policy of active promotion of women’s participation in all sectors of society” by Chakravarthy *et al.* (1988:71). However, this relationship between governmental policy and practice in the scientific workplace does not hold universally. Scandinavia, for instance, has some of the most sophisticated equity policies in existence, with quota systems, high state investment in childcare and careful monitoring of

in Croatia. Given that the sociological processes of accumulative advantage and disadvantage that operate in academia²⁸ are accelerated in a performance-based system, the negative impact of women's lower research productivity on their future productivity cannot remain a matter of indifference for policymakers who have expressed their commitment to address South Africa's declining research output. According to Maürtin-Cairncross (2003), it becomes imperative that academic women engage in the academic activity of publishing for their successful progression in academia, their realization of academic credibility, and their full membership into the academy and into their discipline. Publishing may also serve the broader goal of gender equality by facilitating a de-centring and destabilisation of the authoritative, dominant male voice (*cf.* Seedat 1992, cited in Shefer *et al.* 1997). Thus, the study of academic publication - particularly research aimed at illuminating gender equity issues within higher education - should accompany and ideally inform research-funding policy in this country.

3 Research objectives

The purpose of the present study is to develop a more nuanced understanding of the possible reasons for gender differences in productivity among South African scientists. Previous research on academics in South Africa has produced data on women only, or ignored the issue of gender altogether (see Chapter 2, introduction). By including and contrasting men and women in the empirical research, a much-needed gender perspective will be provided on the topic of faculty publication productivity, which in itself has rarely been researched in South Africa. The study will be based on the quantitative analysis of an existing dataset, and on the analysis of primary data collected from *Curriculum Vitae* (CVs) and qualitative interviews. It therefore consists of two subprojects, which are discussed in more detail in the remainder of this chapter.

recruitment and promotion processes. However, women still only constitute 11.7 percent of the professoriate in Norway and 11 percent in Sweden (Husu 2001, cited in Morley 2003).

²⁸ Productive scientists tend to be even more productive in the future, while scientists who produce little are likely to decline further in their productivity (Cole & Cole 1973). This is mainly because a more productive scientist tends to receive more professional recognition, which leads to greater access to resources, which in turn increases the probability of even higher publication productivity, increases recognition and resources, and so on. The reverse, a process of cumulative disadvantage, is said to operate for unproductive scientists.

3.1 Secondary analysis of SA Knowledgebase

The first project involves the analysis of data contained in SA Knowledgebase, a national database of publications. This secondary analysis is primarily aimed at describing the nature and extent of gender differences in publication productivity in South Africa. As this project involves the analysis of publication data contained in SA Knowledgebase, it may be termed a bibliometric study.

3.1.1 **Bibliometric research: a brief exposition**

Bibliometrics is a subfield within the broader domain of scientometrics, which refers to the quantitative study and analysis of scientific communications. Bibliometric analysis involves the study of publications in a set of journals in order to evaluate and compare the research performance of nations, scientific disciplines, journals and individual scientists (Pouris 1989a). Although bibliometrics is usually considered to be a knowledge domain situated within the discipline of information sciences²⁹ (Tijssen 2004), bibliometric analyses are also relevant to many areas of sociological interest, especially research on occupational attainment, stratification, institutions, prestige, social network analysis and gender analysis (Phelan 2000). It is considered one of the “most efficient and objective methods for evaluating research performance” (Pouris 1988:544). Other than surveys, in which faculty are the source of data about their publications, published articles are the source of information for bibliometric studies. This unobtrusive research design tends to produce more reliable data than a survey design, as it does not suffer from the incompleteness and inaccuracies that threaten the reliability of self-reported measures of publication. In addition, a bibliometric analysis of a large national database, such as SA Knowledgebase, includes data on a far greater number of cases than is usually possible to obtain from surveys, which makes it highly appropriate for descriptive studies.

However, bibliometric research is not a common phenomenon in South Africa. Although most of the South African studies on publication productivity discussed in section 2.4 above may be termed bibliometric, they amount to less than ten distinct studies. Moreover, there have been remarkably few large-scale bibliometric analysis of gender differentiation in publication production worldwide (Webster 2001). The possible reasons for the scarcity of bibliometric research, both within the South African context as well as for studying gender differences in publication productivity, will be discussed in the following section.

²⁹ Judging from the journals in which South African bibliometric research findings have thus far been published and the addresses of the authors of the articles, studies on publication productivity issues in South Africa also seem to be located within the information sciences (e.g., Jacobs 2001; Ovens 1995; Pouris 1989b).

3.1.2 Issues related to bibliometric research

The lack of bibliometric research in South Africa is most probably the result of a limited availability of databases that contain the information necessary for bibliometric analyses. Collecting one's own publication data is a time-consuming task that can at best cover a small number of publications in a limited number of journals. Instead, international bibliometric databases, in particular those based on international indices maintained by the ISI, are usually employed to obtain raw data on publications. These include the most frequently used Science Citation Index (SCI) (established in 1961 and available since 1963), the Social Science Citation Index (SSCI, established in 1973) and the Arts and Humanities Citation Index (A&HCI, established in 1978). Anastassios Pouris, who has undertaken the most comprehensive bibliometric analyses of South African science (e.g., 2003, 1996), utilises this ISI data for his investigations of the South African scientific research enterprise. In her own research and in collaboration with Ingwersen, Jacobs has also utilised data produced by the ISI for their longitudinal study of the publication patterns of South African academic and research scientists (Ingwersen & Jacobs 2002; Jacobs & Ingwersen 2000; Jacobs 2001).

However, as in most developing countries, the high expenses associated with purchasing and managing databases from the ISI have limited the extent to which this type of research is practised in South Africa. In addition, bibliometric databases usually include first name initials only, which is insufficient to identify the sex of authors³⁰. In order to analyse this data by gender, publication data need to be cross-referenced with other sources, for example, professional societies' public relations publications, departmental web pages, or survey data. It therefore comes as no surprise that bibliometric studies focussing on gender differences in publication productivity are either concentrated on small samples, or cover short time spans (Webster 2001).

In addition to these limitations, some observers have argued that international bibliometric databases are at best limited, and at worst inadequate to study publication patterns in developing countries (Gaillard 1992; Stole-Heiskanen 1986; Frame 1980). Research utilising such databases has even been vehemently criticised by commentators in developing countries, particularly in Latin America, as producing "useless" results (Blickenstaff & Moravcsik 1982:137). The main point on which this criticism hinges, is that developing countries might not be adequately

³⁰ However, there are some countries in which it is possible to differentiate between the sexes based on the surname alone. For instance, in Iceland women's surnames typically end in "dottir", whereas the names of men end in "son" (Lewison 2001). In Poland, more than sixty percent of all surnames can be determined as belonging to a man (those which end with "-ski", "-cki" or "-owy") or a woman (those ending with "-ska", "-cka" or "-owa") (Webster 2001).

represented in the international databases, because they include only data on articles published in the world's most prominent "international" journals³¹.

The ISI is indeed very selective, incorporating or excluding journals from their indices according to strict assessment procedures³² (Pouris & Pouris 1988). However, this is done for the very good reason of quality control. The high requirements for acceptance of a publication in the international journals included in the ISI indices imply that the articles they contain are "packaged" in terms of quality. Thus, utilising ISI databases carries the advantage that the articles included in any investigation are all of a certain minimum quality. The journals in which they are published represent the major channels of international scientific communication (Garfield 1983)³³ and it is generally accepted that the articles themselves represent the most significant research in the world (Pouris 1988).

On the other hand, the criteria used to include publications in the indices may eliminate many regional or even national journals, especially those edited locally in developing countries, from consideration (Gálvez *et al.* 2000). According to Gaillard (1992), the scanty number of journals from developing countries contained in the ISI database illustrates how severely developing country science is under-represented. For instance, at the time of writing only 24 South African journals (out of a total of 255 journals accredited by the DoE) were indexed in the ISI indices (Mouton *et al.* 2006).

According to the critics of the ISI databases, this under-representation is not necessarily because science conducted in developing countries is synonymous with poor science, but rather because the databases implicitly record references more to do with mainstream, Anglo-Saxon science (Gaillard 1989, cited in Meyer 1997; Stolte-Heiskanen 1986). Alexander (2004b:325) explains the situation from the perspective a South African sociologist as follows:

³¹ This criticism is not limited to developing countries, as researchers in some developed European countries have raised the issue as well. For example, in the Netherlands Van Vianen (1998) criticises existing studies on gender differences in publication productivity for exclusively focussing on international scientific journal articles. She argues that, although Anglo-Saxon researchers publish exclusively "internationally", it has to be taken into account that non-Anglo-Saxon researchers do not.

³² The ISI employs a staff of professional coverage specialists with backgrounds in the disciplines for which they evaluate journals considered for inclusion in their database. Included journals are monitored on a continuous basis and when their importance (as indicated by well-defined quantitative and qualitative indicators) falls below their minimum standards, the journals are excluded from the database (Pouris & Pouris 1988).

³³ There is indeed evidence of the concentration of scientific literature in a small group of journals to support this claim. This evidence is now generally referred to as "Garfield's law", i.e., that a core of 2 000 journals accounts for 85 percent of published articles and 95 percent of cited articles (Tijssen 2004).

“...publication in international journals is not necessarily an indication of quality. If I want to communicate with colleagues in South Africa or the region, it makes more sense to publish in a local journal, which, locally, will have a larger readership than any international publication; this is especially true when most international journals, especially the better ones, are so slow to publish”.

Alexander concludes by quoting Michael Burawoy, President of the American Sociological Association, as stating that incentivising publication in Western journals will draw researchers away from contributing to the ever more pressing social problems facing South Africa. As developing countries' research is generally believed to be peripheral to this mainstream research effort, it is also possible that the important research³⁴ that is indeed conducted in these countries is overlooked (Pouris 1988, 1989a)³⁵. As a result, critics such as Moravcsik (1986, cited in Gaillard 1992) estimate that, of the scientific output of the Third World which does indeed meet international standards of excellence, only about half is included in the Science Citation Index.

In addition, international databases are usually biased in favour of English-language journals (Pouris 1988), as English is considered the *lingua franca* of international science (Garfield 1983). Again this does not necessarily mean that non-English language journals do not report important research, but rather that there is a bias in favour of publications emanating from English-speaking countries, which places publications that are not in English at a disadvantage³⁶. This argument may be countered, however, by observations that English also seems to be the *lingua franca* of Third World science, as the majority of Third World articles in the Science Citation Index (already more than 85 percent in the 1970s) are in English (Garfield 1983). In general, research reported in languages other than English is diminishing rapidly (Pouris & Pouris 1988). This indicates that scientists recognise that, by publishing their research solely in a non-English language journal they would be marginalised from key debates and unlikely to gain the international recognition they seek. In addition, the language bias is likely to be significant only in some countries that are part of larger cultural and/or linguistic communities outside the centre (such as countries in the Arab States, Latin America, and Scandinavian countries) (Stolte-Heiskanen 1986).

³⁴ Some even argue that the prestigious “international science” problems addressed by those in mainstream journals are often of very little relevance to a developing country's needs (Rahman 1975, cited in Stolte-Heiskanen 1986).

³⁵ However, empirical findings seem to refute this notion (see Pouris 1988, 1989a).

³⁶ This explains why the recently introduced South African Policy for Measurement of Research Output of Public HEIs (DoE 2003) encourages South African journals to adopt a policy of at least including abstracts in English if the language of the journal is not in English, as this “will facilitate possible inclusion of the journal in international indices such as the ISI” (6).

Nevertheless, it is important to recognise that an analysis of international databases does imply an investigation of only the “cream of the crop” – those scientists working at the frontier, or at least in the mainstream of science. By no means do they account for all published research produced in a peripheral, developing country such as South Africa. This is not necessarily a problem for comparative studies, for example those that assess the level and/or impact of South Africa’s research in mainstream scientific journals, or compare South Africa’s position relative to other peripheral countries (e.g., Pouris 2003), as the incomplete coverage of the ISI indices affects all peripheral countries the same way, and hence cancels out.

However, if one wants to describe South African scientific output (e.g., measure the size of the country’s research efforts), or a specific aspect thereof (e.g., gender differences in that output), a partial picture of the true situation would inevitably be formed if one uses international publication databases. One alternative approach is to utilise the information from the DoE regarding publications in accredited journals. The DoE currently recognises approximately 8 500 national and international journals for higher education subsidy purposes. These journals consist of the journals indexed in the three indices of the ISI; in the International Bibliography of the Social Sciences (IBSS); and in the so-called “supplementary list” of South African journals that are not already contained in ISI or IBSS indices, but have been submitted to a panel of reviewers for accreditation with the DoE (DACST 1999)³⁷.

In order to receive subsidy for research purposes, HEIs have to submit lists of articles (and also certain types of peer-reviewed monographs/books) published by their staff to the DoE on an annual basis. The resulting SAPSE data have the advantage that articles in local journals are included as well. However, the accuracy of the data is affected by a number of technical constraints (*cf.* Bawa & Mouton 2002). Moreover, very little information over and above publication units is available (CENIS 2001), which renders any analysis of the data by gender impossible. Another approach to ensure the study of a more comprehensive publication output of South African scientists involves using other South African databases, such as SABINET and NEXUS, in addition to the SCI (*cf.* Jacobs 2002). However, collating such data is highly labour intensive and can therefore only be undertaken in small-scale studies of publication output in usually one specialisation only.

In summary, neither the international databases of the ISI nor government statistics provide the data necessary to conduct a comprehensive analysis of gender differences in publication productivity in South Africa. In 1982 Blickenstaff and Moravcsik suggested that, in order to

address the great need for a much more complete coverage of publications in the Third World, these countries should initiate their own computerised compilation of their scientific literature that could be used for scientometric research. However, the creation of large-scale databases is a costly venture that requires not only significant financial investments but also considerable technical expertise. In 1997, almost two decades after Blickenstaff and Moravscik's suggestion, the Centre for Interdisciplinary Studies (CENIS, now the Centre for Research on Science and Technology) at Stellenbosch University embarked on a long-term project to develop exactly such a comprehensive database of South African scientific production. This project is called "SA Knowledgebase" (Bawa & Mouton 2002).

3.1.3 SA Knowledgebase as data source

SA Knowledgebase primarily consists of information drawn from all the articles published by South African scientists³⁸ in journals that are included in the ISI indices, as well as in those South African journals listed as accredited journals with the DoE. As such, SA Knowledgebase overcomes the above-mentioned bias inherent in utilising international databases. The information gleaned from these articles includes data on the author(s), including so-called "corporate data" (names and addresses of the organisations with which the authors of the articles are affiliated) and data on the article (including title, publication date, source and keywords). Because of logistical constraints, the database is restricted to articles that have been published since 1990³⁹. By 2006 the database was reported to contain complete information on 114 000 articles produced by South African authors⁴⁰. As SA Knowledgebase includes the publication date of each article, it allows longitudinal analysis of South African publication data. This is important, as the expense of collecting longitudinal data has limited the number of longitudinal studies of publication productivity worldwide, and the investigations that study changes over time are generally based on small samples in specific fields (Stephan & Levin 1992).

In addition, SA Knowledgebase contains a separate table with biographical information on active South African scientists (i.e., authors), garnered from various sources, including (initially) the NRTA, which constituted the most comprehensive survey of the South African science system at the time. This data on authors - including their gender, race, age and highest qualification - are continually matched, linked and integrated with the published article

³⁷ See CENIS (2001:48f) for a more detailed description of the criteria for and process of accreditation.

³⁸ South African scientists are defined as those authors affiliated to an institution with a South African address.

³⁹ It also needs to be noted that CENIS reports "some gaps for the early years of 1990-1993" (2001:60f).

⁴⁰ According to private communication from the Director of the CREST, Stellenbosch University.

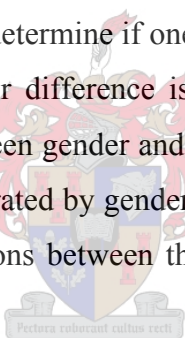
information described above⁴¹. The resulting database overcomes the above-mentioned problem of gender identification and allows analyses involving other demographic variables that may correlate with both publication productivity and gender, e.g., age, highest qualification and rank⁴². This is an important development for sociology of science researchers in South Africa, as it allows them for the first time on a national scale to compare authors' publication productivity on a number of publication-related variables. In particular, the analysis by gender made possible by the development of SA Knowledgebase represents a first valuable step in the process of mapping women's current status in academic science in South Africa.

3.1.4 Research objectives

SA Knowledgebase will be utilised in an analysis, by gender, of bibliometric data in order to achieve four distinct objectives:

3.1.4.1 *Quantifying gender differences in publication productivity*

First and foremost, the author aims to determine if one gender publishes more than the other and, if so⁴³, what the extent of this gender difference is, as indicated by (1) measures of central tendency; and (2) the correlation between gender and publication productivity. As differences in these statistical measures may be generated by gender differences in the distribution of scientific productivity⁴⁴ (Long 1992), comparisons between the publication productivity distributions of men and women will also be drawn.



⁴¹ The linking of quantitative measures of publication output to databases for scientists is not wholly uncommon. For instance, Stephan and Levin (1992) matched scientists in the longitudinal database, the US Survey of Doctorate Recipients, with their publication record taken from the SCI. More recently in Italy, Palomba (2002) linked personnel file data with data on 23 000 publications of researchers in that country, in order to analyse the data by gender.

⁴² Although demographic information is not available for all individuals in the database, and demographic coverage varies slightly, depending on the variable, according to the Director of CREST, coverage is estimated at 40-50% of the active or productive scientists in South Africa. In terms of coverage of the higher education sector, any systematic biases that may have been introduced in the survey procedure of, for example the NRTA, has been overcome by the collection of additional data since 1996, rendering any demographic bias unlikely.

⁴³ It is highly likely that a gender difference will be observed, considering the previous finding that in South Africa women produce less than 17 percent of the publication output in the country (CENIS 2001:61).

⁴⁴ For instance, differences in measures of central tendency might be the result of a disproportionate number of females having low productivity, a disproportionate number of males having extremely high productivity, or some combination of these.

3.1.4.2 *Longitudinal analysis: investigating changes in gender differences over time*

A second objective will be to determine if the observed gender differences have been more or less constant over the period for which SA Knowledgebase data are available (1990 to 2001⁴⁵), or if they have grown or diminished with the passage of time. A longitudinal perspective is of importance if one considers that a number of changes have occurred in South Africa since 1990 that might have impacted on the relationship between gender and publication productivity. First, as mentioned in section 2.2 above, in the past ten years in South Africa certain changes have taken place in the academic institutional environment. These are related to increasing funding constraints and teaching workloads, which have most probably affected academics' research productivity. Moreover, it may be argued that these developments have impacted differently on women and men academics' publication productivity⁴⁶.

Secondly, a more competitive academic labour market, which has partly resulted from steady cuts in government's funding of higher education, could very well have had an influence on the extent of gender differences in the publication output of academics in South Africa, as more competition increases already existing inequalities in chances for professional success. Thirdly - and on a more positive note - during the past few years, government has implemented a number of special initiatives aimed at building research capacity among women researchers (see section 2.4 above). These may very well have reduced gender differences in publication productivity.

Thus, in order to determine if there have been any noticeable changes in gender differences in publication productivity since 1990, a longitudinal comparison of the annual ratio of publications authored by men to those authored by women⁴⁷ from 1990 to 2001 will be undertaken.

⁴⁵ As was mentioned above, the database is restricted to articles that have been published since 1990. A decision was made to include only articles published up until 2001, because at the time the present study commenced, data on publications after this period had not yet been fully processed and linked within SA Knowledgebase.

⁴⁶ The international period of embargo included the imposition of scientific and technological boycotts and sanctions, which most probably had a "closing-off" effect on the publication productivity of academics in South Africa as well (Jacobs & Ingwersen 2002). However, as most of these boycotts and sanctions had already been lifted by the early 1990s, their effects are probably not reflected in the 1990-2001 data contained SA Knowledgebase. Similarly, the impact of the recent Policy for Measurement of Research Output of Public HEIs (DoE 2003) cannot be taken into account either, as it only came into effect in 2005.

⁴⁷ The reader should note that this approach implies analysing articles and not the individual authors analysed in order to quantify gender differences in publication productivity. The reason for the variation in units of analysis is that only articles are connected to particular years (time of publication) in SA Knowledgebase, and can therefore be analysed longitudinally.

3.1.4.3 *Multivariate analysis: controlling for relevant variables*

Thirdly, multivariate analysis will be performed in order to determine if the observed gender differences in publication productivity are confounded by gender differences in other potential covariates of gender and publication productivity. Previous studies undertaken elsewhere that take into account variables related to publication productivity found a reduction, and in some cases even an elimination of observed gender differences in publication productivity (see Chapter 2, section 1.3.4.2). This implies that observed gender differences in publication productivity are due to factors that correlate highly with gender, rather than with gender *per se*. Control variables usually include individual background or personal characteristics (such as marital status, time lag between bachelor's and doctoral degrees, and years of experience beyond doctoral degree) and structural locations and resources (e.g., type of employing institution, academic rank, discipline, teaching hours, research funding and research assistance).

The present analysis will involve a comparison of the gender difference in average publication productivity for each of the categories of certain relevant variables with the average gender difference found for the subset of authors as a whole. According to Xie and Shauman (1998), one has to include a large number of covariates in a multivariate analysis in order to fully account for gender differences in publication productivity. Unfortunately, only a limited number of such potential covariates are contained in SA Knowledgebase. These include the biographic variables of race and chronological age, as well as structural, or work-environment variables that facilitate the production of publications, but are usually unequally distributed between men and women. These “resource variables” are represented by highest qualification, rank, institutional affiliation and discipline. The small number of control variables included in SA Knowledgebase limits the extent to which gender differences in publication productivity may be accounted for in the multivariate analysis. Thus, although relationships between variables will be studied and tentative reasons for the observed patterns proposed, descriptive rather than causal inferences will be drawn from the bibliometric analysis, and the analysis should be considered exploratory.

3.1.4.4 *Investigating gender differences in co-authorship*

Finally, SA Knowledgebase data allow one to determine if individuals differ in their propensity to co-author articles. This is because a system of article-equivalents is adopted in the database that implies weighting each article by the inverse of the number of authors involved. In other words, the fractional count of $1/n$ of a point is assigned for the occurrence of an author's name

among n authors of an article⁴⁸. In addition, the number of distinct, unweighted articles connected to an author's name is recorded for each author. The ratio between the two provides an indication of the relative amount of co-authorship versus sole authorship for each individual⁴⁹.

Determining the degree of co- or multiple authorship of published papers is important from a gender perspective, as it is often used to provide an indicator of research collaboration⁵⁰, and gender differences in publication productivity have been attributed in part to women's limited opportunities to collaborate (Cole 1979). Access to collaboration, which might differ between men and women, could greatly multiply the number of articles an academic produces above and beyond the number he/she could produce as a sole author. Any gender differences in this regard may therefore account, in part, for women's lower publication productivity. However, little empirical research has been reported on the frequency of co-authorship among women and men scholars, and findings are generally inconclusive (see Chapter 2, section 2.3.3.3). In addition, most studies are limited by small samples and do not provide a firm basis for generalisation about women and men scholars' collaborative patterns (Ward & Grant 1991). As the present study includes a relatively large subset of authors, it provides us with greater coverage in terms of the extent to which women academics are given to collaborative publication in comparison to their male counterparts.

3.2 Primary data collection and analysis

The research was originally conceived as primarily a quantitative, secondary analysis. As it progressed, however, and the quantitative analysis produced results, it became clear that it would be desirable to add a qualitative component to the study aimed at identifying possible factors that may differentially affect the genders' productivity in terms of research and the publication of papers⁵¹. The primary data for such a study were collected by means of semi-structured telephonic interviews with a small, select group of highly productive academic women and men in South Africa. This data were complemented by an analysis of the CVs of these scientists. The

⁴⁸ Thus, if five authors are associated with one article, each author's share is counted as the fraction 0.2; if there is only one author, the article is counted as 1.

⁴⁹ Similar to the longitudinal analysis (see footnote 47 above), this research objective again requires that the unit of analysis is the article and not the individual author, as the percentage of collaboratively authored *articles* published by men is compared to the percentage of collaboratively authored *articles* published by women. The methodological implications of this variation of units of analysis within one study will be discussed in more detail in Chapter 3.

⁵⁰ The use co-authorship as the measure of collaboration is not unproblematic, however, and will be discussed in more detail in Chapter 3.

interview and CV data focused on prominent themes that emerge from other studies of academic productivity, as discussed in the literature review.

4 Dissertation outline

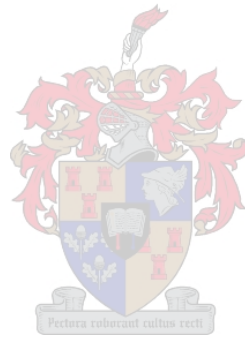
The empirical research detailed above was undertaken against the background of the most important theoretical and empirical explanations for gender differences in research productivity, as reported in the literature. In Chapter 2, these are reviewed and organised into different models or sets of variables that may account for publication productivity differences between the genders. Although the literature review is international in scope, research on South African women academics was emphasised, and local findings systematically compared with those from overseas. In this manner, limitations or gaps within the South African literature are highlighted and attempts will be made to address these in the proposed study.

The literature review is followed by a methodologically-oriented chapter, Chapter 3, which draws attention to a range of methodological issues that should be taken into account when analysing scientific publication productivity with SA Knowledgebase data in general, and specifically in terms of gender. Although much of the chapter examines the strengths and weaknesses of the utilisation of SA Knowledgebase or a similar bibliometric data source, the discussion is also relevant for the measurement of publication productivity by means of a CV analysis that forms part of the second subproject of the study.

Chapters 4 and 5 deal with the analysis of the secondary and primary data, respectively. Thus, in the first of these two chapters, the results from the analysis of SA Knowledgebase are presented and main findings are interpreted. The findings are interpreted within the context of the literature review – with an emphasis on findings that are unique to South Africa – and are also discussed against the background of the methodological considerations discussed in Chapter 3. Chapter 5 reports on the qualitative and CV data that will be collected and analysed in order to develop a more nuanced understanding of gender differences relating to publication productivity through the course of sixteen highly productive South African academics' careers. The dissertation is concluded with Chapter 6, which summarises and integrates the main findings of the two studies within the context of the literature referenced in Chapter 2 and against the background of the objectives of the dissertation (as presented in the present chapter). In this final

⁵¹ It has to be noted that it is not within the scope of the present study to develop an understanding of gender differences in academic *careers* in general.

chapter, recommendations are also made for future research and proposals concerning the measurement of publication productivity are suggested.



5 Conclusion: contributions and impact of the study

The present study is the first of its kind in the country, as it attempts to shed light on the most important factors that influence the publication productivity of *both* men and women academics in South Africa. The fact that this is a poorly researched topic in South Africa is a point of concern, if one considers South Africa's declining publication productivity relative to other countries. Moreover, the policy changes that have recently been implemented in higher education in order to address this state of affairs have not been based on a systematic study of what the most important factors are that both contribute to and inhibit the publication productivity of our academic staff.

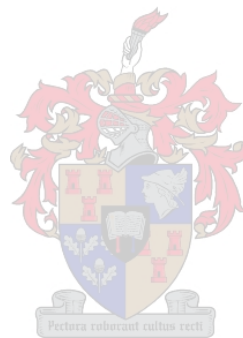
Given the current emphasis of South African academic reward structures on publication productivity, the findings of the study may have important implications for the mostly precarious status of women as an under-represented group within academia in general, and among productive researchers in the country in particular. It is hoped that the research will enable the author to propose informed strategies that are aimed at a more productive utilisation of – in particular, but not exclusively - women's talents and abilities at our HEIs. The results may also enable policy makers in government, research councils and funding agencies to make effective decisions with regard to where they should concentrate their efforts and resources when developing initiatives aimed at promoting South African women's contribution to the country's research output.



The research is also aimed at making a contribution to the study of publication productivity in general. Much of the past research has been concentrated in developed countries, in particular the United States, and is in need of replication in a developing context. This study aims to address this gap in the literature, by determining whether the factors that influence gender differences in publication productivity among South African faculty are different from those established through empirical research in developed countries⁵². International comparisons such as these will also optimise our understanding of local conditions and socio-cultural settings that play a role in creating and maintaining gender disparities in this country.

⁵² It needs to be taken into account that *direct* international comparisons are problematic for a number of reasons. First, basic differences exist between the higher education systems of different countries. For instance, variations exist with regard to how hierarchies of positions are arranged, and the practice of tenure at South African universities amounts to little more than a default position following probationary appointments (Du Toit 2001, cited in Gibbon & Kabaki 2002). These differences obviously impede the drawing of comparisons in some cases. Secondly, previous studies differ among themselves and from the present study in terms of the ranks and disciplines included in the study population, measures of publication productivity, and independent variables analysed.

On a methodological note, the fact that a bibliometric study has been coupled with a qualitative study and CV analysis will allow the author to experiment with different measures of publication productivity - with differing weights and over different time spans. It is argued that such measurement choices may substantially influence findings with regard to gender differences in publication productivity. Therefore, this study aims to also contribute to broader, ongoing methodological debates concerning the measurement of academics' publication productivity in South Africa.



CHAPTER 2

A Review of Empirical Findings and Theoretical Frameworks

1 Introduction

Scholarly productivity in the form of published work reflects an academic's contribution to knowledge. To the extent that science is governed by the norm of universalism, as Merton ([1942] 1973) proposed, the allocation of academic rewards and resources should be based solely on the merits of such contributions. This seems to be the case in most of the developed world, where evidence indicates that research productivity is a critical factor in determining academic rank, rate of promotion and salary (Long *et al.* 1993; Rosenfeld & Jones 1987; Astin & Bayer 1975; Bayer & Astin 1975). In addition, individual faculty research productivity is often aggregated in order to assess departmental and institutional quality, excellence or prestige, which may play a decisive role in funding allocations at national and institutional level. Although direct evidence on the *de facto* association between publication productivity and academic rewards is lacking in South Africa, recent policy changes herald a move towards a similar rewards structure in academia. For instance, the national plan for the transformation of higher education in South Africa, which was announced early in 2001, proposes that research be funded through a separate formula largely based on research publications.

Recognising the critical importance of publication productivity in determining the status of individuals and institutions within academic systems worldwide, investigators working within the ambit of S&T studies¹ have, during the past few decades, devoted considerable attention to faculty publication productivity. However, empirical research on the topic has been largely restricted to academics in the developed world, especially in the United States, the United Kingdom and Australia (Teodorescu 2000). Consequently, in the developing world very little is known about publication productivity and, more importantly, the factors that influence it.

In South Africa, only a few studies with an explicit focus on faculty publication could be identified. The first, an investigation into the citation patterns of scientists at the University of the Orange Free State (Ovens 1995), represented only a single institution. More recently, Mäurтин-Cairncross (2003) published her doctoral dissertation on challenges experienced by

academic staff with regard to the publication of academic articles. Although she included staff at three HEIs in her study, she focussed very specifically on women at selected HBUs. A more comprehensive study of the publication patterns of academic and research scientists in South Africa was undertaken in the late 1990s (Jacobs 2001; Jacobs & Ingwersen 2000) and early in the new millenium (Ingwersen & Jacobs 2002). These longitudinal investigations stretched over the period of 1981-1996 and 1981-2000, and included scientists from ten universities in three provinces of the country: the Eastern Cape, Western Cape and KwaZulu Natal. The researchers identified various publication and citation trends in the fields of physics, chemistry, plant and animal sciences, and microbiology/biochemistry. Of these, the finding most relevant to the present study is that there is a direct relation between academic position, research experience and productivity among researchers in South Africa.

1.1 Explaining variation in productivity

Data from S&T studies in the developed world consistently show that, despite the salience of scholarly publication as a criterion of individual career success and institutional efficiency, the average rate of this productivity is surprisingly low. Moreover, it is highly variable and strongly skewed (Fox 1983). In other words, most scholarly work is published by a few scientists, while the majority publish little or nothing. This feature of the distribution of publication patterns was first observed in the 1920s by Lotka (1926), on whose work Price (1963) based the formulation of the principle he termed “Lotka’s Law”. According to this principle, publication productivity conforms to an “inverse square law”, whereby the chances that a scientist would publish n publications are $1/n^2$.

Publication productivity is actually distributed more unevenly among individuals than income is (Britton 1964, cited in Allison & Stewart 1974). It is therefore not surprising that variation in the productivity of scientists has for a long time been a central concern of sociologists and other observers of science. Since 1940 a considerable number² of empirical studies have sought to explain this variation in publication productivity among faculty in terms of age, race/ethnicity, social and educational origin, and discipline, among other factors. By the end of the 1970s it was cited as one of the most perplexing problems in the sociology of science (Wanner *et al.* 1981; Cole 1979; Gaston 1978), and is still considered “a major research objective” in this field (Long

¹ This “synergistic melding” includes disciplines such as sociology of science, new history, and the philosophy of science (Lederman & Bartsch 2001:2)

² In the US alone, more than a hundred studies on faculty research productivity have been conducted since 1940 (Teodorescu 2000).

1992:159). Its importance is partly due to the fact that variations in publication productivity are linked to the general status of under-represented groups in academic institutions. As Long and Fox (1995:51) explain: "...until we understand the differences in productivity between groups by race or sex, we cannot adequately assess other differences between groups in attainments such as position and recognition".

1.2 The emerging concern with gender

During the latter half of the 1960s and early 1970s gender issues in science received increased attention, especially from sociologists of science in the United States. The spotlight was drawn towards, among others, the issue of women's academic career development and factors that impact on it, which includes their publication productivity. The predominant argument at this time was that women's lower status in academia hinged on their lower publication productivity, and did not result from gender discrimination. During the sixties and seventies a few relatively large-scale quantitative studies of gender differences in publication productivity rates were already emerging [see Zuckerman and Cole (1975) for a review of the literature]. However, these early studies provided mixed and inconclusive evidence for the above-mentioned assumption regarding the association between women's status and productivity in academia. Since then much research has been devoted to gauging the publication productivity of women in comparison to that of men, and the number of studies reporting data on published productivity of men and women scientists has grown rapidly.

As has been the case for studies on research output in general, the bulk of empirical research on gender issues in publication productivity seems to be heavily concentrated on academics in the United States. However, here have also been some studies on gender and publication patterns in other developed countries, i.e. (in order of publication date), Canada (Nakhaie 2002), Iceland (Lewison 2001), Poland (Webster 2001), Australia (Asmar 1999; Bazeley *et al.* 1996; Sheehan & Welch 1996), New Zealand (Brooks 1997; Vasil 1992 & 1996), Italy (Facchini 1996; Palomba 1993), Holland (Hicks 1991), Norway (Kyvik 1990; Kyvik & Teigen 1996), Israel (Toren & Kraus 1987), and Finland (Luukkonen-Gronow & Stolte-Heiskanen 1983). In what could be classified as less developed countries, the scientific productivity of men and women scientists has received recent attention among young Croatian scientists (Prpić 2002), while in India the focus has fallen both on the publication productivity of psychologists (Goel 2002) and of scientists working in India's Council of Scientific and Industrial Research (Gupta *et al.* 1999). In South America, gender issues in science and/or academia have been researched in Mexico

(Blazquez 1996), Venezuela (Vessuri & Canino 2001) and in Brazil (Velho & Leon 1998; Tabak 1993, cited in Etkowitz *et al.* 2000). Finally, Bennet (2002) notes that, during the past decade, there has been rich review of the challenges for gender equity in higher educational sites in Africa, and that much of this work highlights the poor ratio of women to men (especially at management levels).

Although the South African National R&D Strategy (DST 2002) explicitly recognises the need for a clearly defined gender perspective in any human resource development approach for SET, not much systematic research has as yet been devoted to gender issues in science in South Africa. The paucity of available literature on women in South African academies noted by observers (*cf.* Maürtin-Cairncross 2003; Walker 1998; Wolpe *et al.* 1997) is also reflected in the fact that, in the two decades from 1985 to 2005, only a handful of research projects could be identified that specifically focussed on women academics in this country.

In 1985 a working group was set up under the auspices of the South African Council for Natural Sciences to investigate the position of women in science in South Africa (Thomson 1994). The investigation was initiated in response to the fact that so few women held top positions in science either at universities or in industry. Data were collected from interviews with a large number of scientists, both male and female, from universities, medical schools and industry, as well as some not then active in science. Although the report identified reasons for the major loss of women in science in South Africa and advocates solutions to address the problem, it was not primarily concerned with the research activities of women actively involved in research.

In the early 1990s, a study by the Union of Democratic University Staff Association (UDUSA) investigated the position of academic staff at all South African universities outside the TBVC areas (Peacock 1993). The research was based on employment statistics from all fourteen universities and in-depth interviews conducted at one traditionally black university, one traditionally Afrikaans-speaking university, and one “open” English-speaking university. The report not only highlighted that there were fewer women than men employed at all universities, but that overall women occupied markedly lower positions within the hierarchies.

During the late 1990s, the Forum of African Women Educationalists South Africa (FAWESA)³ commissioned research on the experiences of women professors at universities in South Africa (De la Rey, 1998). The study not only drew attention to the poor representation of

³ FAWESA is a national advocacy group composed of women in executive positions in the higher education sector.

women in higher levels of management in South African universities, but its qualitative approach produced a textured account of how a small sample of women experience the academy as a workplace. Based on the research, a skill needs assessment instrument was designed to plan a professional development programme for women in higher education and to identify women's training needs (Moultrie & De la Rey 2003). The qualitative interviews with twenty-five woman professors (both full and associate professors) at twelve universities across the country provided the data for De la Rey's doctoral work – a narrative analysis of the subjective experiences of these women academics (1999). Located within the discipline of psychology, and theoretically within the ambit of feminist post-structuralism and social constructionism, it focussed on the women's family background, educational history, trajectory of career development, professional experiences, and relation between personal life and professional life. Her research confirmed the significance of gender in shaping academic careers, in the sense that most of the women professors did not follow the standard linear model of career, namely continuous service with regular and steady promotion up the organisational hierarchy. However, it needs to be noted that the qualitative methodology and purposive sampling used in this study do not allow for generalisation.

During 1997, the former Centre for Science Development (CSD) of the Human Sciences Research Council (HSRC) conducted a national audit aimed at ascertaining the research status and needs of women researchers and academics in the humanities and social sciences (CSD 1999). This W-i-R Audit sought to develop a profile of women researchers and academics in the social sciences and humanities in HEIs, and to identify the obstacles they face in trying to do research and publish. It succeeded in producing - for the very first time - a picture at national level of women's participation in research. Women's research needs were found to centre around a reduction in teaching and administrative loads, institutional and/or departmental provision of resources and support for research, training in research, supervision and mentorship, and networking and collaborative research. Unfortunately, conclusions cannot necessarily be generalised to disciplines other than the social sciences and humanities, especially the hard sciences. In general, the findings are not generalisable, as the sample was not drawn randomly, because the target population could not be clearly defined. Another issue related to external validity flows from the voluntary nature of the responses: it may very well be that there are women academics that did not respond, because they are not involved in research for whatever reasons. This most probably resulted in biased, "overly optimistic" findings in some respects, because of the over-representation of women with the greatest interest in research (CSD

1999:10). Even more importantly, the data do not allow for the drawing of comparisons between women and men.

More recently the same W-i-R project, now a sub-programme of the Thuthuka Programme of the NRF, published the findings of a more comprehensive audit in 2001. The audit was aimed at generating a profile of South African women who are employed by institutions of higher learning as academics and researchers (including women in support services such as libraries who are engaged in research) across the science domains. As such, this audit represented an improvement on the CSD audit in terms on external validity. In particular, its objectives were to establish the position, level of skills and expertise of women researchers, to identify the needs of women researchers and to identify the barriers faced by women researchers in academic institutions and research organisations. Data were collected by means of a questionnaire that was completed by more than 500 women academics and researchers.

Although the study provides some important insights into the research needs and barriers experienced by South African women in the world of academic research, it did not focus on the issue of publication productivity *per se*. Moreover, the study suffers from limitations with regard to the study population and sampling. First, a comparison between the genders was again rendered impossible, as men were excluded from the study population. Secondly, the use of an on-line questionnaire as data-collection instrument implied that the findings were based on a convenience sample. The findings are therefore vulnerable to extensive sampling error and bias, and the generalisability of the findings to the population of women researchers in South Africa as a whole is limited (especially if one considers that a response rate of only thirteen percent was attained, with non-response concentrated at HBUs).

A telephone survey of all South African universities' top academic and administrative structures was also carried out over three years (2000-2002) to determine whether or not women representation showed a changing pattern. The data indicated that the pattern of women's under-representation in senior academic positions, such as deans and heads of departments, showed very little change over the three years studied (Zulu 2003). Two further studies (Wolpe 1997; De la Rey 1998, cited in Petersen & Gravett 2000) have also attempted to document the situation of women academics in South African institutions of higher education.

A few smaller studies have also been undertaken at specific HEIs. Although these studies are quite limited in terms of their generalisability of academic populations other than those at the academic institution where they had been conducted, they are still valuable in their own right. As early as 1986 a research project at the University of Cape Town investigated possible reasons for

why women overall occupy markedly lower positions within the academic hierarchy than men do. The researchers specifically looked at the degrees and number of publications of men and women at the institution, and found that these factors did not explain the differences between men and women's positions (White 1989). The University of Cape Town has also been selected recently as the case institution for a study on the state of specific gender equity initiatives in higher education in five Commonwealth countries⁴ (Shackleton *et al.* 2004).

Research undertaken by Salo (n.d. 1998, cited in Salo 2002) at the University of the Western Cape (UWC) indicated that, whilst women were well represented in the academic sector, most hold junior academic positions and carry the heaviest teaching loads. Also at UWC, Walker (1997) investigated gender equity issues, by drawing on university documents, relevant publications, interviews with selected senior women academics, and her own insider status as a female academic at the institution. Another institute-specific study, undertaken among faculty at the Psychology Department at UNISA, focussed partly on publication output and included gender (among other variables) in the analysis. In addition to determining the extent and nature of research-related activities at this department, the views of academic staff members on past experiences and future expectations of research activities within the department were also gauged by means of a survey. However, the authors caution that some of the gender differences that were obtained “may be spurious and should be interpreted with care” (Van Staden *et al.* 2001:55).

Most recent research on women academics has exhibited strong tendencies towards a feminist qualitative methodological framework. In 1999, research commenced on the extent to which gender equity has been mainstreamed at the University of the Free State (UFS) (Pretorius *et al.* 2002). The project, which took two years to complete, included a gender analysis of the UFS and a comparison in this regard with other universities, with an emphasis not only on the position of women academics at the institution, but on their experience of and reaction to the organisational culture as well. The latter issues were investigated in the form of a case study of one Faculty at the UFS, namely that of the Humanities, while employing feminist methodology.

On a smaller scale, May (1999) undertook research at Peninsula Technikon in order to determine the factors that impede the career advancement of women academics at this institution. Her research focused on two factors: to determine whether women academics at Peninsula Technikon experienced difficulty in balancing career and family demands, and to

⁴ In addition to South Africa, this project involved research on gender equity in higher education in Nigeria, Sri Lanka, Tanzania and Uganda.

determine which barriers impacted on the career advancement of women academics at the institution. All the women academics at Peninsula Technikon were solicited to participate in the study, though only slightly more than half responded⁵. The results of the study confirmed that women academics at the technikon experienced greater participation in the work role compared to the home and family role, but were more committed to the home and family role than to the work role. However, again no comparison is drawn between the career correlates of female academics and that of their male counterparts. In addition, a relatively low response rate of 58 percent may possibly have skewed these results

In-depth, semi-structured interviews were also conducted with a purposive sample of ten women academics at the then Rand Afrikaans University (RAU, now the University of Johannesburg) in order to understand their experiences. The findings of this research denoted both positive and negative experiences of women academics at the institution – experiences similar to those of women academics in other parts of the world. Positive experiences include the lessening of visible, overt discrimination, and the advantages of flexible working hours. Negative experiences include the double workload of women academics, their ambivalent feelings about academia, and its impact on their reactions and behaviour (Petersen & Gravett 2000). Walker (1998) used life-history interviews to explore the marginalisation of women in South African universities. Thirteen women were interviewed to obtain their educational autobiographies and narrative accounts to explore their personal experiences as academic women. Also conducting narrative research, Perumal (2003) explored the status of women's academic citizenship by means of the autobiographical essays of and interviews with five tertiary educators at various universities in Southern Africa. In addition to highlighting the “second-class academic citizenship status” (*ibid.*:76) of women, the research participants reflected on institutional factors that enabled or disabled their participation in academic life.

Similarly, but with a specific focus on black women who fill academic posts in the faculties of humanities at three Historically White Universities (HWUs) in Gauteng, Dlukulu (2000) used a qualitative research design to explore how six of these women experience their interpersonal relationships in the context of their work environment. Finally, Maürtin-Cairncross's (2003) research on challenges faced by women academic staff members at three HBUs represents the only study thus far conducted in South Africa, which specifically merges a concern with gender and the issue of academic publication. As such, her study represents one of the first attempts to

⁵ The population of women academics at the technikon is very small (N = 73), and the final “sample” of respondents consisted of a mere forty-three women.

address the lack of quantitative as well as qualitative research on South African academic women's relationship to publishing.

Although Maürtin-Cairncross's research is situated predominantly within a feminist qualitative methodological framework, she employed research methods of both a quantitative and qualitative nature. Survey data provided a descriptive profile of the publication records of academic women at the selected institutions, in particular how much and where they publish, as well as what the factors are that influence their publishing endeavours. Her findings in this regard were aimed at providing "understandings, rather than to attempt to find causal relationships between variables" (106). These data were also used as a backdrop for focus group discussions and interviews, which, in turn, generated explorative data on the in-depth subjective experiences of the participants. These focussed on the personal, departmental, and institutional barriers that the women perceive as impeding their publishing endeavours, and their recommendations in terms of strategies and/or interventions that would assist and improve their publication output. Her findings, although based on small samples that cannot be considered representative of academic women at South African universities in general (see Chapter 2, section 2.4), indicate that the women experienced aggregated barriers to publishing, which often relate to the historical-political origins of HBUs.

1.3 Gender differences in publication productivity

Studies spanning four decades, using a myriad of measures, and covering diverse disciplines in a multitude of countries worldwide have clearly established the presence of gender differences in scientific productivity and, in particular, have consistently reported the lesser productivity of women scientists. In 1984 a review of more than fifty (mostly American) studies published between 1973 and 1982 showed that women publish on average fifty to sixty percent as much as men (Cole and Zuckerman 1984). Findings from research published after 1982 have not deviated from this trend: on average, male faculty in the United States have higher levels of research output than female faculty (e.g., Bellas & Toutkoushian 1999; Xie & Shauman 1998; Olsen *et al.* 1995; Primack & O'Leary 1989), although some researchers have reported smaller gender differences than fifty to sixty percent difference reported by Cole and Zuckerman (see Xie & Shauman 1998; White 1989; Fox & Faver 1985; Blackburn *et al.* 1978).

Gender differences seem to hold for British (Endler, Rushton & Roediger 1978; Blackburn & Fulton 1974, 1975), Canadian (Nakhaie 2002), Australian (Sheehan & Welch 1996), and New Zealand (Brooks 1997; Vasil 1996) scientists as well as for Americans. In Europe, a study of

scientific research in the European Economic Community reported that women researchers publish on average five articles in a three-year period, in contrast to eight papers by male scientists (Franklin 1988). More recent research involving individual European countries, e.g., Norway (Kyvik 1990; Kyvik & Teigen 1996) and Sweden (Hemlin & Gustaffson 1996), produced similar results. Finally, the South African National R&D Strategy reports the findings of research conducted by CREST, that women scientists contribute to less than fifteen percent of our nation's scientific output (DST 2002). With the exception of research at UCT, which found that, on average and during three years in the mid-eighties, women produce less than half of the publications that men do (White 1989), no studies have been conducted on gender differences in publication productivity in this country. As Maürtin-Cairncross (2003:i) rightly observes with regard to South Africa: there is a "dearth in research regarding women's publishing records and women's relationship with publishing".

1.3.1 **Changes over time**

The lesser publication productivity of women scientists is considered one of the most persistent differences in research productivity: not only is it found in studies all over the world, but correlations between gender and productivity (of about -0.2 to -0.3) have remained fairly stable among cohorts entering science in successive decades since the first decades of this century (Cole 1979; Cole & Zuckerman 1984). This is surprising, given the marked changes that have taken place - at least since the late eighties in the United States - in the larger society, higher education, and the social organisation of science (Cole & Zuckerman 1984). In particular, one would expect a narrowing of the gender gap in publication productivity as HEIs become more "female-friendly" (Nakhaie 2002:175), and gender inequality in the academic workplace (especially with regard to the distribution of resources and structural positions) becomes less pronounced and less normative.

However, some American researchers that compared different datasets rather than graduate cohorts over time, found an increase in women's publication output and some convergence of the gender gap over time. For example, Xie and Shauman (1998) found that gender differences in research productivity have declined in the United States, with the female-to-male ratio increasing over a 24-year period from 63 percent in 1969 to 76 percent in 1993. Their result is consistent with the observations of other American studies (Ward & Grant 1996; Bentley & Blackburn 1992), as well as with findings in Iceland, where Lewison (2001) found a rise in women's share of publications from eight percent in 1980 to about thirty percent in 2000. Further evidence of a

decrease in gender differentials over time is provided by Cole and Zuckerman (1984), who show that the representation of women in the most prolific group of scientists (defined here as those who publish about two papers annually) had greatly increased from a mere eight percent in cohorts of 1957-1958 to 26 percent in cohorts of 1969-1970. The increased representation of women in this group is significant, since highly productive scientists contribute disproportionately to the literature and presumably to the development of scientific knowledge, thus narrowing aggregate gender differences in publication. However, more recent research shows that this initial increase in highly productive women relative to men has not been maintained, as Sax and her colleagues (2002) report that over the past three decades⁶ the gender gap has remained unchanged among highly productive faculty (defined here as those producing five or more publications within a two-year period). Thus, it seems that although the gender gap in research productivity has narrowed in the United States, it has probably only done so at the lower productivity levels.

1.3.2 Variation across disciplines

Studies that draw comparisons across fields of study, have found that the extent of gender differences in publication productivity varies across disciplines. However, findings are contradictory. In Norway (Lie 1990) and Israel (Toren 1991) indications are that publication productivity differences between men and women scientists are smaller in the natural sciences than in the social sciences and humanities. Two hypotheses are proposed to explain these findings: (1) women in the natural sciences are a selected group of women, having chosen male-dominated disciplines; and (2) research problems in the natural sciences are more gender neutral than in other disciplines. Thus, it might be easier for women in the natural sciences to become integrated in professional networks than for women in fields where gender issues influence the choice of research problem.

On the other hand, Stack (2002) found a smaller publication productivity gap between men and women in such “soft” sciences as sociology and anthropology, and Nakhaie (2002) found that among Canadian professors, men in the arts, humanities and social sciences actually publish *less* than their female counterparts. In order to explain these findings, reference is made to the fact that the soft sciences are characterised by a high proportion of women (e.g., nearly forty percent of sociologists in the United States are women). As these fields are less dominated by

⁶ These findings are based on a comparison of 1998-1999 results of the Higher Education Institute Faculty Survey with results of earlier administrations (1972-1973 and 1989-1990) of the same survey.

men they are characterised by fewer barriers to the publication productivity of women. Also, it is argued that the lower degree of gender inequality in the soft sciences, may lead to “greater integration of women into academic research networks” (Stack 2002:176).

1.3.3 **Other salient patterns**

More detailed comparisons of publication output in terms of gender show that for both men and women the distribution of publication productivity is strongly skewed, with the majority publishing little and a minority publishing a lot (Cole 1979; Cole & Zuckerman 1984; Kyvik & Teigen 1996). The fact that the degree of inequality in rates of publication within each gender is much the same is important, as it indicates that gender is a poor predictor of publication productivity. However, men and women do differ in the sense that smaller proportions of women compared to men are among the prolific (Bayer 1973; Astin 1978; Cole & Zuckerman 1984; Kyvik & Teigen 1996), and even the most productive women publish less than their male counterparts (Prpić 2002).

Longitudinal studies in the United States have also shown that gender differences in productivity generally increase over the course of scientists' careers (Keith *et al.* 2002; Long *et al.* 1993; Long 1992; Zuckerman 1991; Cole & Zuckerman 1984; Reskin 1978a). Long (1992) also found that gender differences in publication productivity usually start decreasing at a later stage in the academic careers of biochemists in the United States. This implies that a significant proportion of women not only maintain their productivity, but increase it, whereas the average man's productivity levels off. However, his findings have not been confirmed by other longitudinal research, most probably because they usually cover only the first decade or so of scientists' careers.

1.3.4 **Alternative findings**

Although most studies have reported a lower publication productivity rate among women than among men, this is not a universal finding. Exceptions to this general pattern have been found. Although it is not clear why the findings of a few studies deviate from the general trend, their use of distinctive population and/or measurement criteria point toward the possible influence of methodological features on findings. In addition, a reduction in the publication productivity difference between men and women is evident when variables related to publication productivity are controlled for.

1.3.4.1 *Methodological issues*

It seems that gender differences in publication productivity are greater among “average” academics than among highly productive “superstars”. For instance, in Davis and Astin’s (1990) small sub-sample of 51 highly productive academics in the United States, the quantity of women’s work was found to be equal to that of men in some respects (article publication) and higher in others (chapter publications). And though women did trail behind with respect to book publication, they did so only negligibly. A similar pattern was found among an elite group of recipients of prestigious postdoctoral fellowships studied by Sonnert and Holton (1995). In this highly selected sample, the women scientists had an average of 2.3 publications per year, whereas men had 2.8 – the women thus publishing eighty percent as often as the men.

Another exception was found in a qualitative study of the work histories of sixty men and sixty women researchers, undertaken in Italy in 1988 (Palomba 1993), which showed that men and women demonstrated similar levels of productivity across different types of publications. In a study of chemists in the United States Reskin (1978a) found only a small but statistically non-significant (at the .05 level) tendency for men to be more productive than women, while significant differences between men and women were found on only three of twelve productivity measures. Similarly, Nakhaie (2002) found that when variations in types of publication are taken into account there is little net difference in publication productivity between academic men and women. For instance, the relationship between gender and publication productivity actually disappears for various types of books, but remains significant for article publications (Nakhaie 2002). This author also found that if only the most recent years of publication are taken into account, very little gender difference in publication productivity remains. The impact of such measurement criteria on findings pertaining to gender differences in publication productivity will be discussed in more detail in the following chapter.

1.3.4.2 *Controlling for relevant variables*

Taking into account variables related to publication productivity also reduces, and in some cases even eliminates, observed gender differences in publication productivity. These variables include individual background or personal characteristics (such as marital status, discipline, time lag between bachelor’s and doctoral degrees, and years of experience beyond doctoral degree), and structural locations and resources (e.g., type of current institution, academic rank, teaching hours, research funding, and research assistance). Not many studies on gender differences in publication productivity take into account any such control variables, and it has even been

suggested that gender differences in publication productivity found in earlier studies may have resulted from the omission of control variables (Nakhaie 2002; Stack 2002; CEEWISE 1979).

Studies that found that women are not significantly less productive than men when some or all of the above-mentioned relevant factors are controlled for include those by Stack (2002), Asmar (1999), Xie and Shauman (1998), Ferber and Loeb (1973), Robinson (1973), and Simon *et al.* (1967). In South Africa in particular, it has recently been found that among academics in the Faculty of Humanities at the University of the Free State the average publication output is the same for women and men at the levels of associate professor and senior lecturer, and that women's output is actually higher than that of men at the level of lecturer (Pretorius *et al.* 2002). Unfortunately, the small sample size of this case study, combined with a response rate of 23 percent, undermine confidence in the reliability and generalisability of the findings. In particular, the number of women faculty in the higher ranks was very small and too low at the level of professor to allow for multivariate analysis⁷.

Studies elsewhere found at least a reduction in gender differences in publication productivity when the major variables associated with publication productivity are controlled for (Nakhaie 2002; Centra 1974). This seems to be a cross-national trend, as Teodorescu (2000) found similar results among ten countries, both developed and less developed. Variables that are related to productivity may also be controlled for by using matched samples of scientists. It is therefore not surprising that studies employing such a research design also observe reduced gender difference in publication productivity (Noordenbos 1990, cited in Nakhaie 2002; Thoreson *et al.* 1990).

Findings such as those discussed in the previous paragraph indicate that gender only influences publication productivity in an indirect manner. Thus, gender *per se* does not contribute significantly or meaningfully to the explanation of productivity. However, the findings do not yet tell us why gender, which is arguably functionally irrelevant for research performance, is associated with the factors controlled for by these researchers.

⁷ For instance, although a significant gender difference in publication output was also found among professors, where an average of 47 accredited articles published was recorded for women in comparison to 18.5 for male professors, the average of 47 for women represents the output of the only woman professor in the study population.

2 Explanations for gender differences in publication productivity

The existence of publication productivity differences between men and women scientists, confirmed by a number of studies during the sixties and seventies, generated much discussion and debate, as well as numerous hypotheses to account for the gender disparity in publication. Efforts within the sociology of science to explain the skewed productivity distribution among scientists in general were useful in this regard, as S&T researchers begun identifying the degree to which facilitators or inhibitors of research productivity already determined previously were gender-specific.

Explanations ranged from biological differences in scientific aptitude to gender discrimination of various kinds. By the late seventies most were still largely untested (Reskin 1978a), but research efforts were already underway to explain the gender gap in publication productivity empirically. These efforts are ongoing, as the controversial nature of the explanations leads them to be continually being revisited by researchers, and because most attempts to account for these differences have been largely unsuccessful, as first acknowledged by Cole and Zuckerman in 1984. This observation led them to refer to gender differences in research productivity as “the productivity puzzle”. After another few years of research into the issue, Zuckerman (1991:24-25) wrote that, “we have yet to understand the sources of gender differences in [publication] productivity”, and that, “more nuanced explanations are required than those explored so far”. Long (1992) agreed: after reviewing many explanations in the literature, he concluded that none of them had been very successful in accounting for gender differences in publication productivity. The complex nature of the reasons for gender differences in publication is often referred to in attempts to account for this state of affairs.

Since these pronouncements more than a decade ago, renewed - and seemingly more successful - attempts have been made to explain the lower rates at which women publish. For instance, Xie and Shauman (1998:863) report that they have, “for the first time, successfully identified differences between men and women scientists in personal characteristics, structural positions, and facilitating resources that account for women’s lower research productivity”. However, the most recent reviews of the literature were undertaken more than a decade ago. Most previous reviews (see, for example, Cole & Zuckerman 1984; Hornig 1987; Long 1987) also tend to focus almost exclusively on North American findings, and report only on a limited range of explanations (e.g., either psycho-social or structural).

In an attempt to address these shortcomings, the remainder of this chapter is an attempt at providing a more recent review of the literature that is also more globally representative and comprehensive in terms of proposed explanations discussed. However, some issues and concerns need to be raised: Firstly, although the review implies the drawing of comparisons between findings from a variety of studies from across the globe, it needs to be kept in mind that the comparability of these studies is problematic given the fact that they differ widely in terms of study populations – in particular the disciplines that are included - and time periods covered. As Long and Fox (1995:66) caution, “[c]are must be taken in citing a result based on scientists in a particular field at a particular time and not presenting the result as though it characterises all fields [and] times”. As was mentioned above (see section 1.3.4.1), methodological differences between studies, especially the measures of productivity that were used, may hamper the comparability of results. Where space allows, dissimilarities that are deemed relevant, will be highlighted.

Secondly, it needs to be taken into account that cross-national comparability is limited by variations between countries with regard to 1) features of higher education systems (for instance, rank structures and the system of tenure), and 2) the extent of gender differences in factors relevant to publication productivity, such as qualifications, salaries and teaching loads. This also implies that it is unclear to what extent the majority of the findings that are predominantly from the developed world are relevant to the understanding publication productivity in less developed nations such as South Africa. According to Teodorescu (2000), there is “a potential danger in applying the findings of Western literature on publication productivity to other national context” (219) because correlates of faculty publication productivity differ markedly across national academic systems. Thus, it stands to reason that those correlates that are important in explaining gender differences in publication productivity may also differ between more and less developed countries.

Finally, the review is only as comprehensive as the literature search on which it is based. Although care was taken to include the widest possible range of findings by means of extensive literature searches and cross-referencing, some studies might still have been omitted. However, it is improbable that these studies will counteract the general trends and patterns indicated by the bulk of research that has been included in the review.

Reasons for gender differences in publication will be categorised into one of three broad groupings: First, those focussing on gender differences in “intrinsic” characteristics, secondly, explanations dealing with women’s greater family responsibilities and, finally, those that refer to

various extrinsic (structural and social) aspects of the academic or scientific workplace. The extent of empirical support for, as well as the strength and weaknesses of each explanation will be reviewed critically. This discussion will be followed by a review of three attempts at theoretically integrating the dynamic interactions between some of the explanations. These include the theoretical frameworks of (1) accumulative advantage and disadvantage; (2) reinforcement theory; and (3) the most recent theory of limited differences. As a whole, this review will not only provide an up-to-date, comprehensive overview of the debates (both theoretical and empirical) concerning the reasons for observed gender differences in publication productivity, but is intended also to identify those questions and issues which should receive priority in the present study, as well as in any future research on gender and publication productivity.

2.1 Psycho-social explanations: the difference model

Psycho-social explanations may be categorised under the general hypothesis that publication productivity differences between women and men originate from deep-rooted differences in the behaviour, outlook and goals of the sexes. Sonnert (1999) refers to this approach as the “difference model”, which he distinguishes from the “deficit model”. The latter hypothesises that gender differences in publication productivity are the result of structural factors, which will be discussed in more detail in section 2.3. The difference model, which holds that the causes of gender disparities in publication productivity lie within women themselves, corresponds to the first attempts at explaining differences in publication productivity levels among scientists in general (Fox 1983). These included individual-level variables, and were dubbed “theories of initial conditions” by Cole and Singer (1991:285).

Within the difference model a distinction may be drawn between gender differences that are said to be either innate, or the result of gender-role socialisation. The former represent physiological or biological factors presumably linked to sex, while the latter correspond to dispositional (psychological) factors.

2.1.1 Innate factors

Innate gender differences that have been considered in the context of publication productivity are those of scientific talent, imagination or aptitude. The “sacred spark” hypothesis (Stephan & Levin 1992:29) suggests that there are predetermined differences among scientists in their ability to do scientific research, in particular their aptitude to tackle and solve difficult problems. In the context of gender differences in publication productivity, this hypothesis implies that, owing to genetic differences between the genders, women might be less able as scientists than men are. As such, the hypothesis is based on traditional assumptions that women lack certain “male” abilities, e.g., quantitative skills that are associated with successful careers in science.

Empirically, there is very little, if any evidence to support such claims. Although there have been no agreed upon measures to predict *scientific* talent, imagination, or aptitude, early American studies that used standardised tests show no direct relationship between publication productivity and general creative ability or intelligence (Andrews 1976; Cole & Cole 1973). In addition, gender has been found to be unrelated to measured ability (Bayer & Folger 1966). Academic ability of women scientists, particularly if measured in terms of IQ scores, has been found to be either the same as, or higher than, those of men (Cole 1979; CEEWISE 1979; Harmon 1965 and NAS 1968, both cited in Graham 1970), and IQ scores have been found to be uncorrelated with publication counts (Cole 1979).

Moreover, in Mexico Blazquez (1996) found that, to be taken seriously as a potential scientist, women had to demonstrate a greater knowledge and research ability than their male counterparts. Thus, whereas men are considered competent scientists until proven otherwise, their female counterparts have to demonstrate their competency fully before it is generally accepted. As White (1989) found to be the perception among female academics at UCT in the eighties, “the rules are tougher for women” (107). This implies that women who succeed under such circumstances are a more highly select group than men in terms of abilities. This conclusion is also reached by Long and his colleagues (1993:710-711), who state that, “women who start their careers with faculty positions in research universities are a more select group than their male counterparts”, and is supported by findings that Norwegian women academics have better grades at university entrance than their male colleagues (Kyvik 1990).

On the other hand, there is evidence that girls do less well than boys in mathematics, and boys in the United States tend to have higher scores than girls on the mathematical portion of the SAT and GRE. This may indicate superior male mathematical ability, but there are some problems with such a conclusion. First, it is unclear whether these differences flow from innate or other

factors, such as socialisation and exposure to mathematics. Also, there is no evidence that after the groups are socially and self-selected into PhD programmes that this difference is reflected in subsequent performance (Cole & Singer 1991). Cole and Zuckerman (1987) make a similar point when they argue that, for the purpose of studying adult men and women scientists – a highly selected population who have passed through the rigours of graduate training, have earned doctorate degrees, and are employed in science - such arguments concerning gender differences among the general youth are neither pertinent, nor helpful.

Although the evidence shows that the scientifically relevant abilities of women scientists are at least equal to those of men, the traditional assumption that women are biologically less capable than men to do research, may indirectly affect women's publication productivity. As Bielby (1991) argues, this stereotype affects the perceptions and expectations of men, and shapes the day-to-day interaction between men and women and their careers. For instance, an Australian study that included men as well as women academics found that men tend to attribute women's relative lack of success in the academic environment partly to their not being "as good as men on the job" (Jones & Lovejoy 1980:98).

More importantly, as Spradley and Mann (1975, cited in Karp 1985) have put it, women in male worlds operate under a "handicap rule". The fact that doubt is cast on women's suitability, commitment and ability to assimilate into academe may affect women's perception of their own abilities, further reducing their potential, via the operation of the self-fulfilling prophesy principle (Subotzky 2003; Petersen & Gravett 2000; Williams *et al.* 1974). Gender differences in such dispositional factors as perceptions of self-efficacy, career aspirations, and preferences for certain roles and work styles are the topics examined in the following discussion.

2.1.2 **Dispositional factors**

Evelyn Fox Keller (1995) argues that science is inherently masculine in character. Thus, valued attributes in successful scientific researchers are androcentric - associated with men and masculinity. In addition, academia is perceived as traditionally male in its workplace culture and values (Maürtin-Cairncross 2003; Caplan 1994; Sutherland 1985). It is therefore not surprising that effective researchers have been found to be those who are "ambitious, enduring...showing leadership, aggressive, independent, non-meeek, and non-supportive" (Rushton *et al.* 1983, cited in Horner *et al.* 1986:323). As these characteristics are "inimical to dominant constructions of femininity" (De la Rey 1999:206), or at least not traditionally thought of as female traits (Harper *et al.* 2001), society still socialises women to be different from men in terms of dispositional

factors such as ambition and competitiveness, in effect not preparing them for the academic world. Thus, differences that result from gender-role socialisation may go a long way in explaining gender differences in publication productivity.

2.1.2.1 *Career motivation and aspirations*

Perceptions of research as a masculine activity (found among both men and women) creates a climate in which women faculty are neither expected nor encouraged to publish like their male colleagues (Harper *et al.* 2001). In 1979, Cole was the first to propose that gender differences in what he terms “socially structured motivation” (85) might lie at the root of women’s lower publication rate. In other words, prior socialisation processes may dampen women’s motivation to succeed, as women may be less often subjected to pressure for career achievement than men are, and because being ambitious is inimical to traditional, but still dominant, constructions of femininity (Nicholson 1996, cited in De la Rey 1999). The reluctance to claim a construction of the self as ambitious renders women less committed to their careers, less driven to achieve, and, ultimately, less productive than men. This, it is argued, is especially true when women scientists’ comparative reference group is composed of other women scientists or women in the larger society, rather than the entire scientific community. Women’s lower career motivation and aspirations has been put forth to explain gender difference in publication productivity, especially among medical faculty (*cf.* Levey *et al.* 1990; Beaty *et al.* 1986).

With regard to empirical evidence, however, Zuckerman noted the lack thereof in 1991: “So little is known about the career commitment of men and women scientists...that this is a thoroughly uncharted area. It would indeed be useful to know whether men and women differ or are the same with respect to career aspirations, concern with promotion, income, and fame” (55). In South Africa in-depth interviews conducted with staff at a selection of universities indicated that women indeed tend to view a career and vocation as less important than men do (Bethlehem 1991, cited by Budlender 1994). Similarly, De la Rey’s (1999) narrative analysis shows that women professors in South Africa convey it as necessary for their academic success to reconstruct the “self from a naïve academic to an ambitious, competitive individual fully informed of the system” (176), but that this transformation was often depicted as problematic.

Evidence of a more quantitative nature has also been reported elsewhere. For instance, in America male professors report a higher level of professional motivation and commitment than their female counterparts (Davis & Astin 1990), while women academics are shown to have lower aspirations (Widom & Burke 1978, cited in Hood 1985) and to be less ambitious than men

(Carr *et al.* 1998; Noordenbos 1992, cited in Nakhaie 2002; Lodge 1976), where ambition was operationalised in terms of, for example, aspirations to full professorships and/or to chairing a department. However, findings are not conclusive. The gender differences found by Carr *et al.* (1998:536) were “modest” and actually “surprisingly small”, and in their study of medical school faculty Barnett *et al.* (1998) found that the lower publication rate of women could not be accounted for by gender differences in career motivation.

More to the point are arguments that women and men faculty differ specifically in terms of attitudes toward research and/or publishing. Women’s lesser motivation for or lack of interest in research has been put forth to explain gender difference in publication productivity among medical faculty (Kaplan *et al.* 1996; Carr *et al.* 1992; Levey *et al.* 1990). Findings from various studies, including a cross-national comparison of eight countries, indicate that women faculty generally have a less positive attitude or orientation towards research and/or publishing⁸ (Poole *et al.* 1997; Noordenbos 1992, cited in Nakhaie 2002), or that they are less “passionate” about research than their male counterparts (Asmar 1999:262). Furthermore, women seem to take longer to adjust to the notion of “publish or perish” (Astin & Davis 1985), while men faculty (in all eight countries studied by Poole and his colleagues) seem to have “a better appreciation of the importance of research to the career track” (1997:388) than women do. In South Africa, Maürtin-Cairncross (2003) reports on research that found that in some cases women admitted that they expected to be rewarded by promotion and tenure for activities other than their publication output. Subsequently, they realised that these other activities were not recognised, nor were they regarded as academically sound when compared to the weight that publications carried as a promotion criterion. Most of the women academics included in her study did, however, recognise the value of publishing, “even if they were not totally accepting of it” (157).

The tendency for women to place a lower value on research productivity than men do, may be traced back to differences in the way women and men view the academic career (presumably as a result of gender socialisation). For instance, women seem to be more likely than men to view an academic career as “an opportunity to influence social change” (Sax *et al.* 2002:436). Thus, it is quite possible that for many women, time not spent publishing is spent instead on projects or other activities perceived as having more direct societal impact. Sonnert (1995) reports a similar observation among women biologists in the US, i.e., that they appear to be the “purer scientists”, in the sense that they are somewhat less concerned with the political aspects of science, such as

⁸ Only one study – research involving academic social workers – has thus far provided evidence to the contrary, i.e., that the level of dedication to research does not differ between men and women (Fox & Faver 1985).

influence and power. In South Africa a similar picture (unfortunately only of women researchers and not of men) emerges as well: women academics at HBUs, for instance, report the realisation that,

“what they did in their academic work as ‘second nature’ (in terms of student counselling and teaching activities), was not assisting them in claiming their ‘academic validation’...[they] spoke of a conscious choice when having to focus on their own promotion and academic development, implying that some of the other aspects of their ‘natural’ mode of being, are compromised in such a pursuit” (Maürtin-Cairncross 2003:151).

A national audit of women researchers further indicated that, although promotion, job security and academic status are highly ranked as reasons by women researchers as a reason for doing research, personal fulfilment, professional interest and enjoyment of research are ranked as even more important (NRF 2001). Another way in which prior socialisation experiences might affect women’s motivation to engage in research and publication, is proposed by Astin (1991). She found some evidence that women are more sensitive than men to external validation, which may, in turn, affect their orientation towards further research and publication.

2.1.2.2 *Self-promotion, assertiveness, self-efficacy and self-esteem*

Socialisation processes may lead women to be (and to be perceived as) less assertive in advancing their ideas and opinions, less apt to pursue their goals aggressively, and less aggressive, combative and self-promoting in the pursuit of career success, compared to men scientists (Sonnert & Holton 1996; Cole & Singer 1991). McIlwee and Robinson (1992) agree that self-promotional behaviour, which is part and parcel of the highly competitive science or academic environment, may be more difficult for women than men. Men seem to have “entrepreneurial spunk” (Sonnert & Holton 1996:67), while women adopt a kind of “challenge-avoidance behaviour” (Asmar 1999:257). However, evidence for such assertions is almost non-existent, and that which is offered is mostly anecdotal or circumstantial⁹.

A related argument, for which more evidence exists, is couched in the framework of self-efficacy theory (Bandura 1986). According to this argument, socialisation processes may lead women to be less confident about their scientific ability, which may, in turn, disadvantage them in the predominantly masculine occupation of scientific research. Research and writing for publication are not easy and a great many people would not publish unless it was necessary

⁹ For instance, Asmar (1999) supports the notion that women faculty in Australia sometimes adopt challenge avoidance behaviour by referring to the fact that they are far less likely than men to apply for research grants, despite the fact that when they do apply, they are equally successful (Bazeley *et al.* 1996).

(Graham 1970). Given the often rigorous standards of evaluation that academic scholarship is subjected to, it is likely that perceptions of confidence would play a critical role in academic performance (Vasil 1993). For instance, strong self-efficacy beliefs would be needed to ensure persistence in performance in the face of setbacks such as repeated publication rejections. Indeed, Keim and Erickson (1998, cited in Harper *et al.* 2001) argue that women's greater tendency to abandon articles that have been rejected for publication rather than resubmit them, coupled with higher rejection rates for women (see section 2.3.4.2 below), contributes to their lower publication rates.

Vasil (1992) found that research self-efficacy beliefs of academic staff in New Zealand were positively correlated with research productivity. Moreover, this author also found that women faculty in this country hold significantly weaker self-efficacy beliefs than their male counterparts¹⁰. Women academics in Australia – particularly in science – are reported to suffer from lack of confidence in certain respects (Asmar 1999). Other research has found that women feel less confident specifically about research tasks compared to men (Landino & Owen 1988), while they are more confident than men for teaching tasks (Schoen & Winocur 1988).

In this country, self-esteem was found to be a research-related issue raised by women academics at UCT (White 1989) in the social sciences and humanities (CSD 1999), and among women researchers in general, only half¹¹ of whom felt confident about their ability to conduct research (NRF 2001). The responses from women academics at HBUs also indicated that self-confidence played a central role in their relationship with publishing. It is in particular the black women at these institutions who clearly experience a lack of confidence in publishing, and report that this is a major barrier to their publication endeavours (Maürtin-Cairncross 2003). Although a lack of confidence in writing and publishing is predictably salient at junior levels (as one would expect), even some women professors at South African universities seem to find research and publication to be more difficult than teaching. As De la Rey (1999:177) reports, “Research was constituted as a more challenging area of work that involved issues of self-perception, such as confidence and self-doubt”. These findings indicate that women, even those in the upper echelons of academia, are more confident with their ability to teach than with conducting

¹⁰ It has to be noted, however, that gender did not affect self-efficacy after respondents' academic field was controlled for (Vasil 1996).

¹¹ This figure may vary for different populations. When only those respondents with a postgraduate qualification such as a master's or doctorate were analysed, most of them reported feeling confident and very confident (NRF 2001), indicating the positive effect of higher qualification attainment on faculty's self-perceptions. Interestingly, the audit of women researchers in the social sciences and humanities conducted previously, found that seven in ten of these women were confident about their ability to conduct research (CSD 1999).

research and producing publications. However, no comparisons have as yet been drawn with men academics in this regard.

Studies conducted in the United States that did draw such comparisons found that academic men have higher self-esteem than their female counterparts (Widom & Burke 1978, cited in Hood 1985). Even among an elite sample (all of them had received prestigious postdoctoral fellowships) of American biologists, findings are similar. For instance, the women biologists considered themselves as being average almost twice as often as did the men, while men reported themselves substantially more often above average. Also, women evaluated their own technical skills lower than men did, and thought others rated their scientific ability lower than men were prone to do (Holton 1999). It is important to recognise that these gender differences are likely to be even greater among average scientists.

2.1.2.3 *Preference for teaching*

A third grouping of explanations that form part of the difference model concerns the hypothesis that part of the lower productivity of women scientists in relation to their male counterparts may be due to women faculty's preference for teaching, instead of research (Helmreich *et al.* 1990; Boice *et al.* 1985, cited in May 1999; Simeone 1987; Wilson 1986). Women actively choose the role of teacher, it is argued, because they have been socialised to be more person-oriented, nurturing and care-giving (Maürtin-Cairncross 2003). This would imply that they value the social, communication and interaction patterns associated with teaching more than men do, and therefore take the teaching aspect of their job more seriously.

At the root of the hypothesis is a contention widely shared in the academic systems of especially developed countries, that teaching and research are mutually exclusive activities that compete for faculty members' time and attention (Fairweather 1993; Fox 1992). As such, a preference for or devotion to teaching, in particular undergraduate teaching, may lead to a higher teaching load (as well as more time spent on course preparation and the use of more labour-intensive evaluation methods), which impedes publication productivity (Perumal 2003; Bagilhole 2002; Salo n.d. 1998, cited in Salo 2002; Wanner *et al.* 1981; Williams *et al.* 1974; Bayer 1973). In addition, while institutions give lip service to the value of teaching (particularly undergraduate teaching), research enjoys a higher status than lecturing, and is increasingly seen as the "real" work of universities (Jackson 2002:26). Consequently, faculty who focus on teaching have limited access to research-related rewards (e.g., promotion) and facilities needed for further research and publication (Harper *et al.* 2001).

Research findings are consistent with such views. For instance, based on data on the academic profession in ten countries, Altbach and Lewis (1996) found that scholars with primary commitment to research publish more and obtain more research funds than do those who stress teaching¹². Smaller studies in the United States also show that higher levels of research output are associated with lower time spent on teaching (Bellas & Toutkoushian 1999; Davis & Astin 1990). Research in South Africa indicates that women academics experience a lack of time for research, which they strongly attribute to their teaching commitments (Maürtin-Cairncross 2003; Van Staden *et al.* 2001; Thomson 1994; Bethlehem 1991, cited in Budlender 1994). In addition, a national audit of women researchers in the social sciences and humanities found the reduction of teaching and administrative loads as the most commonly area for research-related improvement proposed by the women respondents (CSD 1999).

Empirical evidence for a tendency among women academics to exhibit less motivation for, or lack of confidence in research has already been noted above (see section 2.1.2.1). In addition, evidence indicates that, compared to their male counterparts, women academics report differentially more interest in teaching than research. Studies undertaken in the United States (Astin, Korn & Dey 1999; Ladd & Lipset 1976; Bernard 1974; Bayer 1973; Folger, Astin & Bayer 1970), Britain (Williams *et al.* 1974), New Zealand (Vasil 1993), and a cross-national comparison of academics in eight countries (Poole *et al.* 1997) all support the hypothesis of a more positive orientation among women towards teaching, while men have a more positive orientation towards research. And even though Olsen *et al.* (1995) found no evidence among faculty at a research university in the United States to indicate that women demonstrate greater interest than men in teaching, they did find that women display a greater orientation to the intellectual and social development of students than their male counterparts do. Similarly, a British study found that, although women do not actually teach more than men, in general they did show a little more concern for the needs of students than the men (Williams *et al.* 1974). In South Africa, interviews with women academics have shown a strong tendency among them to give their teaching duties priority over research, and to represent teaching as the area of academic work that is more enjoyable, and provides more job satisfaction, than research and publication do (De la Rey 1999; White 1989). Unfortunately, no comparisons with men have yet been drawn in this regard in South Africa.

¹² However, Teodorescu (2000), who analysed the same dataset, found that, with the exception of Japanese academics, time spent on teaching does not negatively affect publication productivity.

As faculty's orientations to research and teaching are considered important predictors of time spent on these activities (Blackburn & Lawrence 1995; Fox 1992; Stark *et al.* 1986), a greater amount of time invested by women in teaching as opposed to research is often cited as evidence for women's preference for teaching. A few early studies (mostly of single institutions in the United States) suggested that women academics do spend more time on teaching-related activities than on research-related ones (Over 1982; Helmreich *et al.* 1980; Cole 1979; Ladd & Lipset 1976; Bayer 1973). However, by the mid-eighties gender had not yet been seriously considered in large-scale studies of faculty time expenditures (Yuker 1984), and Cole and Zuckerman (1984) called for paying closer attention to the allocation of time for teaching versus research in studies on gender differences in publication productivity. Since then the fact that women faculty spend less time on research and scholarly writing and more time on teaching than men has been confirmed by numerous studies (including national surveys) in the United States (Bellas & Toutkoushian 1999; Allen 1998, cited in Harper *et al.* 2001; Carr *et al.* 1998; Kaplan *et al.* 1996; Russell *et al.* 1991; Davis & Astin 1990), in the United Kingdom (Bagilhole 1993), and in New Zealand (Vasil 1993).

However, these findings need to be interpreted with care. First, not all research has produced findings consistent with the above-mentioned gender differences in time expenditure on or commitment to teaching and research (see Lie 1990; Olsen *et al.* 1995; Williams *et al.* 1974). Secondly, most of the studies on gender differences in faculty time allocations are characterised by a variety of limitations, including small samples, and a lack of controls for gender differences in total hours worked¹³. Thirdly, and more importantly, the time that academics allocate to teaching and research does not necessarily indicate the existence of an underlying interest for one or the other aspect of the academic role. A feedback mechanism created by publication productivity may be operating, that cannot be taken into account by such studies. For instance, publication success (or the lack thereof) can influence one's orientation to research and teaching. In other words, commitment to teaching may be an effect rather than a cause of low research output (Williams *et al.* 1974). This, in turn, may influence time allocations, if less/more productive faculty choose or are required to spend more/less time in teaching (Bellas & Toutkoushian 1999). However, as most studies on faculty time allocations are descriptive, and/or involve the analysis of cross-sectional datasets, it is difficult to determine the time order of variables.

¹³ See Bellas and Toutkoushian (1999) for a detailed discussion of these issues.

Finally, it is questionable whether women spend more time on teaching than research because their gender-role socialisation leads them to *actively choose* one academic role (teaching) as opposed to another (research). For instance, among early career academics in Australia, Asmar (1999) found little quantitative evidence for the view that “women are knowingly damaging their career prospects by taking on abnormal amounts of teaching...work”¹⁴ (267). But why do they, on average, allocate their time differently from men? A few hypotheses have been proposed:

First, women’s greater time expenditures in teaching may be attributable in part to their disproportionate representation in contexts that increase time spent in teaching activities. For instance, women might be concentrated at teaching-orientated institutions and/or in disciplines with heavier teaching loads, such as the humanities (Bellas & Toutkoushian 1999; Fox 1984). In addition, the fact that women tend to be concentrated in the more junior academic ranks usually means that they are more likely to have a higher teaching workload, particularly in the form of large undergraduate courses (Maurtin-Cairncross 2003; Jackson 2002; Harper *et al.* 2001; Baldwin 1985). Finally, the fact that women have a greater likelihood of not holding a doctorate increases their likelihood of being burdened with a heavier undergraduate teaching load (Vasil 1993; Bayer 1973). However, when such structural factors and other relevant variables (e.g., years of experience, age, length of appointment) are controlled for, most researchers¹⁵ still find that women spend significantly more time in teaching and less time in research than men do (Bellas & Toutkoushian 1999; Blackburn & Lawrence 1995; Stark *et al.* 1986; Cole 1979).

Secondly, the possibility of structural inequities needs to be taken into account. It may be that women are assigned heavier teaching loads (e.g., more courses or more students per course) than their male colleagues. In this regard, some observers have suggested that a gendered division of labour in the scientific community concentrates women in non-research roles, such as teaching, and accounts in part for women’s lower publication productivity (Reskin 1978b). Literature on faculty in the United States frequently refers to women’s heavier teaching loads relative to men’s (Grant & Ward 1991; Hornig 1980; Bayer 1973), with negative consequences for women’s publication productivity (Park 1996; Menges & Exum 1983).

With regard to South Africa in particular, Perumal (2003:78) states that, “perhaps the most blatant disparity in the distribution of resources is the gross exploitation of women academics’

¹⁴ On the other hand, Levett and Kottler (1998) describe their experiences differently: “As white middle-class women academics tend to, we willingly took on huge teaching and administration responsibilities and undervalued our time and research (or feared they would be undervalued by others). We often marginalised ourselves in public contexts; our energies often went to fostering and mentoring women students” (194).

¹⁵ Only Russell *et al.* (1991) found that, after taking rank and institutional type into account, most gender differences in time allocations were no longer statistically significant.

time in the labour intensive execution of teaching and administrative tasks¹⁶ that are not imbued with high premium status". Indeed, at least at HBUs¹⁷, women academics report experiencing infringements on their time, because of the nurturing role they are expected to play in these institutions. Gendered duties and responsibilities, often including counselling students, are regarded as implicit to women's workloads, and take up their "research time" (Maürtin-Cairncross 2003:167). This "gendering of academic labour" has been noted at the University of the Western Cape as well, where women carry the heaviest teaching loads (Salo n.d. 1998, cited in Salo 2002). In respect of higher teaching loads, it seems to be particularly those women academics in South Africa who are the least qualified (those with bachelor's degrees) who feel that they are unfairly discriminated against, in comparison to men (CSD 1999).

However, it is unclear if discriminatory practices are the reason for this gendering of academic labour. According to Vasil (1993), research has only managed to provide anecdotal accounts of discriminatory practices whereby female academic faculty are assigned more time-consuming teaching responsibilities, such as running large undergraduate courses. In South Africa, a recent audit indicated that, with respect of teaching women researchers (especially those with a master's qualification or higher) felt that they were not unfairly discriminated against, compared to men (NRF 2001). Moreover, one national study of South African university staff has shown that, even where formal teaching loads are not heavier, women spent a greater proportion of their time and energy on teaching than men (Bethlehem 1991, cited in Budlender 1994). Thirdly, it could be argued that, because women academics are less likely to be mentored or to benefit from informal and formal networks (see section 2.3.3 below), they do not know exactly what the (androcentric) expectations of the academic role are. For instance, Sonnert (1999) notes that women, more frequently than men, are not taught, or do not pick up, the informal "hidden agenda" of skills essential for a successful science career (48). Similarly, in South Africa, some women academics at HBUs expressed a lack of orientation, especially by senior staff, which rendered them unaware of their obligation to publish or the relevance of publications to academic credibility (Maürtin-Cairncross 2003).

It seems that gender differences in time allocations are not merely a matter of personal preferences and orientation. This implies that, as a possible explanation for gender differences in publication productivity, it does not fit neatly into either the difference or deficit models.

¹⁶ Although administrative workload is not discussed in detail here, it needs to be noted that, in the current context, where the dominance of white males is increasingly viewed as illegitimate, there is a growing demand on women to participate in committees (De la Rey 1999).

However, gender differences in teaching loads – be they self-imposed or the result of institutional factors – remain an important variable to consider in any comparison of men and women academics' publication productivity.

2.1.2.4 *Research and publication styles*

The last explanation for gender differences in publication productivity that is linked to gender-role socialisation, concerns the impact that differential socialisation may have on women's approach to research and publication. Differences in the way women and men view the academic career and what it takes to become successful, have already been referred to in previous sections (see sections 2.1.2.1 and 2.1.2.3 above). In this section, the focus is on how these perceptions might lead women and men to make different choices with regard to what and when they publish, which may have differential publication productivity outcomes for the sexes.

Research in the United States has identified a tendency among women to publish significantly more often than men in publications other than the scientific journal article, e.g., in the form of books (Clemens *et al.* 1995; Davis & Astin 1990), book chapters and conference proceedings (Sonnert & Holton 1995). This may be detrimental to women's scientific careers, as academic reputations are more often made through journal articles than other types of publication. Moreover, in a context where article counts are traditionally considered the most highly valued and primary indicator of publication productivity, the publication of books is an ineffective publication strategy. In an attempt to explain this tendency, Holton (1999) suggests that women experience, or think they might experience, more difficulty getting papers accepted in peer-reviewed journals, and so tend to use other publication channels. But another, more intriguing possibility is that women are more interested than men in publishing substantial, synthetic pieces that are too long for regular journals.

When women do publish articles, however, indications are that the quality or impact of their papers – as measured by citations – is similar to those published by men (Cole & Zuckerman 1984). Among biologists (Sonnert 1995), highly cited scientists (Garfield 1983), part-time faculty in academic medicine (Levinson *et al.* 1993), and biochemists (Long 1992) researchers have even found that women's publications are more frequently cited than those of men. A greater citation impact might indicate that the content of women's articles, on the whole, is more noteworthy, has greater visibility, and, one may infer, are found to be more useful to a particular

¹⁷ It is generally argued that the tendency for women to take on gendered roles is especially evident at HBUs, because of the “deeply entrenched androcentric ethos at these institutions” (Maurtin-Cairncross 2003:167).

field¹⁸. Findings such as these are significant, as they point toward the existence of further gender differences in research and publication styles. For instance, Long (1992) suggested that his findings reflect a tendency among women to take a more measured approach to research, work more intensively on comprehensive research projects, and give greater attention to detail, before making their work public.

Such gender differences in work styles have been confirmed to a certain extent by Sonnert and Holton (1995, 1996), who found that women in science exercise more care, caution, and thorough attention to detail in their publications and that they are more likely to confirm and integrate research findings before releasing them for publication. In particular, these researchers found that the female respondents of their survey: (1) felt they were overly careful, even perfectionist, in their research methods; (2) perceived a “less quantity more quality” approach among their fellow women scientists; (3) responded that they had a propensity for choosing comprehensive and synthetic work; and (4) held slightly different views of what constituted “good science”, placing greater weight on thoroughness or comprehensiveness compared to men.

In a nutshell, women tend not to break up their research into as many publishable “salami slices” as possible (Holton 1999:84). It is ironic that in doing so, they actually tend to uphold (or at least attempt to measure up to) what might be called the traditional standards of good science: “the pursuit of fundamentals, with care, with objectivity, with replicability” (Holton 1999:85). However, as such, women’s work styles run counter to what Fox (1999:90) terms “dominant modes of doing and conceiving science”, which stress the practice of subdividing findings into numerous articles, rather than a comprehensive approach. The fact that women have to spend more time on each research product relative to men results in them working at a slightly slower pace, and publishing at a slower rate than men.

There have been some speculations on the reasons for women’s preferences for particular work styles. Sonnert and Holton (1995, 1996) tend to focus on reasons that resonate with the difference model, i.e., that women may be more sensitive to criticism and therefore try harder to produce work that is above any possibility of criticism, or that women’s tendency to feel less confident in their research than men (referred to in section 2.1.2.2 above) could contribute to their more meticulous research style. However, women’s particular research styles may also be a response to their social marginalisation within the social system of science (discussed in more

¹⁸ Citation counts need to be used with caution, however, as there is no agreement among sociologists and historians of science on the substantive significance of unequal rates of citation. Thus, one cannot truly say whether the gender difference in citations mentioned here indicates that research by women really has greater impact than research by men.

detail in section 2.3.3 below). For instance, as relative newcomers to science, women's work may be scrutinised more closely than men's. There are some indications that, whereas men are considered competent scientists until proven otherwise, women have to demonstrate their competence fully before it is generally accepted (see section 2.3.4.2 below). A related phenomenon has been noted in Mexico, where women scientists typically develop their research findings more fully than men before publishing, as they feel they have to demonstrate a greater knowledge and research ability than their male counterparts in order to be taken seriously (Blazquez 1996). Finally, women's higher citation but lower publication rate might be indicative of gender differences in access to institutional resources (further discussed in section 2.3.2.5 below). As women often do not have the resources to publish as many papers as men, they may be compelled to make each article as important as possible, rather than saving some results for their next article (Long 1992).

Whatever the reason, the tendency for women scientists to focus on quality at the cost of quantitative output, and thus not to play the game of publication maximisation as well as their male counterparts, might offer an intriguing explanation for the publication productivity gap between the sexes. However, research on this specific issue has been limited to the United States, and further research needs to be undertaken in order to determine if the same gendered differences in work styles hold for academics in other countries.

2.1.3 A critical review of psycho-social explanations

As was mentioned above (see section 2.1.1), the so-called "sacred spark" hypothesis enjoys virtually no empirical support and appears to have relatively little theoretical value (Keith *et al.* 2002). In addition, it ignores the role of social factors that contribute to differences in publication productivity. Theories that focus on differences between the sexes in terms of socialisation experiences and their impact on men and women's publication productivity do acknowledge the role of social factors in the form of gender-role socialisation. However, they are hampered by their own limitations as well.

First, the mechanisms whereby gender-role socialisation is linked to actual publication productivity are either unclear (Cole & Singer 1991), or based on speculation, rather than on empirical evidence. Consequently, alternative explanations for findings that are offered as support for these theories are equally valid. Dispositional differences between men and women might just as well be the result of women's experience of discrimination at the workplace, rather than gender differences in prior socialisation. For instance, women whose careers were impeded

by structural obstacles may have adjusted their ambitions and self-expectations downward (Sonnert & Holton 1996), or have lost their motivation to do research and to publish (Astin 1991; Zuckerman & Cole 1975). Among medical faculty in the United States, general demoralisation among women due to subtle or overt gender discrimination or harassment has been put forth to explain gender difference in publication productivity (Barnett *et al.* 1998; Komaromy *et al.* 1993; Grant 1988). And as Bennett (2002) argues with regard to Southern African universities in particular, “it is impossible to conduct rigorous, creative, and dynamic research while combating targeted sexual hostility or menace”. In addition, other factors according to which the sexes differ may have a mediating effect on self-confidence with regard to undertaking research. These include the fact that less women than men hold a doctorate degree, or the higher prevalence among women of feeling less mentored, as reported by Landino and Owen (1988).

In South Africa, historical experiences of patriarchal and apartheid ideologies needs to taken into account as well. Because of their past experiences in this context, many women do not readily believe that they can make contributions, or that their insights are of significance as a contribution to the existing body of knowledge (Prinsloo 2000, cited in Maürtin-Cairncross 2003). Indeed, interviews with women academics at UCT suggest that their “ambitions are thwarted by their conviction that it is more difficult for women than men to achieve high positions” (White 1989:110).

A related point of critique is that proponents of the difference model rarely take into account the possibility that publication productivity may be both a dependent and independent variable, in the sense that it feeds back into dispositions such as motivation, self-confidence, and orientation towards research. In a similar vein, a self-fulfilling prophecy may arguably be operating not only among women, but among their male co-workers as well. If the latter do not expect women to be productive, they are unlikely to provide encouragement and informal rewards, and will thereby contribute to the fulfilment of their expectations. It is possible that women’s research career motivation and aspirations may be moderated by other, more pressing priorities, in particular their additional family responsibilities. Traditionally it has been argued that women, because of their family responsibilities and family-work conflict, have less time, energy, and commitments to invest in their professional careers (Toren 1993). Some support for this alternative explanation has been found among medical faculty, where differences in career aspirations between the men and women were smaller among faculty without children (Carr *et al.* 1998). However, other researchers have found that married women with children appear as committed to their careers as their male counterparts (Rosenfeld 1984; Reagan 1975).

Secondly, the difference model may be criticised on the basis of certain questionable assumptions implicit in its arguments. For instance, the assertion that women are more people-oriented (see 2.1.2.3 above) smacks of stereotypic attributions made to women in general. Explanations based on such gender specific orientations and traits do not only deny women agency by implying that they are programmed to fail in the first place, but also fail to acknowledge the proven fact that dispositional differences among women (especially across different cultures) are greater than those between men and women. Also implicit in these theories, is the assumption that publication productivity differences stem from gender differences independent of institutional and/or organisational factors. As Reskin (1978a) convincingly argues, attempts to understand other group differences (e.g., differences in the publication productivity of different disciplines) look to organisational features of science for explanations rather than hypothesising a priori group differences. Why should the same not apply to gender differences with regard to what is, by and large, an issue of organisation performance? Her argument is supported by the fact that the difference model cannot explain sufficiently why gender differences in publication productivity differ widely between disciplines (as noted in section 1.3.2 above), or that variability between the sexes in publication productivity is not nearly as great as variability within each sex (Cole & Zuckerman 1984).

This is not to say that the issue of female socialisation in relation to publication productivity does not merit a good deal of further investigation. As structural obstacles of the blatant, formal kind are subsiding, or at least have become open to legal challenge¹⁹ in most countries, explanations that from part of the difference model may become more important. However, it needs to be acknowledged that personal dispositions do not exist in a vacuum. They interact with and are affected by organisational variables, and therefore cannot (and, as will be shown in section 2.3 do not) *alone* account for gender differences in publication productivity. Owing to the limitations associated with intrinsic and/or dispositional explanations for gender differences in publication productivity, several studies have attempted to investigate the effects of extrinsic organisational factors and factors such as marriage and childbearing on women's publication productivity.

¹⁹ In South Africa, this is facilitated by the Employment Equity Act (EEA) and Affirmative-Action (AA) and the Workplace Skills Plan (Maurtin-Cairncross 2003).

2.2 The gender differential effect of family responsibilities

The second group of explanations focuses on gender differences in the various obligations traditionally related to marriage and family, and the associated biological imperatives of women's roles as mothers and carers. The assumption that faculty women are less productive than their male colleagues because of greater domestic and childrearing duties was common in the sixties and seventies, when the "folklore" (Astin 1978:156) maintained that single women's career paths and achievement parallel those of men, whereas married women's lower achievement results from family constraints and responsibilities.

This argument is found in the recently published National R&D Strategy (2001). In this document it is claimed (without providing any empirical support), that South African women researchers are faced with "career development limitations" because of family-related responsibilities such as childrearing and home-making that hamper their progress in the academic and research environment (5). Another researcher speculated that the majority of women academics at a South African technikon do not publish because they "may reduce the time at work in an attempt to balance their dual roles". It is further argued that findings that stress the tendency for women academics not to publish as prolifically as men may fail to take into account the various aspects of family responsibilities, such as child care (May 1999:82). The main purpose of this section is to investigate the validity of such claims. However, first the arguments concerning the exact way in which family responsibilities are supposed to impact on publication productivity will be outlined.

2.2.1 **Hypothesised influence**

2.2.1.1 *Time and energy*

Common sense suggests that the loss of time, flexibility in time²⁰ and energy available for research as a result of marital and parental obligations is likely to be greater for women than men, given that women have traditionally been the primary caregivers²¹ in our society (Carr *et*

²⁰ Research data indicate that simple availability of time is not the critical determinant of publication productivity (see Pelz & Andrews 1976). For example, being able to "expand" working hours by working on week-ends, which women medical faculty have been found to be less able to do than their male counterparts (Carr *et al.* 1998), is an important variable to take into consideration.

²¹ Childcare is what is usually referred to here, as other dependent care responsibilities, such as the care of elderly parents or other relatives, has received very little attention thus far in research on the effects of family-related factors on publication productivity. It is argued that in developed countries such as the United States, where the population over the age of 65 exceeds that of the population in general, stress resulting from eldercare needs to be taken into account as a factor that may influence publication productivity negatively (Sax *et al.* 2002; Carr *et al.* 1998). Interestingly, reference is also made in the South African National R&D Strategy to "eldercare responsibilities" as a

al. 1998; Toren 1993), and given the disproportionate share of daily domestic responsibilities that continue to be carried by women (Halsley 1992, cited in Bagilhole 1994; Hensel 1991; Rausch *et al.* 1989). Although most employment is incompatible with such a traditional gender division of labour, it is argued that academic work - but scientific research in particular - implies long hours, and assumes support in the domestic sphere (Collins 1992). Some, such as Bennett (2004), even refer to the impossibility of research-based creativity under expectations of dual labour.

It is therefore argued that married men publish more than married women (and more than unmarried men²²) because the unpaid work of their spouse, who takes care of the private sphere of household responsibilities, frees them to devote larger amounts of time and energy to publication. This is even the case when the female partner is employed outside the home, as reflected by the fact that almost all women academics in Australia have partners who work fulltime, while more than half of male academics have partners who work part-time (Allport 1998).

Although research on the gendered aspects of family responsibilities of academics is scarce, Palomba (1993) found that in Italy women researchers were straining, albeit successfully, to pursue their research programmes while fulfilling traditional domestic roles and meeting family obligations. On the other hand, these same traditional family environments allowed men researchers to successfully pursue their research. In South Africa, the structuring of universities also assumes that academics can adhere to organisational rules and arrangements as if they all had wives to attend to obligations of family and household (De la Rey 1999). As one female academic from UCT remarked, “when I got married I didn’t get a wife, I got a husband instead” (White 1989:109). For academic mothers childcare is rarely “someone else’s business”, as it is for most men.

Evidence also suggests that the traditional gender division of labour in the domestic sphere is still prevalent among married academics, with women faculty spending significantly more time than their male counterparts do on household and childcare responsibilities (Carr *et al.* 1998; Vasil 1993; Gmelch *et al.* 1986). In South Africa, qualitative research among women academics has shown that it is still extremely rare for parenting to be co-equal (Walker 1998), as parental identity is defined differentially for women and men: “Even when men were described as

factor that negatively affects South African women in academia (2001:5). However, research has indicated that even in the United States, elder care and other dependent responsibilities affect a minority of faculty and consume far less time than childcare responsibilities (Carr *et al.* 1998). Thus, this section will focus on the latter.

²² Bellas (1992) indeed found this pattern among male faculty in the United States.

participating partners...this participation was much more limited compared to the woman's role" (De la Rey 1999:209). Even when women and men publish at equivalent rates, women spend somewhat fewer hours than men working on their research but significantly more hours than men devoted to domestic responsibilities (Sax *et al.* 2002). In Norway women faculty with young children under the age of ten have been found to work 5.5 hours less per week than did their male colleagues in the same situation (Kyvik & Teigen 1996).

2.2.1.2 *Career interruptions*

Women who choose to have children have to interrupt their careers in order to bear and raise those children. This is an important decision when competing in an institutionalised context that is designed by men according to the masculine life cycle (De la Rey 1999; Acker & Warren Piper 1984, cited in Bagilhole 2002). Research that follows a life-course approach indicates that the majority of women have "fractured" or discontinuous careers, because they shape their professional lives in relation to the lives of husbands, lovers and children (De la Rey 1999; Probert *et al.* 1998, cited in Chesterman 2002). On the other hand, the careers of men follow a much more orderly, or at least linear, progression, characterised by continuous service, with regular and steady promotion up the organisational hierarchy (De la Rey 1999; Lie 1990; Karp 1985).

The resulting shortening of these women's academic careers may cut down on women's productivity markedly during the years that they are not actively working, but may also have a long-term affect on their publication productivity. It is argued, for example, that women start lagging behind their male colleagues, as the effects of career interruptions on women's chances for promotion, skills and knowledge (which may become obsolete), and reputation (Cole 1979) accumulate. This explains findings such as those reported on UCT academics, that the women with doctorates are older than the men, but have less experience (White 1989). Frequently, this results in women being retained in junior positions for extended periods of time - positions where teaching workloads and administrative duties generally take precedence over research and publications (Maürtin-Cairncross 2003). Within the South African context, maternity leave, especially when taken more than once in a five-year period, may have an additional negative effect, as it could lead to women losing their research rating at the NRF²³.

²³ Individual researchers in higher education in South Africa are rated according to the quality of their research and of their research students. It is mainly on the basis of this rating that they receive funding, usually for a period of five years, after which they have to be re-evaluated in order to receive funding for the next five-year cycle. Although the NRF states unequivocally that researchers who allow their rating to lapse, will not be eligible to apply for

2.2.1.3 *Limited geographic mobility*

It has often been noted that many women scientists are limited in their geographic mobility by family demands and the occupational contingencies of their husbands (Kaufman & Perry 1989; Simeone 1987; Karp 1985; Jones & Lovejoy 1980; Marwell *et al.* 1979; Graham 1970). In a similar vein, it is suggested in the South African National R&D Strategy (2001) that the relocation of a women's partner may negatively affect a women's academic career. Indeed, interviews with a limited number of academic women at UCT during the eighties revealed that these women "have experienced family moves between cities, countries and continents that have served to enhance their husbands' careers, but have seriously disrupted their own" (White 1989:109).

The so-called "two-body" problem of finding work for husband and wife in the same geographical area, and the resultant phenomenon of the "trailing spouse" (Harper *et al.* 2001:242) – who is most often the wife - might to some extent explain the finding that women are often employed in less prestigious institutions and at lower ranks than men (see section 2.3.2 below). Although geographic location *per se* does not seem to have consequences for academic rank (Coggeshall 1981; Rosenfeld 1981; Marwell *et al.* 1979), findings from a study in the United States indicate that women, especially those with children, are far more likely than men to take their postdoctoral fellowship on the basis of its geographic location. Moreover, those scientists who take their particular postdoctoral fellowships to be with a spouse turn out to be less successful in terms of later academic rank than those who do not (Sonnert & Holton 1996).

Women's limited geographical mobility also means that they may be less able than men to take advantage of opportunities that would enhance their careers, as Cole (1979) explains: "Because of reduced mobility...women may find themselves in poorer bargaining positions than men of equal talent at the same universities. Moreover, because women are less mobile, they may be less visible to other institutions. Consequently, their reduced visibility may result in fewer job offers" (84). In a more direct manner childbearing and childcare may also limit women's opportunities to further an academic research career overseas (Gale 1980), or at least limit their work-related travel, as was found to be the case among medical faculty in the United States (Carr *et al.* 1998) and among women professors in Israel (Toren 1991). Toren found that young children limit, above all else (including work overload associated with rearing of children) women scientists' mobility and opportunities to go abroad for a post-doctoral, sabbatical, or

funding in the future, a new funding category was recently introduced to accommodate, among others, women who "could not realise the potential or sustain their research ability" by virtue of time spent on maternity leave, or raising

professional meetings and conventions. These are considered of utmost importance for furthering a scientist's career²⁴, especially in a small, peripheral country such as Israel.

2.2.1.4 *Negative stereotyping*

It is widely assumed that women faculty's family responsibilities stand to compromise their career. In the United States Cole and Zuckerman (1991) found that both men and women scientists report having come up against the belief that marriage and motherhood cannot be meshed with demanding scientific careers. Other studies that included men as well as women academics found that men tend to attribute women's relative lack of success in academia partly to women's involvement in child care. Many men also hold a negative view about the "reliability" particularly of women with children (White 1989:92-93; Jones & Lovejoy 1980).

These prevailing myths – sometimes termed a "motherhood myth" (Etzkowitz *et al.* 2000) – continue to affect women's career opportunities through their recruitment, retention and the ways they are actually treated (Cole & Zuckerman 1991). This, in turn, may affect women's publication productivity adversely. Research has indeed indicated that marital status has the opposite effect on the attainment of academic status (promotion, tenure, and salary) for men and women. In the United States, for instance, male faculty who are married occupy higher-level positions, but this relationship does not appear to hold for women (Bellas 1992). And in Israel Toren (1991) found that, independent of women faculty's publication productivity, marriage and children are associated with lower rank for women.

The acceptance of this situation is so deeply embedded that it is usually taken for granted and explained by these women's alleged lower commitment and involvement in their work. Since a woman with children is more likely to be seen as a "parent" than a man with children, it is assumed that domestic crises will be dealt with by women, and that they will therefore be more frequently absent (White 1989:93). In other words, they will place family obligations above work, instead of exhibiting a singular commitment to work (Mattis & Allyn 1999). Consequently, there is a perception of a greater "risk" involved in promoting women. Among biochemists in the United States, Long *et al.* (1993) found that a delay at the beginning of an academic career had a negative effect for women's promotion, while for men the effect is positive. This may reflect a department's reluctance to promote women who have taken time out from their careers in order to start a family, as such women may be viewed as a liability in terms

a family (NRF 2002:10).

²⁴ The attendance of conferences, especially those outside one's own country, has been shown to be one of the most significant correlates of article productivity in ten countries (Teodorescu 2000).

of research contribution. It is even possible that unmarried and childless women are adversely evaluated by male faculty members simply because they *might* get married or have children (Bagilhole 2002; Rosenfeld & Jones 1986; Zuckerman & Cole 1975).

In addition, there are some indications that negative stereotyping might influence the allocation of institutional resources as well. For instance, among medical school faculty in the United States, Carr *et al.* (1998) found that, compared with men with children, women with children had less institutional support, including research funding from their institutions and secretarial support than men, while no significant differences between the sexes were seen for faculty without children²⁵. Considering the fact that rank and publication productivity are highly related (see section 2.3.2.1), and the crucial role that institutional resources play in publication productivity, negative stereotyping may have a considerable, though indirect, inhibiting effect on women's publication productivity.

2.2.2 Empirical findings

The assumption that, because of childbearing and other domestic duties women faculty are less productive than their male colleagues, seems logical and reasonable. However, since the late 1960s the evidence collected through research on the effects of family-related factors (e.g., marital or parental status) on publication productivity generally *disconfirms* such a hypothesis.

2.2.2.1 *The non-significant effect of marriage and children*

Most studies that have examined the relationship between family-related factors (e.g., marital status, parental status, and number and age of children) and publication productivity, do not find them to have a negative effect on women's research productivity. Studies conducted among various samples in the United States found no effect, or a non-significant negative effect of marriage and/or children (including the number of children) on women's publication productivity (Sax *et al.* 2002; Barnett *et al.* 1998; Fox 1994; Long 1990; Cole & Zuckerman 1987; Helmreich *et al.* 1980; Cole 1979; Reskin 1978a, 1977; Hamovitch & Morgenstern 1977). Rather, single women seem to publish less than married women (Astin 1978), even when the latter have children (Cole 1979). Only Cole (1979) found that having three or more children negatively influenced women's publication productivity, but even then it was only slightly lower than that of unmarried women.

²⁵ However, causal reciprocity (an issue that will be discussed in more detail below) is problematic here, as the authors explain: "Whether their support was similar to that of men when they started but declined because of lower

On the basis of the results of these mostly quantitative studies, one may conclude that family-related factors do not account for gender differences in research productivity. In addition, data of a more qualitative nature collected by Cole and Zuckerman (1987), in the form of women scientists' own reports of their experiences, also support such a conclusion. For instance, women scientists report that the obligations of marriage and motherhood are considerable, but that they do not take their toll on women's research.

Results from research undertaken in countries outside North America are consistent with those cited above. In Britain, married women with children had written far more articles in the two years prior to being interviewed than women without children. In fact, these university women were found to be the only group whose research output is as high as that of their male colleagues (Williams *et al.* 1974). In Israel, marital status, parental status, and number of children were found to be unrelated to publication productivity (Toren 1991). Also in Israel, only a small minority (less than one-fifth) of a sample of women professors spontaneously noted marriage and/or children as factors that slow down their rate of publication productivity. Similarly, a recent audit of women in research in South Africa found that only twelve percent of women scientists consider family commitments a major research-related problem, while 27 percent consider it no problem at all. In addition, the majority of these women who are married or living with partner report that they do not "perceive children as a [research-related] problem" (NRF 2001:25).

Smaller studies conducted at selected HEIs in the country tend to support these findings. At a technikon only half of respondents experienced any conflict between their role as academic and their role in the home and family, and those respondents who did experience role conflict, only experienced it very marginally²⁶ (May 1999). And only slightly more than half (56%) of women academics at HBUs indicated that their family commitments impede their publishing endeavours (Maürtin-Cairncross 2003). In summary, a variety of studies support the conclusion, succinctly formulated by Toren (1991:667) that, "the incompatibility between being a mother and a productive academic researcher is an empirically untenable stereotype".

academic productivity or whether their lower productivity resulted in part from less support is unknown" (Carr *et al.* 1998:536).

²⁶ May (1999) suggests that the women academics may adopt strategies, such as reducing the time they spend at work, in an attempt to lessen the pressure.

2.2.2.2 *The positive effects of marriage and children*

Even more counterintuitive are the findings of various other studies that marriage and children seem to have positive effects on publication productivity. Studies conducted in the United States indicate that married women actually publish more than single women (Harper *et al.* 2001; Fox 1994; Davis & Astin 1990; Long 1990; Astin & Davis 1985; Cole 1979; Astin 1978; Reskin 1978a; Simon *et al.* 1967). Married women's publication rates seem to resemble those of married men much more closely than single women's publication rates do. In addition, a large body of evidence suggests the even more surprising trend that mothers publish more than childless women (Fox 1994; Cole & Zuckerman 1987; Astin & Davis 1985; Fox & Faver 1985; Wanner *et al.* 1981; Astin & Bayer 1979; Astin 1978; Reskin 1978b; Cole & Cole 1973).

Again one finds similar results in countries elsewhere. For instance, married women academics have been shown to be more productive in terms of publications than their single counterparts in Canada, (Nakhaie 2002), Norway (Kyvik 1990), and Finland (Luukkonen-Gronow & Stolte-Heiskanen 1983)²⁷. Women with children have also been found to be more productive than women without children in Britain (Williams *et al.* 1974) and Norway (Kyvik 1990). In South Africa indications are that, at least among technician staff, single women academics who live on their own with a housekeeper and no children display the same tendency toward non-publication than married women with children (May 1999).

2.2.3 **Proposed explanations for empirical findings**

Given the counterintuitive nature of these findings, several attempts have been made to account for the enhancing effect – or, at least, for the non-debilitating effect - of marriage and children on publication productivity among women academics.

2.2.3.1 *Marriage as a personal asset*

First, it is hypothesised that marriage is a personal asset that may enhance publication²⁸. This seems to be particularly true for women scientists or academics who are married to another scientist or academic. A large proportion of women scientists in North America are married to scientists (Fava & Deierlein 1988) who are often in a similar field (Astin 1969). Gender

²⁷ It is interesting to note that marriage does not only have a positive effect on the publication productivity of women, as unmarried men have also been found to publish less than married men (Nakhaie 2002; Xie & Shauman 1998; Bellas 1992; Kyvik 1990).

²⁸ Given that women scientists are less likely than men scientists to be married (as will be discussed in more detail in section 2.2.4.2 below), it has been argued that women scientists, on average, are less likely to benefit from marriage

differences are also evident, as women are much more likely than their male counterparts to practice such “selective mating” (Cole & Zuckerman 1991:169). This trend has also been found among women scientists elsewhere, for instance in Mexico (Blazquez 1996).

Moreover, evidence from the United States shows that those women scientists who are married to scientists (not necessarily in the same discipline) publish, on average, forty percent more than women married to men in other occupations (Cole & Zuckerman 1987). This indicates that being married to another academic or scientist holds particular advantages for women. Being married to another academic may enhance women’s access to networks, by bringing them into greater contact with other male colleagues, exposing them to information about funding sources, and enabling them to connect with persons in positions of power (Astin & Davis 1985). South African research seems to support such a position, as De la Rey reports that the two participants in her qualitative study of twenty-five women professors who were married to academic men, both described their relationships as facilitative of their career development: “One of them explained that her husband was instrumental in getting her through her first publication, while the other described how through her husband she gained access to important collegial networks” (143)

Spouses in similar disciplines are also in a position to co-author publications, which might lead to a higher publication rate among married couples, especially in fields in which collaboration is essential to research (Stack 2002; Graham 1970). Long (1992) in fact found that a significant proportion of women biochemists collaborate with their spouse. It has further been hypothesised that husbands who are academics have the time flexibility granted by academe to be able to share in family responsibilities, which may free up time for a women’s research (Cole & Zuckerman 1987). However, findings on the division of family responsibilities among academics (see section 2.2.1.1) do not support this latter argument. And in general, more research is needed to ascertain what impact marriage to a male academic or scientist might have on his wife’s publication productivity.

Even if academic women’s spouses are not academics themselves, their spouses tend to be highly educated professionals (Shauman & Xie 1996; Marwell *et al.* 1979), or someone with a PhD (Sonnert & Holton 1996; Long 1992). Thus, they may provide “high human capital” (Xie &

than their male counterparts (Xie & Shauman 1998). However, findings show that, in terms of publication productivity, men and women seem to benefit equally from marriage.

Shauman 1998:860) in the form of intellectual stimulation, encouragement²⁹ and emotional support that enhance productivity (Sonnert & Holton 1996). In South Africa, qualitative research among women professors seems to support this argument, as the role of the supportive husband and partner in the achievement of success was emphasised in several of their narratives (De la Rey 1999). Spouses may also provide additional economic resources in the form of sufficient income³⁰ to relieve women of “normal” household and family responsibilities. Finally, marriage itself may also contribute to productivity-enhancing factors, such as stability of one’s social life, “routinisation of work patterns” (Cole 1979:66), and an increase in self-respect (Luukkonen-Gronow 1987).

2.2.3.2 *Singlehood as a handicap*

It has been suggested that single women publish less than married women because a subtle form of discrimination operates against them in the male-dominated, predominantly marriage-oriented academic world. Considering the fact that the “model academic” is a married man (Astin & Davis 1985), single women hold two statuses that deviate from this normative faculty member – gender and marital status³¹. This, it is argued, means that single women are more likely to be affected by barriers to productivity that confront academic women in general, as discussed in section 2.3 below. In particular, single women may be stigmatised or perceived as socially threatening (Davis & Astin 1990), while married women are perceived by men as “safer” colleagues (O’Leary and Mitchell 1990). Consequently, single women are excluded from collegial networks and isolated from resources to an even larger extent than married women (see section 2.3.3. below). This may be particularly true for younger women, especially students, because of what Cole (1979:134) has termed, “uneasy interactions” between male professors and female students:

²⁹ This point is not, however, supported by research among women academics at South African HBUs, which found that some of these women still face male partners’ resistance to their success outside the home (Maürtin-Cairncross 2003).

³⁰ The issue of a second income becomes even more important when one considers the low salaries of academics in South Africa. As Alexander (2004b) observes, “Unless an academic has a partner with a well-paid job, below the level of senior lecturer they cannot begin, for instance, to buy a house...” (326).

³¹ Furthermore, research among Australian academics has shown that it is especially married (and older) males who hold negative attitudes towards women academics (Jones & Lovejoy 1980).

“What start out as impersonal relationships in which sex status has no particular significance can and often do move into relationships that are sexually involved. The complexities of such entanglements may give male professors pause in initiating relationships in the first place. Furthermore, the assumption by scientists’ role partners that a close sponsorship relationship with a female student must also involve a sexual relationship may deter many scientists from subjecting themselves to rumour, insinuation, and innuendo”.

Studies do show that, at least among women biochemists, being married doubles the odds of collaboration with a mentor (Long 1990). Collaboration with a mentor is a particularly important factor since it affects pre-doctoral productivity, job placement, and later productivity (Feldt 1986; Long & McGinnis 1985).

Also, fewer unmarried women than married women have contact with male colleagues (Kaufman 1978; Reskin 1978b). According to Davis and Astin (1990:101), the workplace exclusion and isolation associated with singlehood explains their finding that single women tend to publish a higher rate of books than either married women or men, as they may feel the best way to secure an unchallenged place for themselves is by making large and highly visible academic contributions. In addition to this interpretation, termed the “superstar syndrome”, these authors also argue that, as single women have less access to funding resources, they are forced to write books rather than to publish articles (and/or research reports) based on funded research³² (Astin & Davis 1985). In academe, where reputations are generally made through article publication and the citation of such articles, publishing books at least in the beginning stages of a career, could in the long run be responsible for single women’s lower accumulative publication rates.

Unfortunately Astin and Davis’s findings on publication trends among married and single academic men and women are not replicated elsewhere, which limits the generalisability of their arguments. For example, in Norway women with children have been found to publish *more* books than single women (Lie 1990), and Nakhaie (2002) found that unmarried women *and* married men publish more reports than married women. Their research is useful, however, in the sense that it emphasises the academic activities and motivations of single women, and not just married women, as a key to understanding the differences in publication productivity between men and women.

³² This explanation is similar to the above-mentioned explanation proposed by Long (1992) for women’s higher citation rate, i.e., because women do not have the resources to publish as many papers as men, they may be compelled to make each article as important as possible, rather than saving some results for their next article.

2.2.3.3 *Coping strategies*

In order to determine how women with children maintain competitive levels of publication productivity, it may also be useful to refer to the relationship between domestic obligations and levels of occupational involvement and accomplishment in professions other than academia. The question is, do women's careers in science and/or academia really represent a "special case" or do they simply represent another case in point? The literature on women in paid employment in the United States indicates that taking primary responsibility for childcare and household chores does not reduce women's work effort outside the home; "they just work harder" (Toren 1991:651-652). As Toren rightly points out, "If this is the case in general, it should certainly apply to faculty women who choose their occupation voluntarily and are strongly attached to their work; it therefore makes sense that they work hard and publish even when they are mothers" (666).

Cole and Zuckerman (1991:167) found that women scientists with young children manage to continue doing research and to publish, because they are more efficient if they are under greater pressure. Greater efficiency also includes the development of particular coping strategies, or what Cole and Zuckerman refer to as "personal adaptations" (170). In order to manage their status-set, women faculty with young children reduce their "discretionary time" – i.e., other obligations and activities, such as social and cultural activities – to the bare minimum and concentrate almost entirely on work and family (Cole & Zuckerman 1987). Other researchers in the United States, Denmark and Israel have also noted this tendency among women faculty with young children to take time out of leisure activities and/or to sleep less (Sax *et al.* 2002; Toren 1991).

Although many women scientists develop creative strategies to overcome the handicap of burdens placed upon them by their having primary responsibility for raising children, the strategies themselves may have some unintended, negative consequences for women's research and careers. For instance, Cole and Zuckerman (1991:169) found that women scientists in the United States who limit their discretionary time report not feeling part of "the club", not having time for informal discussions with colleagues. In the UK, Acker (1994:67, cited in Walker 1997) notes that women, "while keeping up with family, teaching and research, have less time and energy for committee work and image-enhancing activities". Similar findings are reported for Mexico and Italy (Etzkowitz *et al.* 2000), where women scientists with young children reportedly do not spend as much time as their male colleagues on engaging in "laboratory politics". Such activities are, however, necessary to ascend into managerial positions, which

might explain why very few women hold upper-level, managerial positions in scientific institutions in these countries.

2.2.4 A critical review of the empirical findings

Although it seems to be a general phenomenon that unmarried and childless women publish less than women with children, it cannot necessarily be asserted that family responsibilities are not a factor in explaining women's lower research productivity compared to men's. The following qualifications and exceptions need to be taken into account:

Not all research produces results that correspond with the patterns reported in section 2.2.2 above. Some earlier studies conducted in the United States show negative (albeit weak in some cases) effects of having children (Cole 1979; Hargens *et al.* 1978; Reskin 1978b; Cole & Cole 1973; Astin 1969), and some show negative effects of marriage (Fox & Faver 1985; Astin 1969; Simon *et al.* 1967) on publication productivity. Long (1990) found that for both men and women biochemists, there is a steady decline in average publication productivity with increasing numbers of children, but that these decreases are larger for women. More recently, Carr *et al.* (1998) who researched medical school faculty in the United States found that, compared with men with children, women with children had fewer peer-reviewed publications, while no significant differences between the genders were seen for faculty without children. These findings remained even after controlling for variables such as years as a faculty member, number of hours worked per week, and hours of dependent responsibilities. They concluded on the basis of their research that, "family responsibilities go a long way toward explaining an overall difference between the genders in publication" (537). Outside North America, data from Norwegian universities even suggest that childcare is the most critical factor influencing women's publication productivity (Kyvik 1990, 1991). Some of these inconsistencies may be explained with reference to methodological issues related to sampling and measurement.

2.2.4.1 *Sampling selectivity*

First, sampling selectivity might bias findings. Many of the studies cited in section 2.2.2 focus only on faculty in prestigious (e.g., tenure-track) positions. Defining the study population as such might produce the finding that the presence of young children has no effect on women's productivity; if women in non-tenured positions were analysed as well, an effect of children might be found (Long & Fox 1995). This is because having young children may affect a woman's decision or opportunities to pursue a tenure-track academic position. Indeed, research

among medical school faculty found that among faculty with children, men were significantly more professionally ambitious than women, while among faculty without children, differences in aspirations between the sexes were smaller (Carr *et al.* 1998). Already in the seventies, Williams *et al.* (1974:401) hypothesised that married women who continue to work after the birth of children represent a special case, as they:

“...have to break existing social norms, which are more universal and strongly adhered to than norms about the restriction of professional occupations to men. Thus they have to be women of exceptional drive and confidence to attempt to break down this double barrier. In order to justify the rejection of the maternal role as a main commitment, the pressures on them to achieve are greater than for other women. Otherwise they must constantly question themselves about whether it was worthwhile making the sacrifices that are required of them and their families; it is especially important to them that there should be some tangible return to their deviant decision to remain in fulltime work. If there were little or nothing to show for it, it would be even harder to assuage any guilt they might feel and there would be too little social recognition to balance the social criticism”

A more extreme form of sample selectivity is the result of the greater attrition from the academic profession by women strongly committed to family roles. Stated differently, in most studies on publication productivity the demands of marriage and motherhood do not affect a substantial proportion of women respondents. In various countries research has shown that academic women tend to remain outside the marriage institution and have fewer children in comparison with women in the general population of similar ages and in comparison with their male counterparts³³ (e.g., Harper *et al.* 2001, cited in Subotzky 2003; Brooks 1997; Shauman & Xie 1996; Vasil 1993; Hicks 1991; Toren 1991; Cass *et al.* 1983). And in South Africa, a small-scale study at UCT has revealed that, whilst most men in high positions in the university are married, women of equivalent status are more likely to be single or divorced (White 1989).

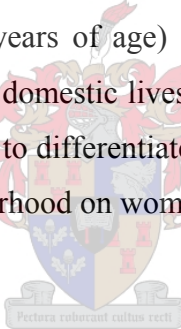
In a similar vein, it has been proposed that academic women who have children may have better health, more energy and stamina, than women without children (Fox & Faver 1985), or that women who have children and remain productive are “self-selected”, that is, are simply more talented scientists than those who choose to remain childless (Cole & Zuckerman 1991:164). However, findings do not seem to support such a hypothesis (*ibid.*).

³³ These findings support Bennett’s (2002) argument that institutional practice in the higher education sector – especially the segregating of academic work from family networks – produces scholars and teachers without knowledge of the complex world of social reproductive labour, and ensures the “masculinisation” of people within the academy.

2.2.4.2 *Taking children's ages into account*

Secondly, most of the investigations on the impact of motherhood on scientific productivity do not take children's age into account, and as such comparisons between women and men with and without children can be misleading. Kyvik's (1990) Norwegian study provides evidence that "caring responsibilities for small children are very important in explaining women's lower publishing activity" (156). She finds that it is women with children under ten in particular who publish on average substantially (47%) less than their male colleagues in the same situation. This difference is reduced to fourteen percent among men and women who have children aged ten or older. These results were replicated in a later study (Kyvik & Teigen 1996), which produced the further finding that women with preschool children (under age six) were almost sixty percent less productive than were their male counterparts in the same situation. In addition, interviews with women professors in Israel (Toren 1991) have brought to light that those women faculty who noted career difficulties related to their family situation (the minority), attribute this effect only to the stage when their children were young. Similarly, in South Africa, women academics with young children (e.g., under six years of age) are more likely to experience problematic tension between their professional and domestic lives (Moultrie & De la Rey 2003; CSD 1999). It may therefore be critically important to differentiate between women with children of different ages to understand the impact of motherhood on women's publication productivity.

2.2.4.3 *Qualitative findings*



Thirdly, research that approaches the topic of the impact of family responsibilities on publication productivity in a more qualitative manner often provides a different picture from the one presented by quantitative analyses. Asmar's (1999) research among early career academics in Australia provides one of the best examples in this regard. In her study "there was a certain discrepancy in this study between what individual voices were telling the research team in the qualitative domain, and what the quantitative data showed up with respect to the family issue" (269). For instance, while quantitative data showed that men were only slightly less likely than their female colleagues to report that their family commitments had a research-inhibiting effect, much of the qualitative data obtained in interviews painted a different picture. During these interviews academic women "sometimes mentioned their family situations with a degree of anguish" (*ibid.*:260), while men who mentioned the issues of family and children mostly did so in reference to the family commitments affecting the women that they worked with. These discrepancies are most probably the result of women's reluctance to describe their family and personal commitments in the negative terms of the kind of questionnaire item, which implies that

their children represent some kind of barrier³⁴, inhibitor or problem area in their life (Asmar 1999).

Various qualitative research studies conducted among women academics in South Africa report that many of these women refer to the ways in which they experience difficulties when juggling the a double workload of academic and family responsibilities. Fulfilling the roles of academic, wife and mother is revealed to be conflictual and difficult, with frequent references being made to the negative effects mothering has on their career development. In particular, reproductive roles reportedly often result in a lack of time to publish and/or women academics taking time out from research, ultimately causing them to be “slow” or “late” starters, and late achievers in academia (Maürtin-Cairncross 2003; Petersen & Gravett 2000; De la Rey 1999; White 1989).

2.2.4.4 *Taking the socio-cultural context into account*

Before dismissing the effects that the burdens of marriage and childcare may have on women’s publication productivity, the influences of different societies on the career, marital and family choices should be taken into consideration. Support for such a position may be found in the incongruence between findings from research conducted in Norway (Kyvik 1990), and the large body of American and European research findings referred to in section 2.2.2. While the latter provided no evidence to support the assumption that women with children are more hampered in their publication productivity by caring responsibilities than are men in the same situation, Kyvik found that taking care of young children is the factor that best explains the difference in publication productivity between men and women in Norway. Even a Northern American study relatively comparable³⁵ to Kyvik’s, in the sense that it differentiated between mothers of young and older children (Fox & Faver 1985), produced results dissimilar from the Norwegian study.

In order to explain these incongruities, Kyvik & Teigen (1996) propose that the extent of gender equality and the strength of the traditional ideology of the family in a country might play a role. Women in Norway, they argue, might take more responsibility than their male colleagues for preschool and early school-age children than their North American counterparts do. Similarly, Jones and Lovejoy (1980) link the fact that in Australian society, family life is upheld

³⁴ On the other hand May found that South African women academics were less likely to indicate their experience of tension/dissatisfaction with their career advancement in direct, discrete questions than on items of a career barrier scale in which they seemed to “express themselves more openly” (1999:ii).

³⁵ It is possible, however, that the contradictory findings may be the result of different disciplines included in the research: while Fox and Faver’s (1985) research was confined to faculty members in the discipline of social work,

to a very high degree, to women's lower research productivity. In that country, the role of wife and mother is considered of prime importance to the stability of the society, the nurturance of children and the perpetuation of a stable ongoing society. It is therefore not surprising that married women reportedly have difficulties in combining home and work roles, as well as doing research.

However, the effect that the extent of equality in household tasks between men and women has on women's publication productivity is unclear. For instance, in Israel, where traditional expectations of female responsibility for childcare are strong, a study by Toren (1991) found no diminution of publication productivity due to combining a demanding career with family roles. And although a seven-country comparative study showed that Finland had the most equal division of domestic labour, research on younger Finnish women scientists found that "women primarily bear the burden of responsibility for the reproductive activities of the family" (Luukkonen-Gronow & Stolte-Heiskanen 1983:273). Also, the majority of both women and men scientists in that country believe that the main reason there were not more women in science was the difficulties that reproductive and familial responsibilities engendered for a research career.

South African women might experience similar difficulties, especially considering that patriarchal relations and gender stereotyping continue to shape social relations and practices in all South African cultures (Ramphela 1995, cited in Walker 1997). Women academics at one technikon were found to be "more committed to the home and family role than to the work role" (May 1999:ii), and some women at HBUs referred to incidents in which they felt that "being a woman and having been socialized in a gender-stratified society, contribute to their...strong family commitments" (Maurtin-Cairncross 2003:162). In this regard, reference is often made specifically to Indian cultural practices, which may lead to the particularly low number of older Indian women employed as academics in South African HEIs (*cf.* CSD 1999).

Alternatively, it may be argued that differences between countries in terms of institutional conditions and arrangements, in particular the availability of child-care facilities and social security benefits, may result in different effects of the family on the scientific productivity. As Kyvik & Toren (1996) note, the disparities between North American and Norwegian findings may be explained by the fact that women scientists in Norway spend more time with their children during the first year after birth, because of a favourable social security system. Also, Norwegian women rely more on university kindergarten places than on day care mothers to take

which is characterised by a high proportion of women faculty, Kyvik's (1990) study included faculty from a wide variety of disciplines.

care of their children. The latter does not imply taking the children to and fro, and day care mothers might also do some housework. In South Africa the situation is less favourable. Until the late 1970s, tertiary institutions provided no paid maternity leave for staff. Women academics either had to use precious sabbatical leave, thereby foregoing opportunities for research and writing, or time the birth of their babies with remarkable precision (Walker 1997). Although paid maternity leave is now available at many institutions, it is still regarded as inadequate by many women³⁶. The absence or inadequacy of child-care facilities has also been noted at South African academic institutions: only some have established subsidised crèches for women with young children who want to work at these institutions, and the majority of academic women judge the existing facilities as inadequate (Maürtin-Cairncross 2003; CSD 1999; De la Rey & Quinlan 1997, cited in De la Rey 1999; Wolpe *et al.* 1997; Budlender 1994).

The involvement of other women who are prepared to take up responsibility in the domestic sphere may also lessen the effects of marriage and children on women's academic careers (De la Rey 1999). In some countries, e.g., Brazil and Mexico (Etzkowitz *et al.* 2000), research among women scientists has shown that the extended family is often available to assist with childcare. In other countries, a greater availability of unskilled female labour means that the involvement of other women takes the form of paid domestic help as an option to child-care, particularly for white, upper middle-class women academics (Maürtin-Cairncross 2003; Etzkowitz *et al.* 2000; De la Rey 1999).

South Africa is a case in point, where research indicates that 37 percent of married working women have a full-time, live-in domestic servant at their disposal, while 34 percent have permanent, though part-time, domestic help (Du Toit 1993). And although the use of paid domestic labour is suggestive of middle class positioning, historically in South Africa the political economy as shaped by the combined influences of colonialism, apartheid, capitalism and patriarchy, has produced a large pool of black women engaged in domestic labour at cheap rates, so that even working class households have had domestic workers (De la Rey 1999). In addition to variation between countries, factors such as these may also vary over time within a particular country. For instance, in Israel hired domestic help was common for early cohorts of women professors, whereas preschool nurseries have only become available more recently (Toren 1991).

³⁶ A small survey conducted in the mid-nineties by the Gender Equity Task Team, found that all institutions that responded made provision for paid maternity leave. Three months' paid leave was the most frequently reported period, four months was also common. In many cases, women staff are also permitted to extend their maternity

2.2.5 **Concluding comments**

Although the greater part of the available empirical evidence clearly indicates that (at least on their own) family responsibilities do not cause gender differences in publication productivity, the topic continues to engender debate. Results on the worldwide extent of non-relationship between the family responsibilities and publication productivity of women are still considered inconclusive, and warrant a closer look at the role that family-related variables play in the publication productivity of men and women in countries outside the United States. In addition, many interpretations that have been put forward to account for the findings need further refinement and testing.

Nevertheless, one implication of the finding that marriage and children have only a negligible influence on women's publication productivity, is the acknowledgement among sociologists and other observers of science that marriage and motherhood cannot be used to sufficiently account for the persistent differential productivity rates of women and men. On a practical, policy level this implies that no amount of change towards more flexible hours, day nurseries, time off for school holidays, part-time employment, generous maternity leave and so on can create the preconditions necessary for higher publication productivity among women, for single women seem to be just as handicapped as married women. With regard to research on the topic, attention has been turned to considerations other than freedom from domestic responsibilities, in particular the scientific or scholarly work environment, which will be discussed in more detail in the following section.

2.3 Organisational factors: the deficit model

2.3.1 **Introduction**

Based on their research, Cole and Zuckerman concluded in 1987 that certain attributes of the environments in which scientists work are more powerful influences on rates of publication than are influences such as marital and family obligations. Recently, Sax *et al.*'s (2002) research among North American faculty produced an almost identical result, namely that, "the independent contribution of family-related factors was extremely small, suggesting that once key demographic, institutional, and professional variables have been controlled, family-related factors have little influence on faculty research productivity" (430). This third group of

leave by using other leave privileges. On the other hand, only four of the nineteen institutions that responded, make provision for paternity leave (Wolpe *et al.* 1997).

workplace-related explanations may be categorised as part of the “deficit model” (Sonnert 1999): the general hypothesis that women publish less than men, because of structural deficits of the organisations in which scientists or scholars work. One may argue that structural deficits such as these are still very much a feature of the higher education system in a patriarchal society such as South Africa (Shackleton *et al.* 2004; Zulu 2003). The apartheid system, in particular, reinforced male dominance and hierarchical patterns in institutions where women were marginalized and not given the same opportunities as their male counterparts (NRF 2001).

These deficits, it is argued, lead to the differential treatment of men and women in the workplace and to the sexes not sharing equally in the means of scientific production. And because women have less access to such facilities, resources, rewards, and opportunities required for research, including those associated with high academic rank, affiliation with a prestigious institution³⁷, research funding, and other resources, such as graduate students, they publish less than men. In short, institutional or structural factors mediate the relationships between gender and publication productivity.

Studies undertaken in the United States have found that this is indeed the case. By taking institutional correlates of publication productivity, such as rank and institutional affiliation into account, publication productivity differentials between men and women scientists are reduced, though not eliminated (Xie & Shauman 1998; Cole & Zuckerman 1984; Cole 1979; Robinson 1973). The extent of this reduction depends on the number of institutional variables that are controlled for statistically. For instance, in addition to rank and institutional affiliation, Xie and Shauman (1998) found very little net difference in productivity between academic men and women by taking into account factors such as teaching hours, field of specialisation and access to research funding and research assistance. Such multivariate analyses show that, in comparison to such institutional variables, gender is a poor predictor of publication productivity. In section 2.3.2 below, a variation of these institutional variables will be discussed in terms of their relationship with gender and with publication productivity.

In addition to unequal access to resources associated with such variables, the deficit model also posits the existence of mechanisms of more informal exclusion of women scientists. The exclusion hypothesis, which will be discussed in the latter half of section 2.3, focuses on the effect of gender differences in access to collegial interaction and collaborative opportunities on the publication productivity of men and women.

2.3.2 Institutional correlates of publication productivity and gender

2.3.2.1 Academic rank

A strong positive relationship between academic rank and publication productivity has been established by a multitude of studies. The most recent and comprehensive findings in this regard are those that flow from Xie and Shauman's (1998) analysis of four US datasets that span almost three decades from 1969 to 1993. These authors found that full professors are about twenty to forty percent more productive than associate professors, and associate professors are in turn ten to twenty percent more productive than the rank of assistant professors below them. Some researchers (e.g., Nakhaie 2002; Stack 2002) even report rank as the variable that best predicts, or is most closely associated with, publication productivity. These findings are not surprising, considering the fact that at higher academic ranks a variety of resources necessary to bolster one's level of publication productivity, including access to graduate students and post-doctoral fellows, are usually more readily available than at lower ranks. In addition, the privilege of rank can free senior academics from other time-consuming activities³⁸, such as teaching large undergraduate introductory courses, or those that have a strong emphasis on grading and advising of students (Maürtin-Cairncross 2003; Wolpe *et al.* 1997; Long *et al.* 1993; Zuckerman 1991), which allows them more time for writing and publishing³⁹. In addition to resources and working conditions that offer better possibilities to be productive, academics in higher ranks also tend to have greater confidence in their own abilities.

Considering the fact that a higher rank has a positive effect on publication productivity, gender differences in academic rank attainment may account for women's lower publication output. For many years now, women's under-representation at the higher levels of the academic occupational ladder and slower rate of promotion has been a well-documented, persistent phenomenon worldwide. In addition to a variety of national studies, based on different samples,

³⁷ Moreover, there are indications that, in comparison to men scientists, women scientists' publication productivity is *more* strongly influenced by variables such as the type or prestige of a scientist's employing institution (Prpić 2002)

³⁸ Although senior women might not be as involved in teaching, it needs to be recognised that they are often more involved in managerial and co-ordination responsibilities than their junior counterparts. In the South African context, Maürtin-Cairncross (2003) argues, the dearth of women in senior positions results in these women having greater responsibilities and with fewer role models and mentors. In her study she found that senior academic women at HBU's acknowledged that the seniority of their positions allowed their expertise and opinions to be exposed and thus drawn on, more than was the case when they were in junior positions.

³⁹ However, the validity of this explanation depends on the country being studied. For instance, in Norway universities have established norms that all faculty members should have about the same amount of time for research, independent of rank, and Kyvik and Teigen (1996) actually found virtually no differences in the average time used for research by full, associate, and assistant professors in that country. It may therefore be argued that the

fields and years (e.g., Morley & Sorhaindo 2004; Halvorsen 2002; Fuchs *et al.* 2001; DETYA 2000, cited in Chesterman 2002; Valian 1998; Hemlin & Gustaffson 1996; Castleman *et al.* 1995; Long *et al.* 1993; Vasil 1993), Lie *et al.*'s (1994) comparison of seventeen countries showed that the proportion of women decreases as one rises in the academic hierarchy. In South Africa, research, including a national audit, has highlighted the under-representation of women in senior academic positions (Perumal 2003; Macfarlane & Groenewald 2002). In 2002, women constituted 19 percent of full and associate professors in higher education (CHE 2004). Male academics still dominate the senior and even middle ranks, with significantly higher proportions of men compared to women found at the ranks of associate professor and senior lecturer. More than sixty percent of female academics in this country are clustered at the lower levels of the academic hierarchy as junior lecturers and lecturers (Pretorius *et al.* 2002).

The fact that few women reach the rank of full professor seems to hold even for men and women scientists who are initially about equally advantaged in the sense that they all achieved a prestigious post-doctoral fellowship in their early careers. In such an elite group of about 700 American scientists studied by Sonnert and Holton (1995), 88 percent of the men attained a full professorship, but only 43 percent of the women did so. Gender differences in rank attainment do, however, vary considerably from field to field, and are smallest where women represent a critical mass of at least fifteen percent. This is the case in the life sciences in the United States, for example, where women find themselves one full promotional stage below that of men of the same measurable ability and time since PhD (Tobias 1999).

Women's lower status and the delays they encounter in achieving high academic rank may well contribute to their falling behind men in terms of publication productivity. Some would even argue that the lower publication productivity among women results from them being forced into a position less conducive to research, perhaps as a result of discrimination (see section 2.3.4 below). However, the relationship between rank and productivity may be reciprocal or "cyclical" (Maürtin-Cairncross 2003:156). In other words, it is equally possible that, because of universalistic processes women, as less active in the research and publishing department, have less chance of gaining promotion (Halvorsen 2002; Long & Fox 1995; King 1994). In the sixties and seventies it was commonly accepted that women's lower status in academia was a reason for their lower productivity rate. And for some women still today, accusations of discrimination by

relationship between rank and publication productivity cannot be due to differences in the *time* available for research.

women faculty who have been denied reappointment, tenure, or promotion are viewed as an “excuse” or “crutch” for a lack of productivity (Winkler 2000).

But what does the evidence show with regard to this potentially ambiguous relationship between promotion and productivity? Xie and Shauman (1998) found that gender disparity in publication productivity narrows or even reverses as rank rises. This supports the notion that universalistic processes are at work – that promotion depends on productivity, not the other way around. However, a much larger body of evidence supports the counter-argument, i.e., that differences between men and women in publication productivity are not sufficient to explain women’s lower ranks. Various researchers in the United States (e.g., Sonnert & Holton 1995b; Long *et al.* 1993; Zuckerman 1991; Cole 1979), and elsewhere (e.g., Toren 1991 in Israel, and Lodge 1976 in New Zealand) found that gender differences in rank achievement remain substantial even after controlling for level of productivity. Although these findings do not necessarily support the position that women’s lower rank attainment is the result of discrimination, Long and his colleagues (1993:720) do conclude on the basis of their findings that, “women are expected to meet higher standards for promotion” than men.

2.3.2.2 *Employment status*

In addition to rank, gender differences with regard to employment status may also explain women’s lower publication productivity. Marginal positions in academia, which including non-tenure positions such as instructorships, research associateships and other miscellaneous research jobs are not conducive to a high rate of publication. On the contrary, these positions are characterised by a lower level of demands for publishing, lack of access to research resources, facilities, support, and absence of promotional opportunities. In particular, such staff are usually ineligible for professional development programmes, including sabbaticals. For example, at South African tertiary institutions, contract staff on long-term or repeatedly renewed contracts are hampered by the lack of provision that is made for them to take study leave (CSD 1999). In addition, non-tenure track faculty are generally paid less, tend to be clustered at the lower ranks and in departments that teach large numbers of required first-year courses, and are generally excluded from faculty governance (Subotzky 2003; Harper *et al.* 2001; Zuckerman 1991). In fact, the conditions of service and other arrangements for such employees has become steadily more problematic in terms of equity (Subotzky 2001).

More importantly, data from a number of sources indicate that women tend to be concentrated in such positions (Harper *et al.* 2001). Women’s over-representation in these positions has been

noted worldwide. Already in 1987, Lamanna *et al.* (cited in Dwyer *et al.* 1991) suggested that academia is approaching a dual labour market characterised by a male-dominated class of tenured and tenure-track professors and a growing female-dominated class of part-time and temporary positions. In the United States, figures for 1995-1996 indicate that women are under-represented among tenured faculty, and over-represented among non-tenure faculty (Valian 1998). In Australia, women have been found to hold only a quarter of continuing (tenured) appointments in universities (Castleman *et al.* 1995). The literature further details how a higher proportion of academic women than men are in contract, short-term or part-time positions, both in the United States (Collins 1998) and elsewhere (Chesterman 2002; Halvorsen 2002; Fuchs *et al.* 2001; Poole *et al.* 1997; Lodge 1976).

In South Africa, a similar pattern obtains. Historically, women in South Africa were disadvantaged in that, until as recently as the mid-eighties many universities would not employ married women on a full-time basis⁴⁰ (De la Rey 1999; Budlender 1994), and until recently the University of Fort Hare had regulations prohibiting permanent contracts for women until they had been in the post for five years (Peacock 1993, cited in CSD 1999). Unpublished research conducted by the author during the year 2000 at a research university in South Africa indicates that women are still hired disproportionately on short-term (mostly one-year) contracts in ad hoc, casual or temporary positions. For instance, in 2000 more than two-thirds of instructor and research personnel in such positions at the university were women.

There are even some indications that the trend among academic women to fill short-terms and part-time academic positions is increasing worldwide (Poole *et al.* 1997). Changes in the environment external to academic institutions - for instance volatile or uncertain economic conditions, or changes in government policy - may reduce research funding and job opportunities in higher education. This has led to universities to dramatically increase their use of cheaper part-time, temporary positions, principally as a market-driven, cost-cutting measure (Subotzky 2003; Harper *et al.* 2001; Bellas & Toutkoushian 1999). Such changes in response to economic realities amplify existing structural inequities and reinforce the gender segregation between tenure-track and off-track positions, as women are disproportionately hired for such positions⁴¹. For example, a case study of gender equity in the Faculty of the Humanities at the University of the Free State showed that the percentage of women in permanent positions had decreased by

⁴⁰ This practice reflects the rule prohibiting the employment of married women in the civil service. Although it was removed in 1976, at some universities it was still applied well into the 1980s (Peacock 1993, cited in CSD 1999).

1.37 percent after a process of rationalisation at the institution, which “proves that rationalisation was detrimental to women” (Pretorius *et al.* 2002:17).

Again there are some competing explanations for these gender differences in employment status in academia. First, it has been argued that women’s concentration in non-tenure positions may be the result of fewer women proportionately holding the doctorate (Bayer & Astin 1975). However, studies conducted in the late 1970s and early 1980s indicate that *doctoral-level* women in science and engineering in the United States were twice as likely as men to hold so-called “off-ladder” positions (Fox 1991). Also, despite the growth in women doctorates in this country, the incidence of these appointments is still greater among women than among men (Stack 2002:175). Based on his findings among biochemists in the US, Long (1992:162) suggests an alternative interpretation, i.e., that women are “less successful in translating their postdoctoral investment into increased productivity by means of secure employment”.

Secondly, it is unclear whether women are freely choosing these positions (for whatever reason), or whether they are being in some way exploited by a discriminatory system (Harper *et al.* 2001). For example, women faculty at medical schools in the United States (in particular those with children) are reported to have expressed concern about the absence of a part-time tenure track at their institution (Carr *et al.* 1998), and in South Africa a working group concerned with the loss of women in science even suggested introducing a system in which women could switch between full-time and part-time jobs in order to retain those with family commitments (Thomson 1994). However, according to Zuckerman (1991), the fact that women’s career histories are often marked by part-time work cannot be attributed solely to women’s domestic and parental responsibilities, as women scientists with young children under six are more apt to be working or seeking work than those with older children.

2.3.2.3 *Institutional affiliation*

The prestige of an institution where a scientist is employed has been shown to be one of the strongest correlates of publication productivity (Fox 1983). This is particularly evident in the relatively large North American academic system, where there is a high degree of variation between different types of academic institutions. According to a classification scheme developed by the Carnegie Foundation for the Advancement of Teaching (1994), a distinction may be

⁴¹ As in other sectors historically, the increase in female numbers in academic work has been accompanied by a devaluing of the work performed, leading some observers to argue that the increasing feminisation of academia implies simultaneous casualisation (Chesterman 2002; Castleman *et al.* 1995).

drawn between research institutions, doctoral institutions, comprehensive institutions, liberal arts institutions, and two-year colleges.

It is not surprising that faculty at research and doctoral institutions report higher publication productivity than those at two-year colleges (Bellas & Toutkoushian 1999; Long & McGinnis 1981), as the type of institution influences aspects relevant to publication, such as access to resources and the degree of research orientation (Rodgers & Maranto 1989). According to Allison and Long (1990), research and doctoral institutions are able to encourage and facilitate the publication productivity of their members in a number of ways. First, because of their size and resources (at least in the United States), these more prestigious institutions are more able to offer facilities, such as laboratory facilities, computer hardware, library holdings, graduate student ability, and time available for research. As a spin-off, granting agencies might be more willing to fund research at larger institutions with such facilities. Secondly, a high level of collegial exchange (e.g., departmental seminars) is common in such environments. This implies heightened intellectual stimulation in the form of close contact with eminent scholars, who might provide ideas that stimulate an academic's own productivity, and often bring offers for publications.

Thirdly, an entrenched publication culture means that universities expect their faculty to engage in research and that more rigorous publication requirements exist for advances in rank and salary at these institutions. This expectation, coupled with a desire to maintain informal esteem among highly productive colleagues, provides a higher level of motivation for a scientist to be productive⁴². On the other hand, the other primarily undergraduate institutions, such as two-year colleges in the US, or Historically Disadvantaged Institutions (HDIs) in South Africa, focus more on teaching and interaction with students. Thus, it is often argued that these institutions have higher teaching loads, while the lighter teaching loads at major research universities afford their employees more time to do research (Maürtin-Cairncross 2003; Stack 2002). Finally, the prestige of the institution in which an academic is employed may have an important "halo" effect (Crane 1967) on the acceptance rate of a scholar's work in major journals and by publishing companies.

Considering the fact that institutional affiliation has a positive effect on publication productivity, differential distributions of men and women in terms of institutional location may account for women's lower publication output. Research in the United States has indeed found

gender differences with regard to both the type and prestige or quality of academics' employing institution. A pattern referred to as women's "institutional ghettoization" (Davis & Astin 1990:95) obtains, in the sense that men are more likely to be employed at more prestigious institutions, particularly research universities, while women are found most readily at teaching colleges (Xie & Shauman 1998; Jacobs 1996; Fox 1995; Long & Fox 1995; Rosenfeld 1991; Astin 1978). In addition, being in a more prestigious university or department has a significantly more negative effect on promotion for women than for men. At nine male professors for every one female professor, HBUs in South Africa have a better record in terms of the representation of women at the level of professor than the more prestigious HWUs, especially the Afrikaans-speaking HWUs, where the ratio is 15:1 (Wolpe *et al.* 1997). Thus, it seems that women "pay" for prestigious affiliation with disadvantages in rank achievement, whereas men do not experience such a trade-off (Sonnert & Holton 1996; Long *et al.* 1993; CEEWISE 1983).

However, some issues need to be noted with regard to the posited relationship between institutional affiliation, gender and publication productivity. First, conflicting evidence has been reported with regard to academics in the United States. Some researchers report that about the same proportions of men and women work in prestigious research universities (Zuckerman 1991; Ahern & Scott 1981; Cole 1979). In addition, Cole (1979) found that institutional affiliation does not modify the relationship between gender and publication productivity: academic men are more productive than their women colleagues, independent of their institutional affiliation.

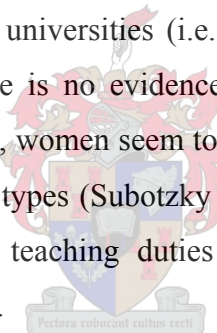
Secondly, it may be argued that a relationship between the institutional affiliation and publication productivity does not necessarily mean that certain institutions facilitate publication productivity more than others. As with rank, the relationship might be reciprocal, in the sense that high publication productivity leads to appointment at prestigious universities (Xie & Shauman 1998; Astin 1978), because these institutions tend to recruit and hire the most productive academics⁴³. Although both conditions are plausible, longitudinal studies undertaken by Long and his colleagues, which monitored the publication histories of American scientists between institutional locations and over time (Allison & Long 1990, 1987; McGinnis, Allison & Long 1982; Long & McGinnis, 1981; Long, Allison & McGinnis 1979; Long 1978), have led to the following conclusion:

⁴² There are some indications, albeit tentative, that facilities affect the number of publications while other factors (motivation and intellectual stimulation) have greater impact on the "quality" (as measured by citations) of work published (see Allison & Long 1990).

⁴³ Some have even questioned the underlying assumption that women, like men, desire such appointment. For instance, Brown (1967, cited in Williams *et al.* 1974:386) suggests that, "Many women may feel work loads of a major university are not compatible with their dual roles, and that they may not be professionally committed".

“Where scientists work makes a big difference in how much they publish...On the other hand, scientists’ prior publication...records have, at most, a marginal influence on the prestige of jobs they obtain” (Allison & Long 1990:478).

Finally, the extent of nature of the variation of academic institutions in the United States - as well as the accompanying arguments on its relationship to gender and publication productivity - are not necessarily applicable to academic systems in other countries. For instance, in a study of the academic systems in developed and less developed countries, no clear article productivity gap was found between faculty employed at research institutions and their colleagues at teaching oriented institutions (Teodorescu 2002). In the absence of a specific variable for institutional type or prestige in this cross-national study, the differentiation between these two types of institutions was based on a construct derived from academics’ responses to three items that gauged their employing institution’s emphasis on research. In South Africa a distinction may be drawn between institutions that, for the greater part of their existence in the past, were considered as teaching institutions (i.e., technikons and HBUs) on the one hand, and those that are considered to be major research universities (i.e., Historically Advantaged Universities or HAUs) on the other. However, there is no evidence of institutional ghettoization of women academic staff in this country. Rather, women seem to be uniformly under-represented at around a third of the total at all institutional types (Subotzky 2003). In addition, research indicates that most women in HAUs have *more* teaching duties when compared to women from other institutions (NRF 2001⁴⁴; CSD 1999).



2.3.2.4 *Disciplinary context*

In the previous three sections, the focus has been on so-called “vertical” gender segregation along the professional hierarchies in academia. In addition, “horizontal” gender segregation into different specialities has been reported as well (Sonnert 1999). Despite regional, cultural and national differences, women academics worldwide are concentrated in the so-called “compassionate” sciences (e.g., the social and life sciences), while they constitute a small minority in the “dispassionate” physical sciences and engineering⁴⁵. South Africa is no exception in this regard: in 2001, 61% of female instruction/research staff in universities and technikons were located in the social sciences and humanities, compared to 50% of the male staff. At the

⁴⁴ These findings need to be treated with caution, as they may be artefacts of the data insofar as the response rate was much higher among academics at HAU’s than those at other institutions.

⁴⁵ The reason for this pattern is debatable. It is equally probable that gate-keeping by academic institutions or a process of (socially and culturally supported) self-selection among women leads to their under-representation in the natural sciences.

same time, there was a reasonable proportion of male instruction/research staff in the natural sciences and engineering (38%) compared to their female counterparts (21%) (Bailey and Mouton 2004).

Such disciplinary gender segregation may produce at least part of the observed gender differences in publication productivity across disciplines, as disciplines vary in terms of factors related to publication productivity. Research that has taken the effect of discipline upon the publication productivity of men and women into account has provided support for such an argument. Gender differences in publication become smaller once discipline is controlled for, and publication productivity differences between men and women are smaller in the natural sciences than in the social sciences and humanities (e.g., Asmar 1999; Lie 1990).

A number of reasons may be put forward for the relationship between discipline and publication productivity. First, research cultures and publication practices vary widely across disciplines. For example, early studies undertaken during the sixties and seventies show social scientists to be much less prolific in terms of published articles, than the physical and biological scientists (Startup & Gruneberg 1976; Fulton & Trow 1974; Astin 1969). At the same time, women are less likely to be in natural science disciplines where the pursuit of research grants and the resulting steady publication of articles is the norm (Harper *et al.* 2001). Rather, women are concentrated in fields where research, or at least publication, is underplayed (Williams *et al.* 1971).

Aside from output volume, disciplines like molecular biology follow a publication pattern characterised by a large number of relatively short papers with joint authorship, while a discipline like philosophy is more frequently characterised by the publication of monographs and longer papers with relatively few articles appearing in journals (see section 3.1.2.3 in Chapter 3 for a more detailed discussion of these differences). Thus, if publication productivity is measured in terms of article output, as is most often the case (Braxton & Bayer 1986), the humanities - with their greater proportion of women - are measured as less productive. In addition, the social sciences and humanities are often characterised by greater undergraduate enrolments and thus heavier teaching loads, which are likely to hamper publication productivity. Third, funding for science, engineering and technology research is usually much larger than funding in the human and social sciences. Finally, it has been argued that allocations of resources are likely to be more particularistic (i.e., based on characteristics that are functionally irrelevant to science, e.g., gender) within fields with “less developed scientific paradigms”, such as the social sciences, where there is less consensus about research issues (Long & Fox 1995).

2.3.2.5 *Institutional resources*

The institutional factors discussed thus far – rank, employment status, institutional affiliation and disciplinary context – are crucial to publication productivity as they determine access to the means to scientific production. However, there are some who argue that a more direct relationship exists between gender and the availability of institutional resources, which might explain productivity differences between men and women (Lie 1990; Cole 1979).

Astin (1991) cites data from various national surveys in the United States that demonstrate that considerably more men than women report that they have financial and or other support (e.g., research assistants) for their research activities. A variety of studies in academic medicine in that country also suggest gender-related differences in aspects of institutional support, including personnel, space, and equipment (Fried *et al.* 1996; Tesch *et al.* 1995; Carr *et al.* 1992). With regard to research funding in particular, data from various countries (e.g., Denmark, Australia, Norway, West Germany and the Netherlands) indicate that women represent a small proportion of recipients of research grants, particularly when those grants are external to the institution where the women are employed (Asmar 1999; Loder 1998, cited in Jackson 2002; Bagilhole 1993; Hawkins & Schultz 1990; Kyvik 1990). Figures pertaining to research funding in South Africa paint a similarly stark picture: between 1995 and 2001, women consistently received far fewer research grants and scholarships from the NRF than did men. In 2001, women were the recipients of only 21% of the research grants (Bailey & Mouton 2004)⁴⁶.

In addition to research grants, research assistants and PhD students constitute another important resource in an academic environment such as a university, not merely because of the assistance they offer, but also because of the valuable contributions they may make to their supervisor's research projects. This is particularly true for "experimental sciences", such as medicine and the natural sciences, where research is a team effort, and having fewer students would presumably reduce one's research output. Thus, any difference in the ability of women faculty compared to male faculty to attract and retain graduate students may create a gender difference in publication productivity. Such a difference might be the result of the smaller number of women that hold PhD degrees, or as Bayer (1973) and Winkler (2000) argue, women

⁴⁶ However, concern with redressing such imbalances, along with the introduction of a new Women-in-Research award category (see Chapter 1, section 2.4), has meant that 66 percent of the total *value* of research grants awarded during 1997/98 was awarded to women (CSD 1999). It also needs to be taken into account that, between 2000 and 2003, women consistently received a larger number of self-initiated research grants than did men from the other main public funding agency for research in South Africa, the MRC. In part, this favourable picture for women is explained by the general over-representation of female staff in the health sciences – the scientific domain within which the MRC operates (Bailey & Mouton 2004).

faculty's isolation may make it less likely that they are recommended as possible advisors to students. In a similar vein, students may feel that a woman advisor does not have the stature within a discipline to advance their careers, or it may simply be that male graduate students may feel uncomfortable working with female faculty (Yentsch & Sindermann 1992). However, research has not provided any consistent results in this regard. An early study in the US found that women faculty taught fewer graduate students and had fewer research assistants than did male faculty (Bayer 1973) and later Lie (1990) reported that men advise more graduate students than women. On the other hand, in Sweden no gender differences were found with regard to PhD production in the humanities (Hemlin & Gustaffson 1996), and in New Zealand no significant gender differences were found in the number of post-graduate students supervised (Vasil 1993).

It may be that the availability of institutional resources does not differ as much between the sexes, but rather that women are under-utilising those resources available to them. There is both direct and indirect support for such an argument. First, data from the United States (Berbard 1964; Zuckerman 1987), the UK (Lodger & Eley 1998, cited in Jackson 2002), and Australia (Bazeley *et al.* 1996) seem to indicate that gender does not play as much a role in success rates for grant applications, as women and men receive grants proportional to the numbers of proposals submitted by each gender group. Rather, women do not apply for grants at the same rate as men do. Secondly, research indicates that women are less likely to view the importance of institutional resources as enhancing their publication productivity. In a study involving highly productive scholars in the United States, men were much more likely to identify institutional resources, including graduate students, as important facilitators to their productivity than the women were. Women were more likely to cite personal variables such as hard work, motivation, interest and skills, as factors that enable their productivity (Davis & Astin 1990; Astin & Davis 1985). Similar results were reported for Germany and the UK, where it was found that men more than women saw the availability of research funding, and access to quality student research assistance as important in relation to publication productivity (Poole *et al.* 1997). However, this does not imply that ignorance or personal choice on the part of women is to blame. Under-utilisation of available resources may just as likely be a product women's status as an isolated minority. Being in this position, it is realistic for them to depend on what is available to them, i.e., their own personal characteristics and efforts to advance.

Finally, it needs to be taken into account that the relationship between institutional support and publication productivity might be reciprocal. Women's lower productivity may result in part from their lack of institutional support, but it is equally possible that the fact that they receive

less institutional support is the result of their lower publication productivity (Carr *et al.* 1998; Xie & Shauman 1998). Although not enough empirical evidence is available to resolve the issue, research that has controlled for publication productivity seems to support the former statement. For instance, women paediatrics in the United States (Kaplan *et al.* 1996) and professors in Israel (Toren 1993) whose level of publication productivity is comparable to that of their male counterparts, still report less institutional support and fewer resources than men do.

2.3.2.6 *Graduate training*

Factors related to men and women's graduate training might also provide clues as to why gender differences in publication productivity exist. First, it is highly probable that part of the lower productivity of women in relation to men is due to women's lower degree attainment. It comes as no surprise that the likelihood that academics would be involved in research increases with level of qualification (CSD 1999), nor that faculty holding a doctorate are significantly more productive than those without (Jacobs 2001). Graduate training provides opportunities for establishing research skills, and increases perceptions of self-efficacy for research activities, which are positively related to research productivity (see 2.1.2.2 above). In addition, graduate training provides opportunities for developing mentoring relationships, and gaining access to professional networks – factors that are highly conducive to publication productivity (Vasil 1993). On a more practical note, doctorate training is usually a required credential for high rank in academia⁴⁷. Finally, it stands to reason that scientists without a PhD still need to work towards achieving their doctorate, and are therefore not as able to concentrate on independent research for publications as their colleagues with PhDs are.

However, fewer faculty women than men have completed their doctorate. For instance, among faculty working in HEIs in South Africa in 2001, just more than a quarter (27%) of those with a doctorate were women, while women were 51% of all academic staff with lower postgraduate degrees (NACI & DST 2004). Such gender differences in degree attainment are thus very likely to be an important factor in explaining gender differences in publication productivity.

A related point is that, if women do earn their PhD, they generally take longer than their male counterparts to do so (Asmar 1999; Probert *et al.* 1998, cited in Chesterman 2002; Xie & Shauman 1998; Toren 1991). This might reflect a tendency for women to delay the earning of a

⁴⁷ Considering the fact that a lower proportion of women hold PhDs than men, this promotional criterion in higher education actually embodies indirect (sexual) discrimination (see section 2.3.4.3 below for a distinction between direct and indirect discrimination).

PhD until having one or two children, as Toren (1991) found to be the case in Israel. Considering the fact that time between a bachelor's degree and the PhD has been found to have a negative effect on productivity (those who take more than ten years are thirty to forty percent less productive than those who take less than four years), the negative effect of time to PhD contributes to women's lower rates of productivity relative to men's.

In addition to the doctorate degree itself, the institutional location at which it is received has been shown to have a long-term effect on later publication productivity (Keith *et al.* 2002; Long, Allison & McGinnis 1979; Long 1978). Thus, if gender differences exist in this regard, they need to be taken into consideration as well. However, empirical evidence does not seem to support such an argument, at least in the United States. Although Long (1990) found that women biochemists in the United States receive their doctoral degrees at less prestigious departments, Cole and Singer (1991) report that there is virtually no association between gender and admission to graduate schools of varying prestige or assessed quality, and men and women are equally likely to receive their doctorate from top ranking universities (Fox 2001; Long & Fox 1995; Zuckerman 1991). Moreover, Cole and Zuckerman (1984) found that among scientists who were matched for doctoral department, women still published half as many papers as men did. However, the effect of doctoral origins on research productivity has been shown to be greater for men than for women among chemists (Reskin 1978a), biochemists (Long 1990), and scientists in six fields (Cole 1979). According to Long and Fox (1995), this might indicate that men are given a greater return than women for their doctoral training.

Other features of graduate training that might be relevant to later publication productivity, such as the quality of supervisors or mentors and financial support received, have been hypothesised to differ between men and women. However, again the findings are inconclusive. Women biochemists in the United States are reported to have less productive and prestigious mentors (Long 1990), but they not differ significantly in the citations received by their mentors (Long *et al.* 1993). In Australia, Probert *et al.* (1998, cited in Chesterman 2002), found that women academics are less likely to have the advantage of mentoring by an eminent senior scholar. Early research by Astin (1978) indicates that more men than women have stipend support of some sort during graduate training, while Long and Fox (1995) report more recently that men and women are very similar with regard to financial support for graduate training. Further evidence of similarity, rather than dissimilarity, with regard to men and women's graduate training, is the fact that men and women faculty in the United States start their careers

as equals: they are equally apt to take post-doctoral fellowships, and to be accepted for post-doctoral fellowships by top-rated institutions (Cole & Singer 1991; Coggeshall 1981).

In 1979 Cole suggested that more informal aspects of graduate training may be enormously consequential for the rate of publication productivity, and should therefore be considered as important in explaining the differential publication productivity found among men and women. These include, for example, engaging in informal academic discourses with supervisors, and engaging in collaboration with them. We now turn to the potentially differential impact that such informal experiences may have, not merely during graduate training but during the academic career as a whole, on women and men's publication productivity.

2.3.3 **The exclusion hypothesis**

In addition to the more tangible, structural organisational factors discussed above, publication productivity is also influenced by social relationships and networks. It is in these networks of collegial interaction and communication, which form the "invisible college" (Helmreich *et al.* 1980:907) where ideas are generated and evaluated, where human and material resources circulate, and where advantages are exchanged (Fox 1996a). For instance, networks provide information on grants, research funds, and on potential competitors who are working on the same research problem. Networks provide contacts that may lead to research resources, up-to-date professional knowledge and access to the "invisible college" (O'Leary & Mitchell 1990:59). In addition to providing an informal grapevine, being integrated in such networks provides more encouragement and informal rewards for achievements, which increases the motivation to do research (Hagstrom 1965), while exclusion from informal collegial networks may erode motivation and inhibit an individual's investment in research (Long & Fox 1995). Finally, networks offer collegial support and opportunities for intellectual stimulation⁴⁸ that are conducive to publication (Winkler 2000).

2.3.3.1 *The relationship between publication productivity and collegial networking*

Research conducted among American faculty has consistently reported a strong association between publication productivity and making contact or communicating with colleagues, especially with colleagues at institutions other than one's own (Mitchell 1986, cited in O'Leary & Mitchell 1990; Finkelstein 1982, cited in Fox 1991; Blackburn, Behymer & Hall 1978; Pelz &

⁴⁸ Stack (2002) lists a few examples of such opportunities: the informal review of papers (including preprints), communication of reactions to new ideas, talks, journal articles and other academic news, positive reinforcement

Andrews 1976; Hagstrom 1965; Pelz 1956). And in Norway, faculty who have an even wider contact network in the sense of having a higher degree of contact with colleagues in other countries, tend to be more productive than other researchers (Kyvik & Larsen 1994, cited in Kyvik & Teigen 1996). Again in the United States, prestigious academic departments that are said to provide a context favouring productivity are reported to have strong patterns of collegial exchange (Parsons & Platt 1968).

Biglan (1973) found that a faculty member's level of social connectedness (measured as numbers of collaborators, number of persons worked with on research, teaching and administration, and sources of influence on research goals and teaching procedures) is related to publication productivity. Faculty in Norway who do not collaborate are less productive than those who work together with colleagues (Kyvik & Teigen 1996). In South Africa publication productivity has not yet been linked empirically to collegial networking, but research on women at HBUs indicates that these women at least "felt that collaborative ventures would assist in more frequent and regular publications resulting from the supportive environment established between junior and senior colleagues" (Maürtin-Cairncross 2003:198). In addition, women professors are reported as having a mentor, receiving advice from peers and actively participating in a staff association as factors facilitating academic success (De la Rey 1999). Although it is tempting to conclude on the basis of such findings that publication productivity appears to be highly dependent on networks, it needs to be noted that so-called "colleagueship" is not necessarily causally prior to publication productivity.

Nevertheless, some have argued that collegial interaction may be especially important for the publication productivity of women faculty (Fox 1983; Reskin 1978b). The reasoning behind such a hypothesis is that women face more demands that are in conflict with their research role (e.g., family responsibilities and heavier teaching loads). Collegial support may mediate role overload and enhance performance among women subject to such role conflict. Similarly, Maürtin-Cairncross (2003:176) points out that academic women in South Africa, particularly those who are "new" to academia, require guidance in publishing. She bases this on her finding that publication is often an activity which takes women away from their "natural state of being", because it often requires solitary time away from their families and their socialised role of nurturers (see section 2.1.2.1 above). Kyvik and Teigen (1996) agree: in Norway their finding that lack of research collaboration with colleagues has a significantly negative impact on

and encouragement in idea and research development, feedback on grant proposals, news on funding opportunities, and so on.

women's productivity but not on men's productivity, suggests that women may be more "dependent" than men upon collaboration with colleagues. However, empirical evidence in support of women's larger degree of dependence is weak so far.

2.3.3.2 *Gender differences in collegial networking*

What is more important is to determine if men and women differ in their level of social connectedness in the academic workplace, as this might explain some of the gender difference in publication productivity. Actually, the "exclusion hypothesis", i.e., that women lack integration into informal networks at male-dominated academic institutions, is the most widely used explanation for gender differences in publication productivity (Kyvik & Teigen 1996). The hypothesis is based on the assertion that, as a consequence of men's numbers and their dominance, academia is a predominantly male milieu⁴⁹, characterised by a history of patriarchy, and an institutional culture that is still strongly masculinist. In this culture, the majority (male) members accept one another, support one another, and promote one another, while it is typically hostile and unfriendly to women (Maürtin-Cairncross 2003; De la Rey 1999; Heward 1996, cited in Zulu 2003; Fox 1985:13-14). Thus, the networks that are highly related to publication productivity are per definition "old boy networks" - a closed fraternity from which women (and other minorities) are arguably more isolated or estranged. In this way, women are often shut off from information, opportunities and services, which are critical for research and publication productivity.

By the late eighties women's participation in professional networks had still been largely understudied (Fox 1991; Zuckerman 1991), and thus the data had not yet been available to verify such statements conclusively. However, since then evidence that supports women's isolation from collegial interaction has mounted. In the United States (Exum 1983; Kaufman 1978) women faculty were reported to be more isolated from collegial networks than men. Loring (1985, cited in Fox 1991) found that 85 percent of women faculty at American colleges women agreed that an "old boy network" exists on their campus, and the same proportion disagreed that women faculty relate well to this network. More recently, women faculty in the United States, as compared to their male counterparts, reported significantly less interaction with faculty in their departments (Fox 1995), less access to networks (Fox 1996a), and non-integration into their academic departments and disciplines (O'Leary & Mitchell 1990). Even among an elite sample

⁴⁹ This is not to say that academia is unique in this regard. In other professions women also often exist outside the dominant culture. However, academia is often perceived as "a man's world" *par excellence* (cf. Petersen & Gravett 2000).

of biologists in America, Sonnert and Holton (1995) discovered that relative isolation from the collegial network characterises the career paths of women scientists. Research conducted among medical faculty in the United States indicates that it is especially women faculty with young children that are less likely to be included in professional networks (Carr *et al.* 1998).

Outside the United States similar findings have been reported⁵⁰: In Australia, women faculty are reported to be often shut out of the networks and to be less likely to have strong international networks which will enhance academic careers (Probert *et al.* 1998, cited in Chesterman 2002; Baldwin 1985); in Germany research has shown that women scientists have fewer networks at their disposal (Fuchs *et al.* 2001); and in Norway (Kyvik 1990) fewer women than men have regular contact with colleagues at their institution regarding their own research work. Moreover, when researchers ask American women faculty themselves to identify constraints imposed on their publication productivity, they mention (in addition to limited access to resources) feelings of exclusion, disconnectedness, marginalisation, and intellectual and social isolation again and again (Lawler 1999; Bornstein & Farnsworth 1998; Park 1996; Olsen *et al.* 1995; Sonnert 1995; Sonnert & Holton 1995; Etzkowitz *et al.* 1994, O’Leary & Mitchell 1990). Similarly, most in-depth studies among academic women in South Africa have highlighted the difficulties experienced by women academics in terms of being isolated in a predominantly masculine environment (Moultrie & De la Rey 2003; Perumal 2003). Indeed, Walker (1997) claims that, “The exclusion of women from certain academic identities, and the silences around the construction of these same identities according to white male norms, is *deeply embedded* in the university system of South Africa” (42, italics mine)

2.3.3.3 *Explanations for women’s exclusion from collegial networks*

In addition to the argument stated above, that the informal web of “old boy networks” in male-dominated academia by definition exclude women, some further explanations have been put forward to account for women faculty’s exclusion from collegial networks. According to Reskin (1978b), exclusion might be the result of gender stratification, which accords women a lower gender status, or a “second-class academic citizenship status”, as referred to by Perumal

⁵⁰ In a national audit, South African women researchers without exception reported “no problem at all” with the receptiveness of male team-members to the inclusion of women researchers in research projects (NRF 2001:35). Interestingly enough, a less (but still overwhelmingly) positive response was given when the same question was posed on the receptiveness of female team-members to the inclusion of women researchers in research projects. Unfortunately, very few women (25 and 19 out of a total of 550) answered the open-ended questions on which these findings are based, and one cannot maintain that such sentiments are characteristic of South African women researchers in general.

(2003:76) in her South African research. As such a status is inconsistent with the implicit status equivalence of colleagues, normal collegiality between male and female researchers is blocked.

Alternatively, it is proposed that male scientists have traditionally had little contact with women in either academic or corporate research settings, which produces awkwardness and discomfort in relating to women scientists as peers (Mattis & Allyn 1999). A third possible explanation traces the issue back to graduate training, during which professional socialisation takes place. Women report more isolation and marginality in their graduate training, which has consequences for their opportunities to gain access to collegial networks (Asmar 1999; Fox 1991). Mentors may assist graduate students with their integration into professional networks, with the latest research techniques, by influencing who reads the student's articles or papers, and by providing friendly reviews and suggestions for drafts of papers (Zulu 2003). However, women seem to lack such mentors (O'Leary & Mitchell 1990).

Finally, women may simply be disproportionately clustered in "isolated circumstances and marginal appointments" (Fox 1985:13). Fox (1991) cites various research findings from studies conducted in the United States as indicators of women's greater marginality to the social system of science. For instance, women are less likely than men 1) to have professional connections as editors, officers of professional associations, reviewers of grants, and journal referees; 2) to be invited to lecture or consult outside of their institutions; or 3) to spend time off campus in professional activities. Similarly, a South African study by Dlukulu (2000) reports on the lack of departmental support as perceived by academic women in some institutions. This becomes problematic to academic women who have not yet published, as they often feel isolated and require assistance to "get started".

If one assumes that gender discrimination lies at the root of women faculty's non-integration into academic research networks, and disciplines may vary in terms of gender equality, it is reasonable to expect that the extent of women's exclusion may vary between disciplines. For instance, Stack (2002) argues that, in disciplines as sociology or anthropology, one would anticipate greater integration of women into academic research networks, because these disciplines are characterised by a lower degree of gender inequality. The proportion of women in a field of specialisation may also have a role to play, as gender discrimination is argued to fall away in fields that have exceeded what Sonnert and Holton (1995) term a critical mass of fifteen percent (e.g., biology). Also, in fields characterised by large numbers of women, gender discrimination is more visible, therefore sanctions for discrimination are frequent, which lowers levels of discrimination (Cole 1979). On the other hand, some have argued that the culture and

practices within a particular discipline might explain gender differences in the extent to which feelings of intellectual isolation and exclusion are reported (Asmar 1999). For instance, in “hard science” disciplines where men are clustered, team research, collaboration and informal mentoring is strongly encouraged within the departmental and disciplinary ethos. Women, on the other hand, are more often located in disciplines such as the arts and humanities, where the traditions of the solitary scholar, the idea of the “individual character” of research, still persist (Hemlin & Gustaffson 1996:430).

2.3.3.4 *Access to collaborative opportunities*

The intellectual and social isolation of women faculty may influence their publication productivity by making it harder for women to find admission to a network of collaborators (Sonnert & Holton 1996; Cole 1981). Thus, gender differences in publication productivity have been attributed in part to women’s limited opportunities to collaborate (Cole 1979). Given the considerable role of collaborative research in contemporary scientific inquiry⁵¹ (Cole & Zuckerman 1984), and the fact that teamwork itself stimulates productivity (Pelz & Andrews 1976; Price & Beaver 1966), it makes sense that scientists who work alone would be handicapped in their publication rates. Co- or multiple authorship of published papers is often used to provide an indicator of research collaboration. Findings in this regard do indeed indicate that those who publish the most joint papers are the most productive, even if corrections are made for multiple authorship (Price & Beaver 1966). Obviously, co-authorship could greatly multiply the number of articles an academic could produce above and beyond the number he/she could produce as a sole author. In addition, joint-authored papers seem to have a higher acceptance rate than do single-authored papers [see Kyvik and Teigen (1996), and Fox (1983) for reviews of the literature on the topic].

But the question is, are there gender differences with respect to access to research collaboration? According to Kyvik and Teigen (1996), the issue has not been examined sufficiently. In addition, research has produced inconclusive findings, because of measurement issues and cross-disciplinary differences in publishing patterns, which tend to confound the findings. For instance, although Asmar (1999) found that men in the early stages of their academic careers in Australia were significantly more likely than their female counterparts to have published from their research jointly, the finding seems to be the result of cross-disciplinary

⁵¹ The long-term trend toward collaboration has been called “one of the most violent transitions” that can be measured in patterns of scientific performance (Price 1963:89). Collaboration is now the norm worldwide, and scientific publications with a single author are infrequent (Gálvez *et al.* 2000).

differences in publishing patterns. Thus, women are less involved in collaborative research than males because they are in the social sciences and humanities, rather than because they are barred from access to male networks.

There are some indications that women faculty in America tend to work alone more, especially after the post-doc (Sonnert & Holton 1995), and that collaboration with a mentor⁵² is less likely among young women biochemists in the United States than among their male counterparts⁵³ (Long 1990). In Norway, Kyvik and Teigen (1996) found that more women than men do not collaborate with colleagues on research projects. Moreover, women who do not collaborate with other colleagues in research are less productive than both their male and female colleagues.

Some research has found that women sociologists are less likely to co-author papers than their male counterparts are (Mackie 1977). However, these findings have not been replicated, and it is possible that they simply reflect the fact that before the 1980s there were fewer women scientists with whom men could collaborate. Other examinations of co-authorship trends among various samples in the United States failed to find evidence of gender differences (Long 1992; Astin 1991; Cole & Zuckerman 1984; Zuckerman & Cole 1975). In Norway, Kyvik and Teigen (1996) actually found a higher percentage of female faculty's publications (49%) than male faculty's publications (42%) to be co-authored. Also, American women in the field of criminal justice have recently been shown to write more multiple-authored articles and less sole-authored articles than men (Stack 2002). Thus, the greater part of the available evidence seems to support the conclusion that women's lower publication productivity cannot be explained on the basis of their lack of access to collaboration.

Nevertheless, as Long and Fox (1995) note, the issue may be more subtle than can be reflected by rates of co-authorship: "even when women publish jointly, it may be that they have more difficulty finding collaborators and have fewer collaborative partners available to them" (Fox 1991:198). More detailed analysis of with whom women and men's actually co-author have been undertaken to address this and other related co-authorship issues. First, the rate of cross-gender co-authorship may provide an indicator of the extent to which women participate equally

⁵² Co-authoring papers with a senior mentor positively affects later productivity (Long 1990; Feldt 1986, 1985; Long & McGinnis 1985).

⁵³ This could also be the result of the general lack of female role models and mentors available to young women academics. Indeed, South African audits among women in research (NRF 2001; CSD 1999) indicate that most women had men as mentors in their research careers or as their principal supervisors in their postgraduate studies. According to these reports, the finding reflects the greater number of males with these higher qualifications.

with men in informal social networks. Among often-cited scientists Astin (1991) found that more men tended to co-author only with other men, than women tend to co-author with women only. Stack (2002) recently found that women in the field of criminal justice who wrote multiple-authored articles were substantially more likely to write them with men than with other women. However, again the differential availability of men and women co-authors needs to be taken into account when interpreting findings such as these. Women have many more men than woman colleagues, and therefore women have more opportunities for co-authorship with men than the other way around (Stack 2002; Astin 1991). Nevertheless, Stack feels confident that his findings are indicative of a high level of integration between men and women scientists within the field of criminal justice, which in turn lessens the likelihood of women having a lower publication productivity than men.

Secondly, according to Cameron's (1978) research, men have a greater number of different collaborators. That is, men collaborate more broadly; women collaborate with fewer persons. This might be the result of the fact that women are affiliated more often than men with smaller academic institutions (see section 2.3.2.3 above) whose faculties are of limited size and diversity (Cole & Zuckerman 1984). Finally, Lewison (2001) found that the general rise in female to male output in Iceland is lower where there is foreign co-authorship, which leads this researcher to suggest that women are less able to make overseas contacts through travel. This is important if one considers that the attendance of conferences, especially those outside one's own country, has been shown to be one of the most significant correlates of article productivity in ten countries (Teodorescu 2000).

2.3.4 **The link between discrimination and publication productivity**

The deficit model emphasises structural deficits or obstacles that women in particular have to face, and which compromise their publication productivity. As such, it implies that gender discrimination within academia lies at the root of gender differences in publication productivity. Some observers go as far as positing that sexism is imbedded in the male-dominated university culture (Park 1996), where a "hidden gender agenda" (Castleman *et al.* 1995) operates to ensure that women's publication productivity is lower than men's. However, it is difficult to conclusively prove a direct link between discrimination and publication productivity. Because of the potential of causal reciprocity, it may be that women's lower publication productivity causes

their under-representation in higher ranks, not the other way around. Indeed, according to Maürtin-Cairncross, “It *appears* that women find it particularly difficult to fulfil the required promotional criteria and because many women lack the required promotion criteria, they are detained in lower academic positions” (2003:i, italics mine). In the previous sections reference was made to this point, and findings were cited that – on the whole - support the contrary notion that, for academics in general, publication productivity is the outcome, rather than the cause, of factors such as rank, institutional affiliation and access to institutional resources.

However, such findings do not necessary prove that women’s under-representation in publication-enhancing structural and social contexts, are the result of gender discrimination *per se*. First, discrimination may be entangled with other forms of prejudice (based on age, for example), therefore a full accounting of its effects is hard to make (Zuckerman 1991; Lodge 1976). Women may be more heavily concentrated in the lower ranks because they are, as relatively newcomers to academia, on average younger than men (*ibid.*). However, cross-sectional data cannot take into account the differing age distributions of the pools from which men and women academics are drawn. Discrimination may also be entangled with socially structured self-selection among women, which gravitates them towards teaching rather than research-oriented institutions, part-time positions, and disciplines less characterised by collaborative research and high article output.

In addition, allegations that publication differences between men and women are a consequence of discrimination are problematic, as the incidence and dynamics of gender discrimination in science is difficult to adequately describe or explain (Zuckerman 1991). This is mainly because dramatic, clear-cut and obvious discriminatory elements of policies have been eradicated – certainly in South Africa, where labour and employment equity legislation precludes this⁵⁴ (Subotzky 2003). Women academics at South African universities have been reported as recognising the positive, visible changes over time, especially the lessening of overt discrimination (Petersen & Gravett 2000; De la Rey 1999). However, despite the removal of overt sexist practices and the introduction of formal policies to redress inequalities, covert gender discrimination is reportedly common in most departments and institutions (Maürtin-Cairncross 2003; Petersen & Gravett 2000; Walker 1997; Wolpe *et al.* 1997).

Consequently, attitudes, behaviours and social norms of a more subtle nature – what Subotzky (2003:6) refers to as the “ambience” of institutions - must be considered in research. However,

⁵⁴ Gender discrimination in benefits and leave was, however, only outlawed recently, after the new South African Constitution came into effect in 1996 (De la Rey 1999).

these mostly informal and, therefore mostly “invisible” barriers are difficult to conceptualise and operationalise (Blackstone & Fulton 1975). As a consequence, researchers have come to rely on indirect rather than direct measures of discrimination, i.e., discrimination is inferred from the residual net difference in publication productivity between men and women after controlling for relevant variables- an approach known as “sophisticated residualism” (Cole 1979:29):

2.3.4.1 *Controlling for publication productivity*

The sophisticated residualism approach is based on a meritocratic base-line model that represents the distribution of rewards and resources as a function of the publication productivity (Bielby 1991). This model has its origins in the work of Merton ([1942] 1973), who argued universalism to be one of the four cornerstones of the ethos of science. Universalism dictates that the allocation of rewards and resources should be based solely on the merits of a scientist’s contribution to the advancement of scientific knowledge, which occurs most directly through the publication of new research (Zuckerman & Merton 1973 [1972]). Particularism, in contrast, involves the use of functionally irrelevant characteristics as a basis for allocating resources and rewards in science. Thus, to the extent that gender, an ascribed status that is arguably irrelevant to academic competence, affects allocation of publication-enhancing positions and resources in academia, particularism is said to operate and discrimination occurs. Methodologically, this implies proving that gender significantly affects or explains outcomes such as rank and salary after controlling for publication productivity. The findings of research employing sophisticated residualism have provided important clues as to the extent to which gender discrimination can be said to operate to the disadvantage of women’s publication productivity. It is this body of evidence that that will be reported and discussed in the remainder of this section.

Gender discrimination may affect women’s publication productivity in the sense that women are rewarded differently from men for the same research performance. Stated otherwise, do men and women who publish equally well receive the same tenure, rank, and salary? Research in the United States, Italy and New Zealand indicates that, when women are matched with men on publication productivity, they still receive fewer rewards, in particular lower salaries, and have a lower expected probability of promotion than men do (Black & Holden 1998; Ornstein & Stewart 1996; Sonnert & Holton 1996; Long *et al.* 1993; Paloma 1993; Zuckerman & Cole 1987; Rosenfeld 1981; Cole 1979; Hargens *et al.* 1978; Lodge 1976; Tuckman 1976; BSA 1975, cited in White 1989; Bernard 1964).

At the time of this study, no research had yet been done in South Africa to investigate whether there is gender discrimination in how academics are positioned within salary scales. However, two South African studies could be identified, that employed a form of sophisticated residualism. A relatively early research project, conducted at the University of Cape Town in 1986/7, found that the number of publications of men and women do not explain the differences between men and women's positions (White 1989). A more recent survey conducted in 2001 at the University of the Free State reported similar results: there is a clear indication that “women have done “more senior work” than men, relative to the positions they occupy. This is especially true for women in the lower ranks...especially at the level of lecturer, women are better qualified than men, more women have performed postgraduate supervision and *women's research output*⁵⁵ is higher” (Pretorius *et al.* 2002:22&25; italics mine).

Such findings may also indicate that women are expected to meet higher standards of research performance than men are, before they get promoted (Long *et al.* 1993; Zuckerman 1991), which implies another form of gender discrimination, i.e., that women's research performance is judged according to different standards from those that apply to men.

2.3.4.2 Attribution theory

Discrimination may affect men and women's publication productivity when their research performance is judged according to harsher standards, because it might lead to their publications being undervalued by the gatekeepers of academia. Despite supposedly blind review processes, it is argued that gender bias on the part of reviewers results in higher rejection rates for women, making it more difficult for women to get their papers accepted for publication in the first place (Jackson 2002; Keim & Erickson 1998, cited in Harper *et al.* 2001). This, in turn, adds to lower self-esteem, discouraging women from submitting other papers, and lower women's probability of receiving research grants (Billard 1993). Attribution theory, the principle that dispositional attributions are made about others under certain conditions, is conceptually useful in order to investigate this issue (Astin 1991). Attribution theory posits that individuals generate a distorted perception of the capabilities of other people, based on whether that person is an in-group or out-group member. If one were to argue that men are in-group members and women out-group members of the male-dominated culture in academia, one would expect gender differences in evaluations of research contributions among academics. In particular men may rank a woman's work lower than that of her male counterparts, because of slight and subtle differences in

⁵⁵ Research output was measured as average number of accredited articles published nationally and internationally.

languages, behaviour, ways of work⁵⁶, and working goals between women and men (Selby 1999; Lodge 1976).

Studies that have been conducted on the peer review process of journals and funding agencies are few and far between, and limited to particular disciplines. Most research on the topic does, however, provide some support for the argument that attribution processes operate in academia⁵⁷. In an early study of psychologists, Fidell (1975) found that departmental chairs recommended a higher rank for professional summaries containing male names than those containing female names, although the names were randomly assigned to the summaries. Another early report showed that in the United States blind refereeing of papers increased the acceptance of women's papers for presentation at the meetings of the Modern Language Association (Lefkowitz 1979). The same phenomenon is illustrated by a study in which papers believed to be written by a man were rated higher than those believed to be written by a woman. Even among women reviewers, the ratings were skewed in favour of the "male" writer, but less so than among the men reviewers (Paludi & Bauer 1983). More recently, Wenneras and Wold's (1997) controversial analysis of the peer review system of the Swedish Medical Research Council found that women with equal productivity as male applicants received a lower scientific competency rating from peer reviewers. They estimated that a female applicant had to be 2.5 times more productive than the average male applicant to be viewed as equally competent.

Such forms of discrimination are often ascribed to the fact that the peer-review system often lacks transparency and therefore is open to question in terms of subjectivity or bias that might intrude (Bagilhole 2002). Some (e.g., Long & Fox 1995; Fox 1991) consider ambiguous evaluation standards for scientific performance as a major cause:

At the centre of the problem is a particular normative standard applied to scholarly and scientific work. In this work, standards are both 'absolute' and 'subjective'. Performance is measured against a standard of absolute excellence, which, in turn, is a subjective assessment. Thus, the evaluative criteria are vague; the process of appraisal is highly inferential...In such a context, gender-stereotyped and biased assessments abound (Fox 1991:191).

⁵⁶ See Chapter 3, section 3.1.2.2 for a more detailed discussion of the argument that the topics women tend to study may affect the likelihood of publication, particularly publication in prestigious journals, of their research.

⁵⁷ Two exceptions have been reported, i.e. the studies Bakanic *et al.* (1987) and Blank (1991, cited in Keith *et al.*), which suggest that males are no more likely than females to have their manuscripts accepted for publication in journals of high calibre.

2.3.4.3 *Women's self-reports of gender discrimination in the workplace*

Indirect measures of discrimination and research that provides support for attribution theory do indicate - at least with respect to gender - that, "universalism falters in science" (Long & Fox 1995:68). In addition to these more quantitative approaches, qualitative research may provide more direct evidence of gender discrimination in academia, in the form of women's self-reports of their experiences in the workplace. According to South African research, even successful senior women academics "often perceive their roles in the academy as invisible and express disillusionment with their institutions when their hard work is not recognized" (Maürtin-Cairncross 2003).

Moreover, in recent research employing a feminist methodology among women academics in the Faculty of Humanities at the University of the Free State, almost a quarter of the respondents indicated that they had experienced discrimination in terms of appointment and 38 percent had experienced it in terms of promotion. Most of these cases represent indirect discrimination, i.e. when any ostensibly neutral measure (e.g., the requirement that a doctorate be obtained at a specific time in one's career) has a proportionally greater detrimental effect on women than on men (Pretorius *et al.* 2002). However, indirect discrimination is notoriously difficult to establish (Halvoren 2002). The more recognisable "direct" type of discrimination, e.g., if men and women have the same qualifications, "experience", publications, and so on, but women are appointed in lower positions and receive lower salaries, is seldom reported (Pretorius *et al.* 2002:28). Findings elsewhere have also generally disproved the notion that women experience widespread, overt gender discrimination in academia that negatively impacts on their publication productivity.

Data that do register gender discrimination, find it to operate on a very subtle level, and primarily in the domain of informal social interaction. For instance, almost three quarter (72.8%) of the women interviewed in Sonnert and Holton's comprehensive study of American scientists reported that they had experienced discrimination, but mostly in the form of "very subtle exclusions and marginalizations" (1996:66). Similarly, in South Africa, Subotzky (2003:2) notes that a range of, what he refers to as "informal, covert institutional impediments to equity" exists, which renders many, if not most, institutional practices and climates somewhat hostile to the advancement of women staff. This assertion is supported by the many women academics at HBUs studied by Maürtin-Cairncross, who referred to the "subtlety in the gendered nature of organizational structures and their difficulties in identifying the reasons which render academia having a "closer fit" to the careers and working styles of men" (2003:162). Other authors have also contended that covert and subtle gender discrimination continues to exist (Walker 1997),

particularly in some historically black and historically Afrikaans institutions (Subotzky 2003; Bethlemen 1992, cited in Maürtin-Cairncross 2003).

However, such findings that accord a central explanatory role to discrimination seem to be the exception to the rule. Although many British female academics believed that discrimination did sometimes take place, a much smaller proportion, about a third, thought that they personally had suffered from discrimination, and when asked about why women rarely got chairs, discrimination was given as a reason by very few women indeed (Sommerkorn 1967, cited in Williams *et al.* 1974). In a similar vein, the results of Toren's (1988) study of Israeli female full professors show that the majority rejected discrimination as a factor explaining their slower advancement and lower positions on the academic hierarchy, as compared to their male counterparts. And in Cole and Zuckerman's (1987) focused interviews with American scientists most women also indicated that they had not personally experienced discrimination.

Although some have argued that South African women in general have a tougher time than American women in overcoming attitudinal and organisational prejudices keeping them from promotions and key appointments (Ward 1998, cited in May 1999), the 1999 and 2001 W-i-R Audits also found that the majority of women researchers do not experience differential treatment between the sexes at South African research institutions⁵⁸. Moreover, at least half reported that, sexism, and more research opportunities for men than women, were not research related problems at all (NRF 2001; CSD 1999). Similarly, by far the majority of women academics at one South African technikon reported that their career has not been impeded at the institution because they are women (May 1999). Even women professors (who, it may be argued, would have been most probably disadvantaged by gender discriminatory policies that were implemented in previous years), although they acknowledged the reality of gender discrimination and are able to identify and describe many instances of gender discrimination, tend to claim that gender had no relevance in their career development (De la Rey 1999).

Such findings may be interpreted in several ways. There might be a tendency among women researchers to emphasise their equality – their own competence and self-reliance – rather than their significant difference as women (Subotzky 2003). As Toren (1991) explains: “If you say that you have been discriminated against, then something is wrong with *you*” (655; italics in original). This need to distance the self from gender and sexism enables the women to “create a sense of reality that seemingly persuades them that their success had been achieved on merit

⁵⁸ These findings need to be treated with caution, however, as only ten percent of a non-probability sample of women researchers answered this question.

alone” (De la Rey 1999:180). Another explanation is offered by Maürtin-Cairncross (2003), who reports that her research participants – women academics at South African HBUs – did not spontaneously mention the aspect of “gendered power and androcentric cultures” in focus groups and interviews. According to her, this may be because of “deeply embedded socialisation of patriarchal systems, which women accept unchallenging”, or simply the result of the subtlety of “androcentric barriers” (78). On the other hand, one may argue that these perceptions reflect the actual state of affairs. For instance, the fact that universities in South Africa have come under increasing pressure since the mid-1990s to demonstrate that they were not discriminating against women might play a role. What is evident is that direct measures of gender discrimination, and – more importantly – the dynamic interplay between gender discrimination and publication productivity, have not been satisfactorily described.

2.4 Concluding comments

In summary, this review shows that even after half a century of empirical research on gender differences in publication productivity, no single explanation or group of explanations satisfactorily accounts for the phenomenon. This is not surprising, if one considers that no single factor has been found to explain the skewed distribution of publication productivity found among any sample of individuals. Complex phenomena such as these cannot be accounted for by applying a single-factor explanation. However, the review does indicate that some explanations are less useful than others. Ironically, the hypothesis that is most in line with common sense, has proven to be least valid: women do not publish less than men, because they have more family responsibilities than men do.

The explanation that has garnered the most empirical support in the literature is that women are less likely than men to have the structural positions and facilitating resources that are conducive to publication. Rather, because women tend to occupy marginal positions in academia they are less likely to have their work published. Although not explicitly reported by women, hidden gender discrimination underlies many of the structural and social obstacles that women experience in the scientific workplace. In recognition of this fact, calls are made for more explicit performance criteria for promotion, and for open and formal ways of evaluating scientists and of deciding about resource allocations, in order to check this tendency (Bellas & Toutkoushian 1999). It is heartening to report, however, that Xie and Shauman (1998) found a notable decrease over time in the power of structural variables to explain gender differences in

publication productivity. This provides some indication that structural locations and resources have become more equally distributed between men and women in the past three decades.

With regard to psycho-social differences, only those explanations that refer to gender-role socialisation, and not those that result from innate gender differences have some merit. And even then, the relationship between dispositional factors and gender differences in publication productivity has not yet been researched thoroughly enough to provide conclusive evidence in support of such hypotheses. Moreover, as the critical review of the difference model showed, dispositional differences between men and women might be the result of other factors (e.g., discrimination at the workplace, or family responsibilities), rather than gender differences in prior socialisation. In other words, deficit-model factors and family responsibilities may have a mediating effect on difference-model factors. This provides a strong indication that barriers that stem from women's attitudes and values, although important, cannot alone account for gender differences in publication productivity. They do not exist in a vacuum, but interact with and are affected by other factors, in particular the structural and social obstacles that women experience in the workplace. Thus, the two main explanatory models – the deficit and difference model – should not be regarded as mutually exclusive. Elements of both can produce gender differences in publication productivity. Neither should they be considered as independent from each other, as they are closely intertwined and reinforce each other. It is therefore essential that a theoretical model of publication productivity be developed that incorporates the social and psychological properties of the individual academic together with the structural and institutional forces operating in his/her environment.

3 Theoretical frameworks

Some theoretical frameworks have been developed that take into account the interplay between factors that determine gender difference in publication productivity. These provide a dynamic, interactive view of gender differences in academic careers in general, and as such, add to our understanding of the complexities of gender differences in publication productivity. Three theoretical frameworks will be discussed. Two earlier, closely related theories - accumulative advantage and disadvantage, and reinforcement theory - were originally developed to explain gender differences in publication productivity among scientists, but have been used increasingly to address the specific issue of gender differences in this regard. The more recently proposed theory of limited differences is an attempt at integrating and extending useful elements of both theories, in order to offer a more holistic approach to gender differences in publication

productivity. In this, the last section of the chapter, a brief outline is given of the main tenets, empirical body of evidence and critique associated with each of the frameworks. This is followed by a discussion of problems associated with their applicability in empirical research.

3.1 Accumulative advantage and disadvantage

The possibility of causal reciprocity between women's lower publication productivity and the structural positions they occupy within the social system of science/academia, referred to in section 2.3.2, suggests a "feedback" process between these two variables. For example, it may be argued that the prestige of an academic's first appointment has an impact upon later productivity, which in turn has an impact upon the prestige of second and subsequent appointments and on subsequent productivity. Different aspects of this feedback process are the focus of both the accumulative advantage and reinforcement perspectives.

The sociological processes of accumulative advantage and disadvantage are considered essential in understanding any differences in publication productivity. The hypothesis of accumulative advantage (Cole & Cole 1973) states that, because of a variety of social mechanisms, productive scientists are likely to be even more productive in the future, while scientists who produce little original work are likely to decline further in their productivity. The most important of these mechanisms is hypothesised to be the recognition awarded to research through conference invitations, citations, job offers, awards, etc. Thus, a more productive scientist receives more professional recognition, which leads to greater access to resources, both capital (e.g., research funding and/or grants⁵⁹) and human (e.g., competent assistants, graduate students, stimulating colleagues and professional network connections), which in turn increases the probability of even higher publication productivity, increases recognition and resources, and so on⁶⁰. The reverse, a process of cumulative disadvantage, is said to occur for unproductive scientists.

With regard to evidence supporting this hypothesis, Allison and Steward (1974) refer to various cross-sectional studies that have consistently shown that productivity is strongly associated with recognition and with key resources. They themselves also found evidence in

⁵⁹ This is a particularly relevant point in the South African context, where a novel approach to research was introduced more than a decade ago, that involves the rating of individual researchers in higher education, based on a peer evaluation of their recent track records and outputs in research. It is this rating that determines the extent of a researcher's access to NRF funds (NRF 2002). Since 1996, less than twenty percent of the NRF's rated scientists in all categories in the natural sciences and engineering were women (De Paravicini, 2005).

⁶⁰ It is exactly this feedback process that creates problems for cross-sectional analyses that attempt to explain differences in publication productivity, as the causes and effects of publication productivity are difficult to identify.

support of the accumulative advantage hypothesis, in the form of increasing inequality of the distribution of publications and citations over scientists' career courses. Further empirical support for the theory includes Teodorescu's (2000) more recent finding that access to research grants and international professional networking most strongly correlate with article productivity in ten countries.

Accumulative advantage has also been integrated into the debate on gender in science. Cole (1979) was one of the first to recognise the potential influence that the processes of accumulation of advantage and disadvantage might have on the careers of women scientists:

If for one reason or another [women scientists] do not attend superior training centres, do not apprentice for master scientists, do not have facilities to carry out their research ideas, their chances for recognition and esteem are diminished. If women are more apt to be in such disadvantaged positions than their male counterparts, then the career histories of men and women in science may be explained in part by processes of accumulation of advantage and disadvantage (8).

Applied to gender differences in publication productivity, such an approach views gender differences in publication productivity as reflecting different cumulative effects for men and women over time. Research has shown that women almost always have lower average levels of those institutional correlates that positively affect productivity and higher average levels of those that negatively affect productivity (see section 2.3.2). Other factors may combine with these institutional factors in order to produce disadvantage among women. For instance, it is argued that, for most women childcare breaks and caring and administrative responsibilities in the home make it more difficult for them to establish their careers than men, which in turn results in less time for research, fewer contacts, and fewer resources in the form of assistants and funding.

More importantly, however, the processes of accumulative advantage and disadvantage themselves seem to operate at different levels for women and men. Whereas men's early productivity proved to be a good predictor of their future productivity, women's early productivity had only a negligible effect on their productivity over a decade (Reskin & Hargens 1979; Reskin 1978a). Thus, processes of accumulative advantage seem to be weaker for women than for men. Long (1990) agrees: resources that may be translated into productivity consistently provide smaller returns for women than for men. Similarly, Long and Fox (1995) found that

women are less able to translate their productivity into resources and recognition⁶¹. Their finding is further substantiated by King's (1994) observation that,

“even highly productive women scientists face special difficulties in winning recognition in their own right as creative research workers and in gaining an authoritative voice in their disciplines. Given that an individual reputation is a crucial resource in making a career, this helps to explain why they tend to enjoy less success than do men with no better research records” (120, emphasis mine).

At the same time there are some indications that processes of accumulative disadvantage operate more strongly against women. For instance, Cole (1979) found that, while men who start off with institutional disadvantages can probably still “make out fairly well”, the same apparently does not hold for females: “Once they begin the race at a disadvantage, the race is pretty much run” (139).

Accumulative advantage and disadvantage provides a plausible explanation for some of the findings already discussed in the previous sections. These include the lag in women's promotion referred to in section 2.3.2.1, and the fact that gender differences in productivity generally increase over the course of scientists' careers (see section 1.3.3). However, empirical findings do not always support the theoretical notions of accumulative advantage and disadvantage. For instance, Long (1992) reports decreasing gender differences in publication productivity of American biochemists after the first ten years of their careers. Cumulative advantage cannot account for such a reversal, which suggests that processes other than cumulative advantage may become important later in the career.

Criticism has also been levelled against the theory for assuming, rather than establishing, that growing inequality is the result of accumulative advantages, as a step-by-step linkage between the changing distribution of resources and productivity differentials has not been made (Cole & Singer 1991). In addition, the processes of cumulative advantage and disadvantage themselves cannot be considered a “cause” of gender differences *per se*. However, as theoretical notions cumulative advantage and disadvantage do add to the understanding gender differences in publication productivity, by focussing attention on two important aspects: (1) in a feedback process the lower publication productivity of women may quite possibly be both a cause and an effect of women's status in science and academia; and (2) even if the variety of disadvantages that women scientists may experience are initially small or even negligible, they consistently

⁶¹ Ironically, women seem to depend more resource-related factors, such as employment setting, and collegial recognition and professional rewards for performance. For instance, Reskin (1978a) found that getting citations were more important for women than they were for men.

work against the publication productivity of women and, even more importantly, keep on reinforcing each other in feedback loops to produce an accumulative deficit at later stages in women's careers. This latter point offers an insight important to those conducting empirical work on gender differences in publication productivity, i.e., to understand these differences, it may be more important to many small subtle disadvantages that women face, rather than on large and obvious handicaps.

3.2 Reinforcement theory

Reinforcement theory is closely related to accumulative advantage and disadvantage, and literature on publication productivity has often lumped together these two perspectives (Fox, 1983). However, it is important to distinguish between them, as they focus on different aspect of the feedback process: while accumulative advantage and disadvantage deals with *how* scientists are able to obtain the resources which facilitate publication, reinforcement theory deals with *why* scientists continue to be productive (Gaston 1978). The behaviourist principle of reinforcement is rooted in the social psychological theory of social learning. From this perspective, the work required for publication is difficult, and will only be maintained by a researcher if he/she receives the necessary recognition. Without recognition, scientists become discouraged, their commitment to research and publication wanes, and they publish less as time passes.

Within the social system of science, collegial recognition may a formal or informal form. The former refers to citations - provided especially early on in a scientist's career – and honorific awards. The latter refers to feedback or comments offered by colleagues, and is therefore dependent on the extent to which a scientist is integrated into informal networks. Recognition may also take the form of institutional rewards or incentives, such as early promotion, appointment in a prestigious department, and salary increases. As such, the hypothesis of differential reinforcement is consistent with the sociological explanation that emphasises women's unequal access to the means of scientific production, as discussed in section 2.3 above.

The positive effect of formal collegial recognition (citations) on publication productivity has been corroborated by studies undertaken among scientists from various disciplines in the United States. For example among sociologists (Lightfield 1971), chemists (Reskin 1978a) physicists (Cole & Cole 1973), biochemists (Long 1990) early collegial recognition has been found to be positively related later productivity. Similarly, Cole and Zuckerman (1984) found that among a cohort of American scientists the more cited scientists have been, the more likely they are to

move into or to remain in the prolific category. In addition, reinforcement theory is supported by the strong relationship between rank and publication productivity (see section 2.3.2.1).

In order to account for gender differences in the rates of publication, a hypothesis of differential reinforcement has been proposed. According to this hypothesis, women's published research may not receive the same degree of recognition as similar research produced by men, which may account in part for their lower productivity. In support of the hypothesis, Cole and Zuckerman (1984) cite the following findings: (1) declining rates of publication are more common among women than men; (2) a much smaller proportion of women than men increase their pace of output; and (3) disparities between the publication rates of men and women increase over time. In addition, a number of other investigators have documented the fact that women and men's work are not equally recognised by institutional rewards, such as salary and promotion (see section 2.3.4.1).

However, women's publications are not necessarily cited less often than men's; it merely appears to be the case, largely because women tend to publish less (Cole & Zuckerman 1984). Davis and Astin (1987) also failed to find any significant gender differences on four different citation indices among a cohort of academic scholars in the United States, and in Iceland women and men do not differ in terms of the number of citations they receive (Lewison 2001). On average then, the evidence shows that papers by women are cited as often as those by men. Some researchers have even found that women's publications are more frequently cited than those of men (see section 2.1.2.4). In addition, studies of men and women scientists over the past three decades have shown that there is virtually no association between gender and other indicators of reinforcement, such as acceptance or rejection of manuscripts submitted for publication, success rates for grant applications or number of early career honorific awards received (see Cole & Singer 1991). Moreover, in the critical, early stage of PhD candidature, Asmar (1999) found that women academics in Australia are just as likely as their male counterparts to be recognised for their research contributions.

In addition to the fact that the available empirical evidence is not fully in accordance with the tenets of reinforcement theory, the theory has also been criticised for emphasising internalised psychological components of action, at the risk of ignoring structural contexts that may also shape actions and reactions (Cole & Singer 1991). Thus, as is the case with accumulative advantage hypothesis, the theory of differential reinforcement has its useful elements, but on its own goes only part of the way in accounting for gender differences in publication productivity.

3.3 The theory of limited differences

A scientist's reaction to recognition or the lack thereof, may also play an important part in the outcome. Moreover, the genders seem to differ with regard to their reaction to reinforcement, possibly as a result of socialisation processes. Cole and Zuckerman's findings, based on extensive focused interviews with men and women scientists indicate that, "women scientists...are slightly more responsive than men to the lack of reinforcement and considerably less responsive than men to positive reinforcement" (1984:243). In particular, their results show that women's productivity is less apt than men's to increase with citation but more apt than men's to decrease without such reinforcement.

Their findings on differential responsiveness of men and women to varying degrees of reinforcement suggest that women need more encouragement than men to maintain the level of publication they set for themselves earlier in their careers. These findings, as well as empirical work that shows that gender differences in publication productivity are initially small, but increase over the course of scientists' careers, form the backbone of Cole and Singer's (1991) new "theory of limited differences". According to this theory, accumulative productivity differentials between men and women scientists are the result of small – or "limited" – differences in their reactions to a limited set of external influences or "kicks" (after terminology used in kinetics). These kicks may be positive (e.g., receiving a fellowship), neutral or negative (e.g., having a grant application refused). They evoke reactions in the scientists who experience them, and the actual impact of a kick depends upon the reaction to it. It is the accumulative effect of these "limited" differences in reactions of individuals to these kicks in a highly competitive community having limited resources and rewards that produce major productivity differentials between men and women over a career. If women scientists tend to receive fewer positive and more negative kicks during their careers than do men, and if their reactions to these kicks are less than optimal, those elements combine in bringing about considerably worse overall career outcomes, including lower publication productivity.

For example, if women experience publication rejections more often than men (possibly because of attribution processes, as discussed in section 2.3.4.2), and do not have strong self-efficacy beliefs (because of their gender socialisation, as discussed in section 2.1.2.2) to ensure persistence in performance in the face of such setbacks, their productivity will diminish increasingly. This example illustrates what is probably the most attractive aspect of the theory of limited differences. It integrates the difference model (gender socialisation processes) and the deficit model (structural impediments), as negative "kicks" roughly correspond to deficit-model

obstacles⁶², while differences in reaction systems of men and women scientists may result from socialisation experiences⁶³. As such, the theory emphasises the more than only one or two variables as factors that may determine gender differences in publication productivity. Moreover, it is much more fine-grained and specific about the dynamic mechanisms which generate productivity differentials than the two theoretical frameworks that preceded it. As Cole and Singer (1991:307) explain:

“The theory allows us to specify precisely the interrelationships between concrete events in the histories of individuals, a set of reactions to these experiences, and the short- and longer-term consequences on processes of differentiation in scientific productivity”.

3.4 Putting theory into practice: a critical review

More than two decades ago Cole commented that the existing arguments and explanations for gender differences in research productivity “simply are not adequate or are empirically unsound” (1979:130). A few years later Cole and Zuckerman (1984:249) also noted that the “theoretical contexts...of the productivity puzzle need further development”. Consequently, most studies cited in this review tended to rely on batteries of correlates, without a basis of theoretically described interrelationships. Although theoretical frameworks such as accumulative advantage and disadvantage, reinforcement theory and the theory of limited differences have been developed to address this issue, they are applied, almost invariably, as *a fortiori* or *post factum* interpretations of observed patterns. There has rarely been an attempt to test this theoretical work in a precise manner.

This state of affairs is predominantly the result of the fact that data needed for tests of the theories are also not easily captured by means of cross-sectional, quantitative questionnaire surveys – the methodological approach typically favoured by researchers studying publication productivity differences. First, as all three theoretical frameworks posit processes that operate over time, it is necessary to gather longitudinal data over a span of years in order to fully understand these processes (Keith *et al.* 2002). However, given the expense of collecting longitudinal data, it is not surprising that few longitudinal studies of scientists have been done, and that the ones that have been done are generally for small samples in specific fields (Stephan

⁶² The theory also allows one to determine the extent to which one group or another “dominates” the distribution of positive or negative kicks.

⁶³ However, structural factors may also play a role, as scientists in different social structural locations have different opportunities to react positively or negatively to kicks (Fox 1983). Social and cultural customs and mores cannot be

& Levin 1992) and are largely limited to the first fifteen years of scientists' careers (Zuckerman 1991).

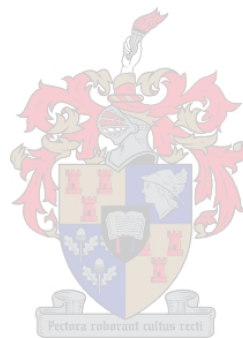
Secondly, distinctive conceptual and methodological limitations hamper the testing each specific theory. The hypothesis of accumulative advantage requires data on the particular research resources of scientists – a central variable in the accumulative advantage process. Since investigators have generally lacked these data on resources, they have used imprecise and often questionable “proxies” for key variables (Cole & Singer 1991:288f). Thus, their findings support the accumulative advantage hypothesis only indirectly⁶⁴ (Fox 1983). In addition, gender differences in advantages and disadvantages are initially small, and therefore difficult to detect by means of research that applies crude measures. With regard to reinforcement theory, it is difficult to test reinforcement as it relates to productivity, because the social context of scientific productivity is much more complex and variable than the laboratory setting and animal experiments from which the principle of reinforcement derives (Fox 1983). In addition, the effects of reinforcement and accumulative advantage are difficult to untangle (especially if the two theories are combined), because they operate in feedback loops. Finally, variables such as the extent of informal collegial recognition received are extremely hard to capture in quantitative questionnaire surveys. Consequently, most researchers limit their analyses to only one form of the range of possible forms of recognition that may serve to reinforce publication productivity, i.e., citations.

Another case in point is that testing of the theory of limited differences requires data on career dynamics and publication histories far richer than what is usually available. Testing this theory requires detailed, longitudinal data of kick-reaction pairs over individual scientists' careers. The originators of the theory, Cole and Singer (1991), caution against the use of standardised questionnaire surveys. Instead, they recommend within-laboratory participant observation, in particular the analysis of vignettes, in order to test their theory. In addition, testing the theory has its own, distinctive conceptual and methodological problems (Cole & Singer 1991). For instance, a natural decay in respondents' memory limits the extent to which they can reliably respond to retrospective questions on kick-reaction pairs that operated some time ago in their careers. Also, the validity of scientists' self-reports both of their reactions to kicks, *and* of the impact of their reactions on their motivation to complete papers, is questionable (Cole & Singer 1991). It is

excluded either, as the norms surrounding marriage may restrict a women scientist's choices, e.g., her geographic mobility, which can constrain her reactions to kicks.

therefore not surprising that the theory has not yet been used in its mathematical rigour, but has only been applied as a conceptual framework.

Considering the relative lack of data needed to test the theories in a precise and reliable manner, the theories discussed in section 3, though plausible and useful, remain speculative hypotheses, rather than empirically grounded explanations for the puzzle of gender differences in publication productivity.



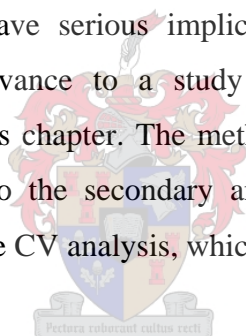
⁶⁴ For instance, Allison and Stewart (1974) attempted to measure the distribution of resources by using (1) the Gini index of the reported percentage of work-time spent on research, (2) the Gini index of the number of research assistants, and (3) the proportion who report that they “always” get the grants they seek.

CHAPTER 3

Methodological Considerations Relating to a Study of Gender Differences in Publication Productivity

1 Introduction

Before proceeding with an analysis of the relationship between gender and publication productivity, a range of methodological issues involved in utilising SA Knowledgebase as a data source have to be carefully considered. Any secondary analysis is constrained by parameters that are determined by the research purpose of those who originally collected the data to be analysed. Using such data requires making significant “up front” decisions with regard to the study population, the variables included, and the conceptualisation and measurement of those variables. As these choices can have serious implications for, and substantially influence findings (Phelan 2000), their relevance to a study of gender differences in publication productivity will be discussed in this chapter. The methodological issues raised will, however, extend further than those related to the secondary analysis of SA Knowledgebase – some considerations are also relevant to the CV analysis, which will form part of the second subproject in the larger study.



As a large part of this discussion highlights issues relating to the measurement of publication productivity, it may therefore benefit those individuals - ranging from departmental heads to administrators at the DST - who have the task of measuring and evaluating research performance in South African public HEIs. Thus, an ancillary objective of the present discussion is to examine the strengths and weaknesses of leading approaches to the measurement of publication productivity. In particular the extent to which they may be considered fair and effective where *both* sexes are concerned, will be critically evaluated. As such, this aspect of the study will hopefully add a much-needed gender perspective to the current national debate over the measurement and funding of research output.

2 **Population: whose productivity will be studied?**

2.1 The issue of scientists versus scholars

A dichotomy between scholars and scientists is sometimes drawn in the literature, in which scientists are equated with those working in the “hard” (e.g., natural) sciences, while the term “scholars” is used whenever academics in the “soft” sciences (e.g., the social sciences and humanities) are included in a study. Contrary to this practice overseas, the South African NRTA defines science, engineering and technology (SET) human resources very broadly as “those people who were educated in science and technology, i.e. those with a tertiary education” (DACST 1998a:8). SA Knowledgebase also applies this inclusive definition of “scientist”. Consequently, the secondary analysis of the database includes those working in the natural sciences and engineering, the medical and health sciences, as well as the social sciences and humanities. This definition of the term “scientist” needs to be taken into account when comparing results from the present study with those from studies elsewhere that have conceptualised the term more narrowly.

2.2 Criteria for defining a population of scientists

In principle, a population of scientists can be defined according to one or more¹ of three criteria (Xie 1989, cited in Xie & Shauman 1998): (1) their contribution to scientific knowledge, which is known as a contribution-based definition that restricts the population to scientists who have a publication record²; (2) their scientific education, which is a supply-based definition that limits the population to, for example, recipients of doctoral degrees in science; and (3) their scientific occupation, which is a demand-based definition that restricts the population to, for instance, those with academic jobs (as opposed to those working in other R&D sectors, such as industry). Each approach to defining scientists carries both advantages and disadvantages. These will now be discussed with specific reference to the South African higher education context.

¹ These criteria are not mutually exclusive, but can be combined, for instance by defining scientists as individuals with doctoral degrees who occupy faculty positions at academic institutions (*cf.* Xie & Shauman 1998; Cole 1979).

² Some studies that apply a contribution-based definition to their study population limit the population even further, by concentrating (for a variety of reasons) on an elite group of scientists who are the major producers (e.g., Sonnert & Holton 1995; Astin, 1991; Cole & Singer 1991; Davis & Astin 1990).

2.2.1 **The supply-based definition**

2.2.1.1 *Advantages*

The tendency among researchers to draw samples from a population of recipients of doctoral degrees is based on the assumption that the possession of a doctorate is regarded as the starting point of an academic career, and an indicator of the ability to conduct independent research (CHE 2000; Reskin 1977). This approach offers several advantages to studies that investigate gender differences in publication productivity in particular, which partly explains why most of these studies employ a supply-based definition. First, by the time scientists have received their doctoral degree, their standing in the stratification system – a theoretically important issue in studies of gender differences in publication productivity - is fairly well set (Cole & Zuckerman 1984). Stated otherwise: studying only doctoral recipients controls for those potential correlates of gender and publication productivity that influence access to institutional resources for research. Keeping the level of resources available to women and men constant is important in assessing the independent effects of gender on publishing (Stack 2002).

Secondly, in a population of holders of doctoral degrees the number of years since the doctoral degree was awarded provides a measure of “career age” (Allison & Steward 1974), or the length of an academic career, which is considered a good proxy of seniority and/or years of professional experience. When one examines a publication dataset, dividing it by career age is important in order to compare individuals on a fair basis (Blackburn & Lawrence 1995). Information on the year the doctorate was awarded is also useful to measure the time lag between the year at which the undergraduate (bachelor’s) degree had been attained, and the PhD was completed. This is considered an important control variable in research on gender differences in publication productivity, as women have been found to take longer to obtain their PhDs than men (Xie & Shauman 1998; Zuckerman 1991).

In addition to these gender-related advantages, including only those who hold a doctorate degree also allows the delineation of specific graduate cohorts according to their career age. Including only those scientists who received their doctorates in a certain time period controls for certain “period effects” that may arise due to changes in, for example, the scientific labour market³, the legal and social environment of science, and/or the nature of research (Long 1992). In addition, a single cross-sectional study different graduation cohorts may also be used to

³ For example, if universities in a country entered a buyer’s market due to an oversupply of PhDs, characterised by low demands for such credentials in the academic market, one may distinguish between cohorts who received their doctoral degree before this change, from those with a post-change doctoral degree.

approximate longitudinal data, by dividing a cross-sectional population into such “synthetic cohorts” (*ibid.*:176).

2.2.1.2 *Disadvantages*

The practice of including only doctorates in the population to be studied has been criticised for excluding from an investigation many prior experiences undergone during undergraduate and graduate training, which shape scientific careers. As Cole points out, “In a sense, we start looking for problems at the finish line – after the race is already run” (1981:389). This is particularly problematic from a gender perspective, as the decision to include only those scientists who have finished their graduate training implies that one is only concentrating on the “survivors” among women scholars, i.e., those who have “overcome the cultural forces impeding their choice of science as a career” (Noordenbos 1992:24). This is a point of criticism is also relevant to the demand-based definition, and will be referred to in more detail in section 2.2.2.2 below.

The homogenisation of the training credentials of scientists may also be particularly problematic in countries outside the United States, where the doctoral degree is not necessarily the starting point of an academic career. In the United States, the doctorate is most often the prerequisite for promotion to the “ladder” faculty position of assistant professorship (more or less equivalent to the rank of “lecturer” in countries that follow the British higher education model, such as South Africa), and as such marks the beginning of the person’s “real” academic career (Blackburn & Lawrence 1995). In South Africa on the other hand, the doctorate - although traditionally an important criterion for achieving high academic rank - has not generally been considered a normative entry requirement for an academic position.

HEIs in this country do not generally apply a system of tenure, but one may argue that the starting point of an academic career is probably at the rank of lecturer (roughly the equivalent to the first tenured position of assistant professor in the United States). However, if tenure is defined as a permanent position until retirement age, the South African junior lecturer may achieve it at a relatively early stage - in some cases even before achieving a master’s degree and more often than not before gaining a doctorate⁴. According to De la Rey (1999), many South African academics reach retirement age without completing a PhD.

⁴ This situation is not unique to South Africa. For instance, in the 1970s in Britain the PhD was not a formal prerequisite for a regular faculty position at a university (Blackstone & Fulton 1975). Although its increasing importance was already noted in the mid-1970s (*ibid.*:265), in the 1980s in some disciplines at British universities tenure was still something that could be achieved even before achieving a “second” (master’s) degree, and in some

The fact that completing a doctoral dissertation is not a precondition for an appointment at a university, and certainly not for an appointment at a technikon, is reflected in recent human resource figures: the vast majority of technikon teaching staff continue to hold qualifications below master's level training (Cooper 1995), with only four percent holding doctoral degrees (DACST 1998a). At universities the representation of academic staff with doctorate degrees amounts to about 40 percent. Less than a third of the total group of academics employed in the higher education sector as a whole, hold doctorates (*ibid.*). Moreover, the lack of doctorate credentials among academics is more common among women than men: among faculty working in HEIs in South Africa, just more than a quarter (27%) of those with a doctorate were women (NACI & DST 2004). This is even the case at high-level positions, as Moultrie and De la Rey (2003) found among their sample of women leaders in higher education: only a third held doctorates, and only slightly more than half were “sufficiently qualified for their positions by traditional standards” (410)⁵.

The DoE (2002) has recently set a benchmark with regard to the qualifications of academic staff: at least 50 percent of permanent academics at universities should have a doctorate, while at least 35 percent of technikon staff should have either a master's or a doctorate degree. It seems, therefore, that the “climate has now become far more competitive” (De la Rey 1999:104), in that a permanent job in South African academia tends to hinge more on a doctorate degree than before. Still, a supply-based definition that focuses only on those scientists with doctoral degrees will exclude more than two-thirds (and an even higher proportion of women) of the potential publication producers in South African HEIs. It is therefore not surprising that the recent SSRD utilised a modified version of the supply-based definition, by surveying all academic staff with a qualification of four or more years (DACST 1998b).

2.2.2 The demand-based definition

Scientists work in a number of employment sectors. In addition to HEIs, organisations actively involved in research in South Africa include science councils, government departments (and related statutory organisations), museums, non-government organisations, and industry-based research organisations (organisations mainly funded by industry to perform research on their

certainly before gaining a doctorate (Sutherland 1985). A similar situation was reported to exist until recently in the Netherlands (Noordenbos 1992), which explains why, in the 1980s at the State University in Leiden only approximately a third of the academics had obtained their doctorate.

⁵ According to these authors, this pattern should be understood within the context of South Africa's socio-political history, and argue that, even though these women may not have the “formal qualifications”, they bring a wealth of valuable experience to their high-level positions (Moultrie & De la Rey 2003:410).

behalf) (DACST 1998a). A demand-based definition of a scientist population implies sampling only those scientists who are working in certain settings (R&D sectors, institutions, disciplines and/or positions) where publication of research results is expected and rewarded. This usually implies focussing only on academic scientists, who occupy tenured positions at Ph.D.-granting institutions and in disciplines that are expect and reward publication.

2.2.2.1 *Advantages*

- Controlling for employment sector variability

The research environment tends to vary across employment sectors, and this variability may be related to publication productivity in a variety of ways. First, the expectation to produce *published* research results in journal article format differs between sectors. Scientists employed in academia are more likely to engage in research leading to journal publication than are scientists employed in either industry or government (Stephan & Levin 1988), where research outputs more readily take the form of patents and/or unpublished internal reports (Holton 1999).

These differences may be explained partly as a result of the influence the institutional context has on the goals and objectives of research and therefore, what are regarded as important research outputs in that context. For example, in industry where applied research is usually undertaken in order to earn a profit, knowledge takes on proprietary value; therefore, organisations have a commercial desire to establish property rights over new knowledge. In order to maintain secrecy until results are adequately covered by patents and the subsequent profits captured, publications must be delayed (Gupta *et al.* 1999; Stephan & Levin 1992; Long & McGinnis 1981). Thus, in industry the more pragmatic logic of business replaces the “emphasis on the free exchange of information that is suggested by the functional theory of science” (Long & McGinnis 1981:422).

In addition to the commercial imperative for secrecy, national constraints on publication might also imply that a great deal of research never gets published⁶ (Zuckerman 1988). This effect a particular institutional context has on what are regarded as important research outputs, may also be observed in the government sector. Here an emphasis on applied research and development work results in a higher output of unpublished - or at least unrefereed - reports and technologies (DACST 1998b). A second form of sector variability relates to the types of reward systems that operate in different sectors. For example, promotion in academia (or at least at

⁶ Such arguments are supported by findings that chemists employed in industrial settings in the United States publish substantially less on average than those with positions in universities (Hargens *et al.* 1978).

research-oriented universities) is generally dependent upon publications. In industrial settings, however, publications are generally not criteria for promotion, but are “incidental” to career advancement (Reskin 1977:500).

In summary, in industrial locations the sharing of knowledge by means of publication is at best tolerated, but more often discouraged, disincentivised or even normatively prohibited. On the other hand, strong normative obligations and incentives to publish journal articles obtain more in academia than in any other R&D sector. By implication, attempts to draw comparisons across R&D sectors would be severely hampered by a *publication*-based definition of what constitutes research output, as such a definition is potentially biasing against scientists in other sectors⁷. It is therefore important when investigating *publication* productivity, to control for R&D sector variability. This may be done by including categorical variables to capture the differences among R&D sectors. However, such a strategy will not control for the variability if unmeasurable factors, such as a scientist’s talent or motivation, affect both his/her R&D location and productivity within the scientific community (Stephan & Levin 1992). Consequently, it is considered methodologically preferable to limit publication productivity studies to one particular employment sector. The demand-based definition of a population of scientists allows such a homogenisation of the employment environment of scientists to the academic sector, where publication of research results is expected and rewarded.

Such an approach also makes sense in the South African context, if one considers that academic staff at HEIs form the largest portion (82%) of research capacity of the country (DACST 1998a). Moreover, this sector is responsible for more than 80 percent of the country’s visible research outputs (Pouris 2003). From a gender perspective it may further be argued that it is particularly important to focus on the academic sector, as progress with regard to gender equality seems to be quite slow among universities (Maurtin-Cairncross 2003; Goldberg 1999).

In addition, limiting a study of publication productivity to the academic sector offers some practical benefits as well. First, because researchers who study publication productivity are themselves most probably in the academic profession, data on academic scientists and their publications are more readily available to such researchers than data on other R&D sectors (Blackstone & Fulton 1974). Secondly, publications provide a ready measure of research output, while (as mentioned above) this is not necessarily the case in other R&D sectors, such as industry or government. Thirdly, ranks, as well as norms of hiring and criteria of promotion tend

to be more uniform, easy to define, and compare in academia than in other sectors. In South Africa the academic ranks of instructor staff are quite uniform across HEIs, while the comparability of scientific ranks within (and even between) other R&D sectors is more problematic.

- Controlling for institutional variability

The demand-based definition may further require that a population of scientists is limited to those working in HEIs with a similar level of expectation and rewarding of publication. Thus, only faculty who are employed at institutions that select faculty based largely on their interest and performance in research, and/or encourage the publication of research, are usually included in the population of scientists to be studied. The advantage of homogenising the institutional environment or setting is that the effects of access to resources for research productivity are controlled for. These include, for example, access to appropriate research facilities, such as laboratories, division of time between undergraduate and graduate teaching responsibilities, and availability of graduate and other research assistants. It is therefore not surprising that most studies involving academics in the United States are restricted to the major doctorate-granting institutions.

The importance of controlling for institutional variability is a function of the degree of variation between different types of academic institutions found in a particular country. For example, the sheer number and diversity of HEIs in the United States is not found in countries such as South Africa, which are modelled on the traditional British higher education system⁸. Nevertheless, HEIs in this country still vary considerably with respect to (1) the professional demands placed on staff, and (2) the level of available resources for research. These differences may be traced to institutions' historically defined missions, and/or historical, apartheid-embedded disparities in the allocations of resources (for a more detailed discussion of these institutional differences, see section 3.3.3.1 below). The resulting stratified higher education system within South Africa requires that one controls for institutional variation by including, for example, only those faculty working at universities (not technikons) that were historically advantaged in the population of scientists to be studied.

⁷ Frame (1980) even takes this argument beyond the sector level, when he argues that in less developed countries, where the scientific norm to disseminate one's findings does not necessarily prevail, the restrictive definition of science as published research may "give a very distorted view of...indigenous S&T activity" (136).

⁸ For example, American "universities" include institutions, which would not be accorded that status in either the UK (Blackstone & Fulton 1975), or in South Africa.

Attempts at drawing clear-cut distinctions are, however, frustrated by the fact that the higher education system in South Africa is currently being restructured, in particular through a process of institutional mergers of existing institutions and the formation of new comprehensive institutions⁹. Moreover, from a gender perspective, the relevance of controlling for institutional variability hinges on the extent to which men and women are differentially distributed in terms of institutional location. In the United States, men are more likely to be employed at more prestigious institutions, particularly research universities, while women are found most readily at teaching colleges (Xie & Shauman 1998; Jacobs 1996; Fox 1995; Long & Fox 1995; Astin 1978). However, it is unclear whether such a pattern of women's "institutional ghettoization" (Davis & Astin 1990:95) obtains in South Africa: indications are that the male to female ratio is approximately 2:1 in both universities (63% male) and technikons (62% male) (DACST 1998a). It might therefore not be that important in South Africa to limit a study population to staff at universities when assessing the independent effect of gender on publishing. This issue will be examined in more detail as part of the discussion on institutional affiliation as a control variable (see section 3.3.3.1 below).

- Controlling for disciplinary variability

Many researchers who study publication productivity exclude from their study populations those faculty working in departments whose expectations and norms of publication productivity (including the products of their scholarly performance, the evaluation thereof, and their teaching arrangements) are "atypical" (*cf.* Vasil 1993, 1992; White 1989; Landino & Owen 1988; Wanner *et al.* 1981; Fulton & Trow 1974). This usually implies excluding faculty who are working in the visual or performing arts (e.g., fine arts, dance, music and theatre), whose output or contributions often include creative works, exhibitions or performances (Bellas & Toutkoushian 1999). Creative work clearly has to be measured by other than the conventional indicators of publication productivity (e.g., a count of articles and/or other publications that report empirical findings), or else faculty in these disciplines will be disadvantaged time and again in any assessment of output¹⁰. A demand-based definition may also exclude those faculty associated with disciplines that place a greater emphasis on application and practice, than on research and

⁹ In future there will be eleven universities, five technikons, six comprehensive institutions, and two national institutes in the public sector. The total number of publicly-funded institutions in SA will thus be reduced from 36 to 24 in the next 3-5 years (Shackleton *et al.* 2004).

¹⁰ In South Africa, HEIs as well as individual faculty have raised concerns regarding this bias against certain disciplines in the arts and humanities, as not all creative output are recognised, measured and subsidised as research outputs by government (DoE 2001).

publication. For instance, in architecture, journalism and social work a proportion of faculty are primarily practitioners, for whom the expectations of publication are atypically low.

- Controlling for appointment-related resource variability

A demand-based definition further requires including only faculty who occupy positions likely to contain pressure and rewards to publish. This usually implies focussing only on permanent, full-time employed academics that occupy a relatively high (e.g., professorial) rank, to the exclusion of so-called “irregular” staff at lower ranks. As a rule, teaching assistants, who are for the most part graduate students, are excluded, as they represent an academic group atypical in the expectations and rewards associated with their appointments (Fox 1981). Part-time faculty and temporary (contract) staff are usually also excluded from studies on publication productivity, because these faculty are used primarily in undergraduate teaching, and are generally not involved in graduate teaching and research (Teodorescu 2002).

Undoubtedly, there will be temporary and part-time faculty who do research, but by restricting a study population to faculty in permanent, full-time academic positions, resource effects on publication productivity that depend on type of employment are controlled for. This is important in any study that compares the publication productivity of men and women, as academic women are located disproportionately in non-professorial ranks and part-time positions (Fox & Faver 1985). Thus, by including only faculty at certain ranks and in certain appointments, the effect of availability of resources on publication productivity may be disentangled from those directly attributable to gender (Stack 2002). In addition, there are practical imperatives for a demand-based definition. First, institutions tend not to carry temporary staff on their faculty rolls unless they have long-term contracts, which most do not. Thus, persons in these positions are not readily available in standard sampling frames. Secondly, the job titles or ranks of part-time and temporary positions are not uniform across institutions, or even within one institution. Therefore, excluding these positions circumnavigates problems with regard to comparability of ranks.

In order to further control for appointment-related variability, most research on publication productivity includes only currently active *teaching* faculty, to the exclusion of administrators and research staff. A regular teaching faculty appointment is usually operationalised as a position that involves the teaching at least one course in an academic year (*cf.* Xie & Shauman 1998; Astin 1978), or of which classroom responsibilities represent more than 50 percent of the prescribed duties (*cf.* Rubin & Powell 1987). Among higher education staff in South Africa a clear-cut division of labour among the academic functions of teaching and research can be

drawn. Two categories of staff are usually distinguished: “instructors”, who have both teaching and research duties, and “research” staff, whose primary function is to conduct research, and who do not, in general, have teaching responsibilities. In order to control for the differences in expectations, rewards and resources (in particular time) for research between these two categories of higher education staff, it would be advisable to include either one or the other, but not both, when investigating factors that influence publication productivity.

2.2.2.2 *Disadvantages*

Considering these advantages, it is not surprising that most studies of the productivity of scientists focus exclusively on the academic sector. However, the popularity of demand-based populations means that, while numerous studies have contributed to our understanding of the academic sector, little work has been done on the research productivity of scientists employed in non-academic R&D sectors, such as industrial and governmental science establishments (Sonnert 1999; Stephan & Levin 1992; Zuckerman 1991; Long & McGinnis 1981). This is also true for research on women scientists, which over the past 30 years has mainly focussed on women in academia (Mattis & Allyn 1999). It is generally acknowledged that a great deal of work remains to be done on the special challenges and opportunities for women in the non-academic domains (Sonnert 1999; Cole 1979), and women’s role in industrial research (European Commission 2002). In South Africa, concerns have also been raised that the specific needs of women researchers in non-governmental organisations (NGOs) and technikons have been ignored (Primo 1999).

Secondly, findings from studies that focus only on permanent, full-time employed academics that occupy professorial ranks will only represent part of the overall picture of the academic profession in South Africa, especially where women are concerned. Worldwide, the proportion of women in the non-professorial ranks is much higher than their representation in the professorial ranks. In South Africa, data from 2002 indicate that among university staff nineteen percent of all professors (full and associate) are women, while most female academics in this country are clustered at the lower levels of the academic hierarchy as junior lecturers and lecturers, where they comprise 53-55 percent (CHE 2004). Women in higher education are also increasingly filling part-time and short-term, temporary academic positions. Under-reporting of part-time and/or temporary faculty in surveys has been noted in the United States (Hornig 1980), while in South Africa a similar concern has been raised by the NRTA of human resources in SET. In the audit the extent to which HEIs used short-term, contract appointments was not fully anticipated, and the report cautions that, “The accurate quantification of their contribution is

necessary to obtain a correct picture of the research and development capacity in the country” (DACST 1998a:67).

The exclusion of those who are not employed in full-time, permanent academic positions, or who have voluntarily left employment in academic environments altogether, implies a form of sample selectivity that is of particular relevance to studies on gender differences in publication productivity. To the degree that females from a particular cohort depart academe at a higher rate than males, the gender differences in publication productivity will be underestimated (Keith *et al.* 2002). By including only women who have opted to stay in academia, and who hold permanent, full-time faculty appointments, only the system’s “survivors” (Levinson *et al.* 1989:1516), or at least those who have survived so far, are studied. One may argue, as a number of researchers have (Fox 1995; Grant & Ward 1991; Long 1990), that women scholars who withdraw from the academic labour force are those who are most strongly committed to and/or seriously burdened by marital and parental roles, and who therefore face the greatest conflicts between domestic and professional commitments¹¹. By dropping out of academia or out of the labour force, these women drop out of databases of professional scientists as well, particularly if a demand-based definition of the population is utilised.

Thus, attrition from the academic profession no doubt biases samples somewhat¹². Research that does not include “absentees” - those who left academia, or were fired - probably excludes those who could not manage their family and professional roles simultaneously (Noordenbos 1992; Sutherland 1985). At the same time the “survivors” (Cole 1979:11), who choose and manage to raise families while practicing their profession, are a highly selected group. They are probably very highly motivated (Luukkonen-Gronow & Stolte-Heiskanen 1983; Hargens *et al.* 1978), and maintain high standards of self-discipline and organisation (Sutherland 1985). A bias in sampling in favour of these women reduces the generalisability of the findings, as they may be valid only for women who persisted in academic careers, despite domestic responsibilities (Grant & Ward 1991; White 1989). Sample selectivity does not only limit the generalisability of

¹¹ This argument is supported to a certain extent by findings from research conducted in various countries. In general, it has been found that academic women tend to remain outside the marriage institution and have fewer children in comparison with women of similar ages in the general population (Brooks 1997; Shauman & Xie 1996; Vasil 1993; Hicks 1991; Toren 1991; Cass *et al.* 1983). However, it has to be acknowledged that the perception of incompatibility between a family and an academic career does vary from country to country, depending on how strongly the emphasis on the essential nature of the mother’s care for children is in a particular socio-cultural context.

¹² According to Shauman and Xie (1996), the proportion of women scientists who withdraw from the labour force is “non-trivial”. Indications are, however, that only a small percentage of women scientists fall into this category. In the United States, for example, only some twelve percent of women scientists stop work after getting their PhD, and

findings to these “survivors”, but, more importantly, leads to an understatement of the effect of family responsibilities, and in particular the effects of young children, on women’s academic careers (Carr *et al.* 1998; Shauman & Xie 1996). This is because the most likely reason why women academics are not in the labour force is because they are rearing children (Hamovitch & Morgenstern 1977).

Similarly, sample selectivity with regard to type of employment and rank may also affect findings on the effect that the presence of children has on women’s publication productivity. This is because having children may affect a woman’s decision or opportunities to pursue a full-time, permanent academic position. In addition to this “self-selection” out of a long-term academic career, it is also quite possible that those women who are most likely to allow their domestic responsibilities to interfere with their academic work, have been “sifted out” by the academic reward structure before they reach the higher faculty ranks. Women who have attained these prestigious positions in spite of marriage and childcare responsibilities have gone through a “selection process” with respect to problems posed by having a family. They have been able to survive in these positions, because they are highly motivated for their work, and are willing to put their primary effort into their careers (Noordenbos 1992; Luukkononen-Gronow 1987). Consequently, a demand-based definition of a study population runs the risk of producing the finding that the presence of young children has very little, if any, effect on women’s publication productivity. However, if women in part-time or temporary positions were analysed as well, an effect of children – in the form of a fertility-productivity relationship – will probably be found (Long & Fox 1995; Hamovitch & Morgenstern 1977; also see Chapter 2, section 2.2.4.1).

2.2.3 **The contribution-based definition**

A contribution-based definition of a population of scientists includes only those scientists who have made a contribution to knowledge, usually by publishing one or more articles. Bibliometric studies, which involve the study of publications, by nature, employ a contribution-based definition. Thus, any bibliometric analysis of SA Knowledgebase represents only authors of scientific journal articles, not South African scientists in general. A contribution-based definition is not, however, found exclusively in bibliometric studies. For example, previous research on women researchers in South Africa, in the form of the W-i-R Audit (NRF 2001), only included

only some of them do so because of the intense conflicts that arise between science and parenthood (Cole & Zuckerman 1991).

“women *doing research* in institutions of higher learning for non-degrees purposes” (9, italics mine) in their population.

2.2.3.1 *Homogenisation without control*

As by far the greatest proportion of published research emanates from academia, the contribution-based approach tends to indirectly homogenise the job settings of scientists to those where publication of research results is expected and rewarded. As such, it shares many of disadvantages associated with the demand-based approach (see 2.2.2.2 above). Unfortunately, the contribution-based approach only controls for job setting to a certain extent, and does not share in the advantages of built-in controls for variability in employment sector, institution, discipline and type of appointment. Therefore, categorical variables need to capture this variability statistically. However, as mentioned above, such a strategy will not control for the variability if non-measurable factors, such as a scientist’s talent or motivation, affect both the scientist’s location and productivity within the scientific community (Stephan & Levin 1992). In addition, controlling for R&D sector in a gender comparison of publication productivity is usually limited by the small number of publishing women scientists who work outside academia.

2.2.3.2 *Exclusion of non-publishers*

Applying a contribution-based definition of the population of scientists to be studied is also problematic, because it does not allow one to directly determine to what extent scientists are not publishing at all. The extent of non-publication is important for at least two reasons: (1) it is considered to be one of at least three parameters according to which the productivity of a population of scientists is usually evaluated (Gupta *et al.* 1999), and (2) distinguishing between publishers and non-publishers and understanding what differentiates between them, may be particularly relevant to investigations of gender differences in publication productivity. This is because women are usually disproportionately represented among non-publishers (Sheehan & Welsh 1996; Long 1992; Cole & Zuckerman 1984; Astin 1978; Cole & Cole 1973)¹³, and women’s lower rate of publication is due most importantly to the greater proportion of women who do not publish¹⁴ (Long 1992). Thus, it is highly probable that including publishing staff

¹³ This is not a universal finding, however. In Norway Kyvik and Teigen (1996) found that a very similar percentage of male and female faculty (nine and eleven percent, respectively) had not published anything during the three year period under study. In India the percentage of non-publishing scientists working at the Council of Scientific and Industrial Research was found to be generally *higher* for males than for females, except in the biological sciences (Gupta *et al.* 1999).

¹⁴ A South African case in point is that the majority of women academics at Peninsula Technikon who responded to a questionnaire, had not published articles in accredited journals, and only a third of them had been involved with research which was not related to further qualification (May 1999).

only would produce a smaller gender difference in the level of publication productivity, than if non-publishers (of whom a greater proportion are women) are included as well¹⁵. These are crucial points to take into account when interpreting the findings of any bibliometric analysis (including the analysis of SA Knowledgebase undertaken in the present study) that aims to determine the nature and extent of gender differences in publication productivity.

2.2.3.3 *A high degree of sample selectivity*

A contribution-based definition also leads to a higher degree of sample selectivity than a demand-based definition, as actively publishing academic women are an even more selective group. As Cole (1981) cautions, “Perhaps the women who continue to be *active* scientists and simultaneously manage their families are quintessential cases of superwomen” (388, italics mine). A bias in sampling in favour of these women reduces the generalisability of the findings of such studies to only those women scholars who have *managed to publish*, despite domestic responsibilities (Grant & Ward 1991). In addition, this sample selectivity masks the relationship between presence of children and publication productivity, which may lead to an underestimation of the effects of the difficulties and obstacles caused by family and motherhood on women’s publication productivity (Shauman & Xie 1996; Long & Fox 1995). Thus, analyses that are based only on the experiences of the “superwomen” might find that the presence of young children has very little, if any effect on their productivity. This may partly explain why most studies that have examined the relationship between family-related factors (e.g., marital status, parental status, and number and age of children) and publication productivity do not find them to have a negative effect on research productivity (see Chapter 2, sections 2.2.2.1 and 2.2.4.1). If both publishers and non-publishers were analysed, an effect of these factors on publication productivity might be found.

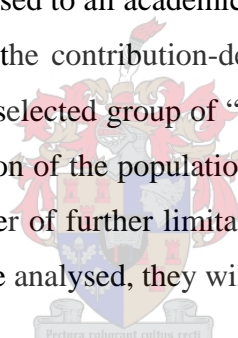
2.2.3.4 *Relevance to SA Knowledgebase*

The effect of sample selectivity on the relationship between publication productivity and marriage and/or motherhood is not of direct relevance to an analysis of SA Knowledgebase, as the database does not include data on family-related variables that would have allowed an assessment of their effects. The preceding discussion does, however, raise a number of issues that need to be taken into account when analysing the database and interpreting the results from a

¹⁵ Findings based on research conducted in America are inconsistent in this regard. Although a longitudinal study by Long (1992) found that gender differences in publication productivity are reduced if only those scientists who are actively publishing are examined, Cole & Zuckerman (1984) found that the strength of the association between

gender perspective. First, it seems preferable to combine a contribution-based definition with a demand-based one, by limiting the analysis to a population of academics only. The numbers of women authors who work in various sectors outside academia are generally too low¹⁶ to allow any meaningful multivariate analysis (e.g., controlling for the effect of institutional type on gender differences in publication productivity) while also statistically controlling for R&D sector variability. In addition, the academic sector is relatively uniform with regard to distinctions between different ranks, institutional types, and disciplines, which are therefore easier to compare and control for in this sector.

Secondly, SA Knowledgebase does not allow one to distinguish between publishers and non-publishers. Moreover, it excludes those academics who are supposed to publish, but do not – a group in which women are usually over-represented. Therefore, findings with regard to the nature and extent of gender differences in publication productivity that result from an analysis of SA Knowledgebase need to be interpreted with this in mind. Finally, the findings of the bibliometric study cannot be generalised to all academics in South Africa. In particular, it may be argued that the women included in the contribution-defined population in SA Knowledgebase are a highly self- and institutionally selected group of “superwomen”. In addition to these issues that flow from the particular definition of the population of scientists in SA Knowledgebase, the database is characterised by a number of further limitations. As these are mostly also related to the final subset of authors that will be analysed, they will be discussed in the following section.



2.3 Further considerations in the use of SA Knowledgebase as a data source

As was reported in Chapter 1, by 2001 SA Knowledgebase contained information on more than 57 000 authors of scientific journal articles published from 1990 onwards¹⁷. In 2003 the author imported this data into the Statistical Package for the Social Sciences (SPSS v. 10), in order to create a dataset of authors. At the time of importation of the SA Knowledgebase data into SPSS, a lack of biographic data meant that both publication productivity and gender was available for just more than one fifth of the total number of authors (who together produced a total of 67 260 article equivalents) contained in SA Knowledgebase at the time. As was discussed earlier in the

gender and publication productivity (as represented by the zero-order correlation) is essentially unaffected by eliminating from consideration those scientists who had failed to publish a single scientific paper.

¹⁶ Of those 7 574 authors for which data on number of articles and gender is known, only 242 women work outside the academic sector: 202 work at science councils, 20 at national research facilities, 18 in government, and 2 in industry.

¹⁷ Because of logistical constraints, the database is restricted to articles that have been published since 1990 (CENIS 2001)

chapter, it was decided only to focus on authors who are working in the academic sector, which excluded a further nine percent of this total. Finally, cleaning of the dataset¹⁸ resulted in a reduction in the number of cases to 6 763. In survey sampling terms, however, having this proportion of the population included in a “sample” would be regarded as excellent. In addition, the author is interested in drawing comparisons between men and women, and it is unlikely that any bias is correlated with gender, i.e., it is implausible that men are any more or less likely to be lacking information on their gender than women are. Thus, any threats to external validity should not apply to generalisations of findings on the *relationship* between gender and publication productivity. On the other hand, the characteristics of the subset of authors described in Chapter 4, should not be considered representative of all South African academic authors.

The final subset of authors for which data are available with the aim of investigation gender differences in publication productivity, may therefore be defined as those South Africans working in the higher education sector who, between 1990 and 2001¹⁹ authored at least a part of one research article in a recognised scientific journal, and whose gender is known in SA Knowledgebase. However, missing data on potential covariates of gender and publication productivity (age, race, highest qualification, rank, institutional affiliation and discipline) imply that in most multivariate analyses the number of cases is further reduced²⁰. Moreover, the fact that SA Knowledgebase does not include information on gender-related variables that have proven relevance to publication productivity - such as marital and parental status, time lag between bachelor’s and doctoral degrees, years of work experience, teaching load, research funding and research assistance - limits the extent to which the database allows us to develop a full understanding of the factors that contribute to gender differences in productivity.

It also needs to be noted that, in the linking process women’s surname changes resulting from marriage or divorce could not be tracked for such a large database as SA Knowledgebase²¹. If a surname change is not known and therefore not taken into account, a woman’s publishing may

¹⁸ This involved checking for obvious errors, such as incompatibility of gender and title, or of degree and rank, and authors with extremely high or low ages. Data cleaning did not lead to any substantial deletion of cases, as there were very few errors, and those that were detected, were corrected as far as possible by finding the author’s correct details on HEIs’ web pages.

¹⁹ By the time the database was imported into SPSS, data on publications after 2001 had not yet been fully processed and linked within SA Knowledgebase, and were therefore excluded.

²⁰ The following percentages of the total of 6 763 cases for which gender and publication productivity are known, are excluded from the multivariate analysis: 22 percent for age, 15 percent for race, 19 percent for highest qualification, and 6 percent for scientific domain. In the case of rank, incomparability of ranks between instructors and research staff at HEIs limited controls for rank to only 46 percent of the population that are employed as either junior lecturers, lecturers, senior lecturers, associate professors or professors at HEIs. Because the articles were used as source for data on an author’s institutional affiliation, and because only academics are included in the population, no data is missing on this variable.

appear to halt when in fact the publications are “missed” due to the fact that she is now publishing under a different surname. Although professional women are increasingly prone to keep the name they held at the time of their graduation as their professional name, some bias may result from surname changes (Keith *et al.* 2002). For example, a study among biochemists in the US (Long *et al.* 1993; Long 1992, 1990), which showed that approximately twelve percent of the women scientists who published at least one article used two or more surnames. And an even larger percentage used variations in how the first, middle, and maiden names were indicated (e.g. Mary Jane Smith Jones, Mary Jane Jones) (Long 1992, 1990). In SA Knowledgebase this may have led to the creation of duplicate authors, each linked to a portion of the articles produced by one women scientist. The fact that this duplication is only a possibility for women, introduces a gender-related bias of unknown extent. Finally, CENIS reports “some gaps for the early years of 1990-1993” (2001:60f), but it is not possible to determine the extent of these gaps, or the potential bias they introduce.

Nevertheless, the subset of academic authors analysed in this study is still more comprehensive than the samples included in most previous research on publication productivity that has been conducted elsewhere. As Teodorescu (2000) points out, most research on publication productivity does not use national samples; instead it typically focuses on a limited number of faculty in one or a few disciplines. In particular, a common limitation of studies that compare the publication productivity of women and men is that they tend to focus on the hard sciences, particularly chemistry and biochemistry, to the neglect of the social sciences and humanities (Keith *et al.* 2002; Stack 2002; Ward & Grant 1996; Wanner *et al.* 1981). Even within a particular discipline, gender studies of publication productivity usually focus on one department, one institution, or a single speciality within that discipline (Carr *et al.* 1998). The main advantage of SA Knowledgebase is that it allows a *national* gender comparison of academic publication productivity. As the inclusion of scientists in the database is based on their contribution to knowledge in the form of article publications, no HEIs or disciplines are excluded *a priori*, unless they produced no publications between 1990 and 2001.

The unit of analysis for the greater part of this study is defined as the individual author, rather than the published article. However, two of the four research objectives detailed in Chapter 1 (see section 3.1.3) require an analysis of articles, not of individuals. First, to determine collaborative patterns, the ratio between the number of articles and the number of article equivalents connected to an author is used to provide an indication of the relative amount of co-

²¹ See Long (1992, 1990) for several methods that may be employed to track surname changes.

authorship versus sole authorship (see Chapter 1, section 3.1.3.4). Therefore, articles are taken as the unit of analysis, as the percentage of collaboratively authored *articles* published by men is compared to the percentage of collaboratively authored *articles* published by women (*cf.* Mackie 1985, 1977). Secondly, the proposed longitudinal analysis requires that the unit of analysis be defined as articles, as only published articles are connected to particular years (time of publication) in SA Knowledgebase²² and as such allow for an analysis over time. As a matter of fact, for the longitudinal analysis the author enlisted the help of the database manager of SA Knowledgebase in order to analyse the original SA Knowledgebase, not the SPSS dataset that was derived from it.

In most bibliometric research, publications are the unit of analysis. Some would even argue that only those studies that take publications as their unit of analysis may be termed bibliometric (Tijssen 2004). However, this is still open for debate, and examples may be found of bibliometric studies that employ two units of analysis in order to circumvent problems such as measuring the productivity implied by single versus joint authorship (e.g., Mackie 1977). The more important point to remember is that the choice of unit of analysis can have serious implications for findings, and variations in the unit analysed need to be taken into account when interpreting findings, and when comparing results with findings from other studies that differ from the present study in terms of the unit that is analysed.

3 Measurement of variables

3.1 Dependent variable: publication productivity

A variety of indicators of research productivity can be identified in the literature. SA Knowledgebase contains data on only one of these indicators: journal articles. Thus, in any analysis of the database one has no option but to define research productivity as the production (or output) of published, research-based knowledge. In short, this is referred to as “publication productivity”, which is measured by a single indicator: a count of articles. It is important to note that there is no single measure of research productivity that is adequate or universally accepted. Thus, although counts of publications, in particular in the form of articles, are widely accepted and among the most commonly used measures of research performance (Webster 2001; Braxton

²² Ideally, the publication year of each article written by an author should have been recorded for each author. However, SA Knowledgebase was designed foremost as a database of articles, not of authors, and its structure does prevent provision of such detail for each author.

& Bayer 1986), their use is by no means uncontroversial. And as Blickenstaff and Moravcsik (1982) note,

“In looking for indicators of scientific output, one has to be modest and emphasise the limitations of any single indicator, especially if it is a strictly quantifiable one which is therefore very convenient and accessible” (136).

Moreover, the way in which research productivity is defined and operationalised has a significant impact on the size of gender differences found (Braxton & Bayer 1986; Fox 1983; Edge 1979). It is these issues surrounding the definition and measurement of research productivity in a bibliometric study of a database of article data, such SA Knowledgebase that will be discussed in this second section of the chapter. First, the fact that the measure of publication productivity used in this study may be considered crude on three counts – because it does not capture the multidimensional nature of research productivity, the heterogeneous nature of publication productivity, and variations in quality in any direct manner – is examined. Thereafter, measurement-related issues relating to the time period for which productivity is measured and the problem of co-authorship, as well as the manner in which these issues are addressed in SA Knowledgebase, will be highlighted. Throughout the discussion the implications of these issues for a study that aims to measure gender differences in publication productivity will receive special attention.

3.1.1 **The multidimensional nature of research productivity**

It may be argued that the measurement of publication productivity used in SA Knowledgebase does not provide a complete picture of research productivity or “performance”. As Braxton and Bayer (1986) caution,

“Measurement of research performance is multidimensional. The predominant or singular use of any type of measure results in failure to assess the full range of professional role performance” (39).

There are two main reasons - actually flipsides of the same coin - why the “fit” between research and publication is an imperfect one. First, research output, in the form of a product such as a published article, serves as a limited indicator of what constitutes *research*, and may under-represent *research endeavour* to a certain extent. The latter construct may include many other activities, such as, “having a novel idea, creating a way to demonstrate a hypothesis, inventing a means to explore it, preparing a way to communicate it” (Blackburn & Lawrence 1995:31). It is possible that SA Knowledgebase, which counts publications over a relatively limited time-span,

may exclude the research endeavours of those who have been involved in ongoing research, but had not yet published the results. And as was mentioned above (see section 2.2.2.1), an emphasis on applied research and/or development work in certain R&D sectors, such as industry and government, results in a higher output of *unpublished* patents, reports and technologies.

The other side of the coin is that not all articles are the outcome of research, in the sense that they are not all empirically based (Creamer 1999; Light 1974, cited in Yuker 1984). Consequently, some researchers (e.g., Creamer 1999) prefer the wider term “scholarly productivity” to “research productivity”. The former includes both a quantitative dimension, referred to as “publication productivity”, and a qualitative dimension, referred to as “knowledge production or innovation”. Similarly, in the South African national SSRD, the term “scholarship” was distinguished from “research”, and defined as comprising “all activities directly associated with the generation of new knowledge” (DACST 1998b:9). However, this raises the issue of what constitutes a contribution to knowledge. Although the debate is beyond the scope of this chapter, it is important to note that it is a gender-related issue:

“The profile of faculty across [the United States] has remained so stubbornly homogeneous because of the reluctance to relinquish traditional measures of faculty productivity. A narrow definition of what constitutes a contribution to knowledge represents only a fragment of academic discourse, and it awards the privilege of an authoritative voice to only a few scholars. Expanding these definitions will benefit minority, female, and male academics alike” (Creamer 1998:4).

In summary, these issues highlight the fact that, just because *publications* such as journal articles are measurable, does not imply that they are the only or even the best indicators of *research*, or of a contribution to knowledge.

3.1.2 The heterogeneous nature of research output

Research output can take on many forms, and the number and diversity of publication outlets (particularly in an age of online publishing) is increasing²³. As Stephan & Levin (1992:57) succinctly state, “contributions to science are not packaged in homogenous units”. Just how diverse research output can be, is clearly illustrated by the recent peer evaluation and rating guidelines of the South African NRF (2003), according to which research outputs may refer to any of the following:

²³ In the age of electronic publishing even the definition of what constitutes a “journal” is becoming increasingly problematic (Tijssen 2004).

“...publications in refereed/peer-reviewed journals, refereed/peer-reviewed conference proceedings, other significant conference outputs including publishing abstracts, books or chapters in books, keynote or plenary addresses, patents, artefacts and products, technical reports and any other measurable outputs. These could include annotated bibliographies, CD-ROMS, development and production of software, electronic publications, plant-breeding rights, research guides, vaccines, web-sites, etc.” (60)

3.1.2.1 A categorisation of indicators of research output

This plethora of research output formats may be simplified by utilising Stephan and Levin’s (1992) categorisation of indicators of research produced that are generally available: (1) counts of publication, (2) patents (filed and granted), and (3) inventions.

Within the context of research productivity studies, publications are sometimes also referred to as “bibliometrics” (Stephan & Levin 1992:58), “professional writings” (Sax *et al.* 2002), or “textual output” (DoE 2003). The publications for which data are available in SA Knowledgebase – journal articles – do not represent the only form that research publications can take. Monographs, chapters in edited books, conference or workshop proceedings, published reviews of books, and textbooks all form part of publication output. The other two indicators, patents²⁴ and inventions, include algorithms, prototypes, designs, creative works (such as music compositions, exhibitions and performances), and computer software (Najman & Hewitt 2003; Bellas & Toutkoushian 1999). Inventions would also include the category of research output defined by CENIS (2000:183) as “technologies”, e.g., information technologies.

In addition to the indicators of research productivity identified by Stephan and Levin (1992), unpublished outlets for research findings exist as well. Papers presented at conferences or professional meetings that are not contained in published proceedings, are probably the most prevalent form of unpublished research. In faculty evaluations in America, conference papers rank almost as highly as publications in journals²⁵, probably because they are not subject to publication delays (Seldin 1984, cited in Franklin 1988). Also included in this “unpublished” category, are final reports of funded or commissioned research. The major problem with unpublished forms of research output is the high possibility of double-counting of research

²⁴ Patents also provide an indicator of perceived *utility* of the underlying research (NSF 2000).

²⁵ Fifty-eight percent of American public colleges always employ conference papers in faculty evaluation, whereas 61 percent always employ actual publications (Seldin 1984, cited in Franklin 1988).

activity, because a great amount of unpublished research is eventually published²⁶ (Braxton & Bayer 1986).

Of these indicators, publications are the most widely used as measures of research productivity, because of the relative ease with which they can be counted and the low cost involved in collecting publication data (Stolte-Heiskanen 1986). Among the different forms of publications, a count of journal articles has been utilised most often, especially in bibliometric research (Phelan 2000; Stephan & Levin 1992; Astin 1991). As SA Knowledgebase includes only data on this indicator, it is this form of research output and the issues surrounding its measurement (particularly those that are gender-related) that will be examined in the following two subsections.

3.1.2.2 *Variations in journal contributions*

A variety of pieces are published in academic journals, for instance, full-length articles, research notes or summaries, book reviews, short news notes, commentaries and debates, and responses to commentaries and debates. Only those journal contributions that meet the criteria of a full-length article are included in SA Knowledgebase, while more minor contributions such as letters to the editor, book reviews, and editorials are excluded. Excluding these journal pieces is standard practice in most bibliometric indices²⁷, as it is assumed that full-length articles represent “original research papers”, and as such provide a ready indicator of research output. However, this practice, as well as the assumption on which it is based is problematic on at least two counts.

First, the definition of what comprises a “full-length article” is not necessarily clear-cut. For instance, Wilkie and Allen (1975:20) found that, in sociology journals the definition of such an article seemed to vary from journal to journal. While this approach led them to mostly exclude so-called “research notes”, Glenn and Villemez (1970) report that they did not distinguish between research notes and articles, because they could not discern consistent or considerable differences in length and theoretical relevance between articles and research notes in the sociological journals, which they used as their data source. Secondly, not all full-length journal articles are “research articles”, in the sense of being empirically based (Creamer 1999). Rather, a distinction may drawn, on the basis of article content, between articles containing data of some

²⁶ Although one would expect that most papers presented at conferences are of sufficient quality to merit publication, they are only potential sources of publication in the strict sense of the word. For instance, Van Staden *et al.* (2001) found that, at one department at a South African university, “a great deal of effort is invested in conference presentations, *of which many never get published*” (52, italics mine).

sort, theoretical articles, thought pieces, literature reviews, and purely methodological articles (*cf.* Mackie 1985).

This latter point is recognised by the DoE in its Policy for Measurement and Recognition of Research Output of Public HEIs. According to this policy, the research output contained in journals includes original research papers as well as review articles (DoE 2003). In most bibliometric indices or databases, including SA Knowledgebase, no distinction is drawn on the basis of content between different types of full-length articles. Neither is article length taken into account (i.e., a short paper is counted equally to a long one), although different forms of articles vary in length, and article lengths differ across disciplines. For example, natural science disciplines such as molecular biology follow a publication pattern characterised by a large number of relatively short papers, while humanities disciplines, such as philosophy, are more frequently characterised by the publication of longer papers (Najman & Hewitt 2003).

The reasons for these differences are primarily normative (i.e., based on the traditions and customs of a discipline), but they may also be the result of practical considerations. For example, in the natural sciences references to formulas, equations, and the like significantly reduce manuscript length. If one considers that a possible reason why scholars in the natural sciences publish more articles than those in the social sciences and the humanities is that their articles tend to be considerably shorter (Hamovitch & Morgenstern 1977), coupled with the fact that female faculty have traditionally been and still are concentrated in the social sciences and the humanities (European Commission 2000; Blackstone & Fulton 1974), it seems inevitable that article length will be related to both gender and publication productivity. However, bibliometric researchers usually do not differentiate between articles on the basis of their length (Meltzer & Salter 1962, cited in Knorr *et al.* 1979), and the literature offers few, if any, criteria for accommodating variation in this regard.

In addition to content and length, journal articles may also differ according to the characteristics of the journal in which they are published. In an academic context, the most fundamental distinction is that which is drawn between refereed (or peer-reviewed) and non-refereed journals. Usually, only articles published in refereed journals are included in a bibliometric article count. This is because refereed journals are characterised by the review of manuscripts by experts in the field covered by the journal, which means that the articles published in these journals have been assessed and certified as a contribution to knowledge. A

²⁷ It is also evident in the South African Policy for Measurement and Recognition of Research Output of Public HEIs, according to which the following “types of articles” appearing in journals are not subsidised: correspondence

similar approach is followed in SA Knowledgebase, in that only those articles published in journals that have been approved by the South African educational authorities for higher education subsidy purposes (known, in short, as government subsidised articles) are included in the database.

At the time of writing, the DoE recognised approximately 8 500 national and international journals for higher education subsidy purposes. These include journals listed in the three indices of the ISI: the SCI, SSCI and A&HCI; in the IBBS; and in the index of Approved South African Journals, maintained by the DoE. The latter index includes journals whose seat of publication is in South Africa, and, although they do not appear in ISI or IBBS indices, they meet certain minimum criteria set by the DoE (2003:6) and their inclusion in the index is subject to an annual review by a panel of reviewers²⁸ (DACST 1999). As the DoE considers peer review as a minimum criterion for inclusion in the list of approved journals, these journals are, per definition, all refereed. The peer-review process sorts out most of the wheat from the chaff, and the relatively high requirements for acceptance of a publication in these journals implies that the articles may safely be assumed to have a higher standard than those published in journals that are not peer-reviewed²⁹. Thus, any analysis of SA Knowledgebase has the advantage that the articles included in it are of a certain minimum quality.

Some concerns have, however, been raised regarding the exclusion of non-refereed journals, and the assumptions on which this practice is based, have been criticised. First, some have argued that there are likely to be a significant number of articles that appear in non-refereed journals but that may make a significant contribution to knowledge. Alexander (2004b) argues that, this tendency is discipline-related: "...good social scientists engage with public opinion, making their research available in popular journals" (325). A gender-related version of this argument is that women may face greater obstacles in publishing their research in the traditional outlet of the refereed journal, because of the particular topics that they select for research (Bellas & Toutkoushian 1999).

According to Ward and Grant (1996), there is growing evidence that women, especially those in the humanities, social sciences, and professional schools, might select topics for their writing that differ from those chosen by men scholars. These researchers argue that women's choices in

to the editors, abstracts or extended abstracts, obituaries, book reviews, news articles and advertorials (DoE 2003:6).

²⁸ See CENIS (2001:48f) for a more detailed description of the criteria for and process of accreditation.

²⁹ However, Blackburn and Lawrence (1995) warn that the peer-review system is not perfect: "A flawed kernel may be discovered in the highest-rated journal, and an original, important mutant may initially be rejected as unimportant, unworthy" (31).

this regard might affect the likelihood of publication, particularly publication in prestigious journals, of their research. This may be because women and gender studies - an area in which women often publish - often confronts and challenges prevailing analytical perspectives, and explores sensitive issues, such as sexism (Nakanishi 1993, cited in Bellas & Toutkoushian 1999).

Feminist research and publication in particular tends to carry little esteem in a male academic culture, where men still hold the vast majority of senior posts, which enables them to determine what counts as “good research”. Such research, especially if based in women’s lives and women’s experiences, is often not counted “real”, “important” or “relevant” research (Jackson 2002:20,23); rather is usually regarded as peripheral, and considered to be more political than scholarly (Maürtin-Cairncross 2003). In addition, feminist research concerns and epistemology often do not match peer-review conventions, and therefore do not usually find an outlet in “traditional” publications, such as peer-reviewed journals³⁰ (Wyn *et al.* 2000, cited in Subotzky 2003). Rather, this scholarship appears as “grey” literature; that is, as conference and seminar papers, or unpublished dissertations (Morley *et al.* 2001, cited in Subotzky 2003). Indeed, Bellas and Toutkoushian’s (1999) research results indicate that focusing on “traditional” measures of research output skews productivity ratings toward white and Asian men, and away from women and blacks.

Secondly, the possibility of variation of quality within the categories of refereed (and non-refereed journals) needs to be considered. The issue may be addressed by means of peer rating of journals, but for practical reasons these are usually limited to one discipline, e.g., sociology (*cf.* Glenn and Villemez 1970), or at most a group of disciplines, e.g. the social sciences (*cf.* Nelson *et al.* 1983). The impact factor for each journal may also be employed as a means to assess the quality of academic journals – an approach that will be discussed in more detail in section 3.1.3 below. Finally, journals may also differ in terms of requirements and conventions concerning co-authorship. Thus, the practice of assigning an equal score to, for example, three persons who each published one article in different journals is questionable (Labuschagne & Watkins 1990).

³⁰ This argument seems to be partly supported by the finding that, remarkably few South African papers related to feminism, feminist issues or gender were published in the main local psychological journal in the country (the *South African Journal of Psychology*), at least before 1995 (Levett & Kottler 1998).

3.1.2.3 *The relationship between gender, publication type and discipline*

According to Braxton and Bayer (1986), counting research outputs is greatly limited by failure to take differences of publication type into account. Particularly relevant to this discussion, are research findings that inter-group differences, in particular gender and race differences in research output, are sensitive to how narrowly or how broadly research output is defined (Bellas & Toutkoushian 1999). Thus, type of publication may be an important variable in explaining gender differences in publication productivity. Research undertaken thus far has indeed provided some indications of a gender difference in types of publications that are produced by women and men. Findings of research conducted in the United States point towards a more pronounced tendency among women than men to publish in outlets other than journals. Thus, among biologists women publish more book chapters, conference proceedings, and similar publications other than the professional journal than men (Sonnert & Holton 1995), among faculty in library schools women publish more textbooks and monographs than men (Garland 1990), and among social work faculty women publish more book chapters than men do (Rubin & Powell 1987). In two separate surveys Astin (1978) and Davis and Astin (1990) found that single women in particular display the lowest mean rate of article publication, but have the highest mean rates of published books. Outside the United States, in Australia Sheehan and Welch (1996) found that, although single-author book production rates are higher among males than females, “differences are less stark than for articles” (77)³¹.

This may partly explain why researchers such as Nakhaie (2002) found that the relationship between gender and publication productivity actually disappears for various types of books, but remains significant for article publications. Similarly, Vasil (1993) found no significant gender differences in the number of books and book chapters published by New Zealand faculty. The implication is that if several indicators of research productivity are used, as Reskin (1977) did, a much smaller, even statistically non-significant, gender difference will probably be found than if only one indicator, such as article publication, is used. Thus, if women scientists in South Africa were to publish more readily than men in outlets other than journals, omitting these outlets from a publication count may systematically penalise women.

Although it is not immediately evident why these gender differences in preferred publication type should exist, they may be traced to differences between the sexes in terms of their

³¹ These findings are not necessarily universal. For instance, Koval (1991) reports that, in comparison with their male counterparts, Soviet women are more often authors of articles, and less frequently independent authors of books. In addition, the smaller variability of book publication may have led to a reduction in gender differences for this publication type.

participation in various academic disciplines. According to Bennett (2004), within most African-based universities participation in disciplines tends to correspond to outdated scripts about gendered professionalism - what Fulton refers to as “subject sex stereotyping” (1996:401). At the same time, disciplines vary in the format in which research findings are published. These differences have been accounted for by disciplinary norms, customs or traditions, especially those relating to the rewards accorded to different types of publications (Nakhaie 2002; Sax *et al.* 2002; Asmar 1999; Blackburn & Lawrence 1995; Pouris 1988; Becher 1987; Biglan 1973). Some explain the differences by referring to variations between disciplines in terms of research methodologies and/or practices³², which affect the type of output that is generated (DACST 1998b; Wanner *et al.* 1981). As a result, not all disciplines are “papyrocentric”, i.e., given to paper publication (Price 1971); some may lend themselves far more readily to the publication of books, and could therefore be termed “bibliocentric”.

In general, it has been observed that a substantial proportion of the publications in the “soft disciplines” (the humanities and the social sciences) consist of books, while faculty in “hard disciplines”, such as the natural sciences, are more likely to publish in the form of the shorter, less narratively oriented journal article (Najman & Hewitt 2003; Altbach & Lewis 1996; Haas 1996; Clemens *et al.* 1995; Creswell and Bean 1981, cited in Stoecker 1993; Wanner *et al.* 1981; Blackburn *et al.* 1978; Hamovitch & Morgenstern 1977; Startup & Gruneberg 1976; Fulton & Trow 1974; Biglan 1973; Astin 1969; Cole & Cole 1967). This basic distinction in terms of choice of publication genre between two “science cultures” seems to be a universal, as it has reported in a variety of countries, e.g., Germany (Enders & Teichler 1996), Norway (Kyvik 1990), Israel (Chen *et al.* 1996); Hong Kong (Postiglione 1996) and South Africa (Alexander 2004b; DACST 1998b)³³.

Thus, a “unitary model” of scholarly or scientific productivity cannot be assumed to operate in all academic disciplines (Wanner *et al.* 1981:250). Considering that female faculty worldwide (European Commission 2000; Blackstone & Fulton 1974) and in South Africa³⁴ (Bailey & Mouton 2004; Bennett 2004) have traditionally been and still are concentrated in the soft

³² For instance, controlled laboratory experiments, conducted within the positivist paradigm of the natural sciences, are conducive to article publication (Alexander 2004a; Hamovitch & Morgenstern 1977), while the need to communicate findings to an external *and* a scholarly audience is best accommodated by book publication (Wanner *et al.* 1981).

³³ Only one exception has been identified by the author: in 1974 in the American higher education system Fulton and Trow (1974) found that, even in fields such as the humanities, those who publish most books do also publish large numbers of articles (and *vice versa*). These authors conclude on the basis of their findings that measures that exclude books do not do faculty in such fields as the humanities a “serious injustice” (72).

³⁴ See section 2.3.2.4 in Chapter 2, and section 3.2.2.2 below for statistics in this regard.

disciplines in which articles are not necessarily the conventional, rewarded mode of reporting research, it makes sense that they would not necessarily publish in this format. Early research undertaken by Astin (1969, 1978) among faculty in the United States indeed found evidence of this relationship between gender, discipline, publication type and publication productivity: When productivity was measured solely by means of article counts, biological and physical scientists (where men are clustered) had the highest productivity rates, but when productivity was measured by in terms of books, those in the humanities (where women are most often located) were more likely to have the highest productivity rates.

In summary, observed gender differences on a single indicator of publication productivity might not provide a valid picture of gender disparities in research productivity. Ideally, a wider array of publication types than the article journal (in particular monographs, edited books and book chapters) should be included when comparing genders in terms of their publication productivity. Unfortunately, this is not a practical or even viable option for a national database the size of SA Knowledgebase. In the absence of a measure of output that is comparable across disciplines, it is crucial to ensure that stringent controls for discipline are applied when comparing men and women in terms of their publication productivity. This issue will be addressed in more detail in section 3.3.3.2 below.

One may conclude from the discussion thus far that, like most bibliometric indices and databases, SA Knowledgebase only allows the measurement of research performance in what is essentially a simplistic, one-dimensional manner. It is important to note that this might have serious implications for any analysis of the database that aims to measure gender differences in publication productivity. However, there are also strong arguments in support of utilising only articles in peer-reviewed journals as a measure of publication productivity.

3.1.2.4 *Advantages associated with article counts*

Measuring scientific output only in terms of articles published in accredited journals may be justified on a number of counts.

- The dominance of the peer-reviewed journal as a publication medium

It is generally recognised that in most disciplines the scientific journal literature is the primary medium through which an academic community of both women and men records and certifies additions to its body of accepted knowledge (Hargens 1988; Menard 1971). This does not negate the fact that publication in the form of a journal article constitutes only one outlet for dissemination of research in many fields. However, it cannot be denied that, at least with regard

to basic research, *most* contemporary knowledge is encapsulated in the form of research articles in scientific journals (Pouris 1989a). One may even argue – as Blickenstaff and Moravcsik do – that, “all scientific research *eventually* makes a trace in a journal publication, even if it first appeared in lectures, reports, or oral discussions” (1982:137, italics in original).

This argument seems even more valid today, as an increasing trend toward publishing journal articles, rather than, for example, books and conference proceedings, has been observed in the European Union (Tijssen 2004). Moreover, articles are the predominant form in which scientific output from the African continent is published (Narváez-Berthelemot *et al.* 2002). Thus, it is safe to assume that, with rare exceptions, a person not publishing original articles is not doing significant research³⁵. This is illustrated by Reynhardt’s (1982) justification of his decision to exclude unpublished reports in his early analysis of publications by South African physical scientists in international journals. According to him, if the content of a report could make a contribution to existing knowledge, it is the author’s *duty* to publish it in an international journal, and so make it known to the international community of scientists.

It is, however, not merely a matter of duty to publish research findings in scientific journals – it is also a matter of occupational survival. The credit in science usually goes to the one who makes the discovery known and not to the one who actually makes the discovery (Pouris & Pouris 1988). Indeed, only when scientists have made their work accessible by publishing it, does it become their intellectual property – a paradox already identified and described by Merton in 1942 (1973). Moreover, publications, particularly those in refereed journals, represent the most highly regarded measure of productivity among government, HEIs and researchers alike. This is primarily because these publications represent a judgement of quality by one’s peer group (DACST 1998a). For example, when Franklin (1988) asked European scientists what they considered to be the most important criteria for evaluating a researcher’s work, 91 percent of respondents chose articles in refereed journals as one of their three preferred criteria. The high value accorded to the publication of journal articles is also signified by how heavily it is relied upon in the evaluation of most faculty for promotion and salary purposes (Maurtin-Cairncross 2003; Holton 1999). In fact, there have been some indications that the number of articles

³⁵ The high acceptance rates of scientific journals, often in excess of 75 percent (Hargens 1988), further supports the argument that journal articles represent a fairly strong indicator of whether a scientist is engaged in research. However, it is important to note that empirical evidence points towards disciplinary differences with regard to journal acceptance and rejection rates (see section 3.3.3.2 below).

published is the indicator of performance that is most strongly related to the rewards of income, rank, and research resources (Persell 1983)³⁶.

- Circumnavigation of the comparability issue

In addition to these considerations, there are also some practical advantages associated with the counting of journal articles as a measure of publication productivity. Counting these publications is less problematic than counting other forms of publication. Not only are they a simple and easy to use quantifiable measure of productivity, they are comparable in terms of features that are not as quantifiable, such as quality. For instance, while it may be argued that articles published in peer-reviewed journals have been judged by the author's peers as constituting a valued contribution to knowledge, this is not necessarily true for other forms of publication, such as monographs and conference proceedings³⁷. By counting only on articles in peer-reviewed journals, a quality filter is built into a database; if one were to include other types of publications, a more sophisticated system of weighting would be required in order to maintain comparability among the heterogeneous publication forms.

A few weighting systems have been developed that assign weights to different forms of research output (for examples of such measures, see Nakhaie & Brym 1999; Kyvik & Teigen 1996; Noordenbos 1992; Garland 1990; Kyvik 1990; Thoreson *et al.* 1990; Braxton & Bayer 1986; Lindsey 1978; Bayer & Dutton 1977; Lodge 1976; and Clemente 1973, who reviewed earlier studies incorporating weighted counts). In South Africa, the DoE (2003) also uses a weighted measure of research output, according to which subsidies are allocated: a research article equals one unit, a book may be allocated a maximum of five units or a portion thereof, based on the number of pages of the book in question, and proceedings are allocated a maximum of one half a unit.

Such weighting systems are problematic, however, as they assign weights in an arbitrary or *ad hoc* manner, which in essence renders them meaningless. In addition, they may over-or underestimate the importance of certain types of publication in relation to other types. This is a particular concern in the case of weighting systems that are designed to measure research across disciplines and/or types of institutions. As Fairweather (1999) states,

³⁶ This has remained the case despite calls for institutions of higher education to recognise and reward a broader range of scholarship in the United States (Creamer 1998).

³⁷ In order to overcome this limitation, the South African DoE establishes for each reporting year, an evaluation panel of senior professionals from the higher education community to evaluate all books and proceedings submitted for subsidy purposes by institutions (DoE 2003).

“...selecting weights that are applicable across disciplines and types of institutions is impractical and can be misleading. For example, a book may be valued more highly in history whereas a refereed article in a top journal may be valued more highly in engineering” (94)

In order to address the problems of arbitrary weighting systems, weights could be derived from ratings made by a panel of disciplinary peers. These are more objective, but are usually discipline-specific (e.g., Glenn & Villemez 1970), and are therefore only useful when measuring publication productivity in one particular discipline. Finally, the mere fact that there is a high degree of variation among weighting systems³⁸ should make one sceptical about their utility.

- High correlations with other measures of research performance

The results of studies that use very broad definitions and comprehensive measurements (including non-publication measures) of research output tend to correlate strongly with those that count only articles (Narin 1976). The number of articles published is highly correlated with variables such as number of books written, number of seminars presented, and number of research grants received (Etzkowitz *et al.* 2000; Primack & O’Leary 1993). Similar results have been reported for South Africa, where per capita profiles for journal articles, conference papers and reports were not found to differ substantively (DACST 1998b). Journal publication counts are also highly correlated with impact or quality measures of scientists’ contributions, such as citation counts, peer evaluations, and honorific awards (Long & Fox 1995; Cole & Zuckerman 1984; Knorr *et al.* 1979). Findings such as these reveal a potential interchangeability of research

³⁸ The following examples illustrate this point:

1) The South African DoE (2003) states that for subsidy purposes a research article equals one unit. A book may be allocated a maximum of five units or a portion thereof, based on the number of pages of the book in question, while proceedings are allocated a maximum of one half a unit.

1) Nakhaie and Brym (1999) applied the following weight to types of publication: non-refereed publication = 2, published report = 2, edited book = 3, refereed article = 3, joint book = 9, single authored book = 18. The publication weights are summed and divided by 3. This weighted measure of research productivity equals the average number of refereed article-equivalent publications.

2) Noordenbos (1992) counted a book review as a quarter of an article, a part of a book as an article and one book as five articles.

3) Garland (1990) assigned 6 points to a monograph, 4 to a textbook, and 2 to an article or book chapter.

4) Kyvik (1990) gave an article in a journal or chapter in a book the value of 1, while a book receives 2-6 points according to the number of pages and type of book (one research book = 2-6, one textbook = 2-4, one edited book = 2-3). A report receives 1-6 points, using the same criteria as for books.

5) In Thoreson *et al.*’s (1990) index the number of presentations and reports each count as one, the number of articles and book chapters are each multiplied by three, and the number of books are multiplied by nine.

6) Lindsey (1978) reports using a system where the weights equal 1 for articles, 5 for books, 2 for edited books, and 1.5 for monographs.

7) Lodge (1976) gave each published article a weight of 2, and each published book one of 8. Monographs of 50 pages or more were weighted 4; co-authorship of books 6; and co-authorship of articles 1.

None of these authors provided any objective reason for their choice of weights.

productivity indices, and provide support for the concurrent validity of journal article publications as a measure of research productivity.

- Comparability with other findings

Considering these advantages, it is not surprising that publications in peer-reviewed journals have traditionally been viewed as one of the best measures of research productivity, and are still the most commonly used indicator thereof. As journal publication has been more thoroughly researched than other forms of publication (Ward & Grant 1996), using this measurement of research productivity also enables one to relate one's results to findings reported in a broader body of existing literature.

The arguments outlined above lead one to proceed with some measure of confidence in the use of articles as an indicator of publication productivity. However, the results of the bibliometric analysis of SA Knowledgebase should still be interpreted with caution, as the database was not designed for the purpose of capturing the heterogeneous nature of publication productivity in its entirety³⁹. In addition, the measure of publication productivity used in the study may be considered crude, because it does not measure quality in any direct manner – an issue to which we turn to in the following section.

3.1.3 **Quantity versus quality**

Publication count is an imperfect indicator of a scientist's contribution to a body of knowledge, as it measures only one dimension thereof, i.e. its quantity, frequency, or volume. Although quantity is considered the most fundamental dimension (Long 1992), it does not measure such aspects as the utilisation, significance, usefulness, impact, visibility, or value of research output. As Zuckerman (1988:528) states, “many a scientist has published much but contributed little”. This now longstanding issue of “quantity versus quality” was raised as early as 1962, when Meltzer and Salter (cited in Knorr *et al.* 1979) cautioned that the counting of papers as a measure of productivity does not distinguish between “highly original work and the repetition of old ideas” (59). Since then, the failure of publication counts to standardise for quality has continued to haunt many discussions of research productivity (see Lindsey 1978; Porter 1977; Nudelman & Landers 1972; Smith & Fiedler 1971, cited in Creswell 1985), and is generally acknowledged as a quite valid critique of article counts (Blickenstaff & Moravcsik 1982).

³⁹ According to the CREST web page (<http://www.sun.ac.za/crest/nav/sakba.htm>), the database is designed to provide information not only on research outputs, but also on the profiles of the most “productive” South African scientists, the research programmes of these researchers, and institutional research information.

Since publications obviously vary in quality and can be either used or ignored⁴⁰ by the scientific community, measures of productivity based solely on their counts can be misleading and may have limited accuracy because they give equal credit to poorly conceived papers, as well as to well-written papers (Keith *et al.* 2002). Ideally, then, a count of publications needs to be supplemented by a measure of the quality of research in order to provide an indicator of a scientist's contribution to the body of scientific knowledge. These concerns have stimulated several attempts since the 1970s at developing measures of the construct of "quality". Although, it has to be recognised that the quality of faculty scholarship is notoriously difficult to operationalise due to its intangible, aesthetic nature (Lindsey 1980), a great deal of work has been done within the sociology of science on the use of citation counts as a measure of the quality of research output. Consequently, citation counts are now the most widely used measure of the quality aspect of publication output. The use of citation counts is based on the premise that the more frequently other scholars use an author's work, the higher the value or quality of that work.

The issue of quality is of particular relevance to any measure of gender differences in publication productivity, as gender differences have been found with regard to this dimension of publication productivity. Recent research conducted in the United States has provided evidence that in some disciplines women's publications are more frequently cited than men's are. Sonnert and Holton (1995) found that, although women academic biologists published less than their male colleagues, the number of citations per article was higher (24.4) for women than for men (14.4). Similarly, in a larger sample in one subfield of biology, Long (1992) found that the average paper by a female biochemist was cited 1.5 times more often than the average article by a male biochemist.

Research utilising measures of quality other than citations have also supported these findings. Persell (1983) employed an anonymous rating of research papers in the field of education by a national panel of judges in order to avoid the possibility of gender bias. She found that women's papers were rated slightly *better*, but that the gender difference was not statistically significant. Among a sample of economists, Kolpin and Singell (1996) found that, although women published fewer articles than men in terms of raw publication counts, the research output of

⁴⁰ As Helmreich *et al.* (1980) note, "One can be widely published and equally widely ignored" (896).

female economists was qualitatively greater (as measured by the impact factor⁴¹ of the journals in which they publish) than that of their male counterparts.

In summary, in terms of Cole and Cole's (1973) typology of scientists (based on publication and citation rates)⁴², men seem to be "prolific" scientists, characterised by frequent publication and frequent citation, while women are more likely to be "perfectionists", characterised by infrequent publication and frequent citation. A greater citation impact might indicate that the content of women's articles, on the whole, is more noteworthy, has greater visibility, and, one may infer, are found to be of value to a particular field. Citation counts need to be used with caution, however, as there is no agreement among sociologists and historians of science on the substantive significance of unequal rates of citation. According to Cole and Zuckerman (1984),

"...not enough is known about the connections between citation counts and contributions to scientific knowledge or about the comparative impact of work by scientists who are cited n times as against those who are cited a fraction of n times...the connections between such counts and the extent of contributions to knowledge have not been satisfactorily established" (240).

The number of citations received by an article may also reflect a variety of other factors besides quality or value, and should not be regarded as unbiased indicators of merit.

Nevertheless, it is still a valid point to consider that, if women focus on fewer, more important papers and take a more "measured approach" to research than men do (Etzkowitz *et al.* 2000:242), a measure of research performance based simply on counting numbers of articles does not take into account these different gender styles, and may very well be biased against women. Persell already made this point in 1983, when she cautioned that, "conclusions about differential performance vary with the indicators used. If quantity is the indicator of performance, men do better. But, if quality is the indicator, men and women perform equally well" (41). A further critique in this regard is that, counting a candidate's number of publications may be more a measure of years' service (especially when publications are measured over a

⁴¹ The "impact factor" measures the average number of citations received by the average article published in a journal, by dividing the number of citations received by a journal by the number of articles in that journal (Garfield 1972). It is used to evaluate the quality or prestige of the journal in which an article appears, on the basis of which inferences about the quality of an article are drawn. These inferences are based on the assumption that articles appearing in high prestige journals may be of higher quality by virtue of their successful completion of the review process in such journals. As such, it provides an indication of *potential* impact, rather than of the actual impact measured by the number of citations to an article. Notwithstanding, it is frequently used to weigh article counts in terms of quality (Long *et al.* 1993; Stephan & Levin 1992). Impact factors are displayed in the annual volumes of the Journal Citation Reports and in the various citation indices published by the ISI.

⁴² The other two types distinguished by Cole and Cole (1973) are the "silent scientist", who is characterised by infrequent publication and infrequent citation, and the "mass producer", who frequently publishes, but is infrequently cited.

lifetime), and access to unlimited time, rather than productivity. In this sense, measuring productivity in terms of quantity rather than quality may discriminate against women who take career breaks or are limited in the extra hours they can work by time-consuming domestic responsibilities (Jackson 2002; European Commission 2000).

Unfortunately, the costs of gathering citation information for a subset of scientists as large as the one contained in SA Knowledgebase are prohibitive (*cf.* Sax *et al.* 2002; Wanner *et al.* 1981; Simon *et al.* 1967). In any event, the only approach currently available to determine the number of citations to an individual's work is to employ the international indices of the ISI, and the use of these indices for citation analysis has its shortcomings⁴³, particularly in a developing country (see Chapter 1, section 3.1.2). Most importantly, a large proportion of South African journals are not indexed in ISI citation indices⁴⁴. In such circumstances, where citation counts are not readily available and/or when samples of substantial size are analysed, one may view publication count as a relatively good proxy for the quality of scholarly work and therefore as a roughly adequate indicator of the research performance of scientists (Cole 1979).

The validity of such an approach is supported by fairly consistent evidence of a strong (although not perfect) relationship (a correlation of about .7) between the quality and quantity dimensions of productivity (see Cole & Zuckerman 1984; Over 1982; Knorr *et al.* 1979)⁴⁵. In addition, in South Africa Pouris (1989b) found evidence for the value of publication counts as a proxy for research quality, albeit on an institutional level. His research showed a high correlation between two rankings of South African academic institutions: one based on the number of front-line researchers affiliated with an institution (as identified by a large scale peer evaluation), and the other on the research output of an institution (as measured by publication counts). Finally, in South Africa the problem of distinguishing between articles of "high" and "low" quality is addressed to a certain extent by the fact that SA Knowledgebase includes data on only those articles that appear in journals that are of a high enough scientific standard to have been approved by the South African educational authorities for university subsidy purposes (see section 3.1.2.2 above). Thus, although the relative quality of the publications recorded in SA

⁴³ A detailed discussion is beyond the scope of this chapter. For examples of such discussions, see Stephan and Levin (1988), Braxton and Bayer (1986), Stolte-Heiskanen (1986), Creswell (1985), Cole and Zuckerman (1984), Garfield (1983), and Lindsey (1980).

⁴⁴ At the time of writing, only 24 South African journals (out of a total of 255 journals accredited by the DoE) were indexed in the ISI indices (Mouton *et al.* 2006).

⁴⁵ One should note, however, that since the correlation is not perfect, this means that a scientist who publishes a large number of papers, each which receives a few citations, may accumulate as many citations as one who publishes only a few papers that are heavily cited (Cole & Cole 1967).

Knowledgebase cannot be ascertained, the choice of articles for inclusion in SA Knowledgebase ensures that a “quality filter” is built into in any analysis of the database.

3.1.4 **The issue of attributing authorship credit**

Attributing credit for multiple authorship represents a significant problem in any publication analysis (Narin 1976). To give full credit to all authors who contributed to a multi-authored article by employing what is known as a “normal count procedure” (Lindsey 1980:146), i.e., counting each paper once for each of the authors involved, may lead to biased results. Therefore it is common practice to make certain adjustments in the measurement of publication productivity.

3.1.4.1 *Adjusting for multiple authorship*

First, a normal count procedure would overestimate the productivity of researchers who produce multi-authored articles (Lindsey 1980). This may introduce considerable measurement bias, as variation in the tendency toward multi-authored articles may depend upon a number of different variables. First, (Kyvik 1989). In general, the incidence of multiple authorship varies by field: the degree of multiple authorship has been found to be much higher in the medical and natural or physical sciences than in the social sciences and humanities (Kyvik & Teigen 1996; Kyvik 1990, 1989). In South Africa, similar patterns have been found: the natural, medical and engineering sciences are characterised by above average multiple authored publications, followed by the social⁴⁶ and economic sciences and the humanities and arts with the lowest proportion of multiple authored publications (DACST 1998b).

Such patterns are partly the result of disciplinary customs that determine how likely scientists are to work alone or in teams, and consequently, to publish solely or jointly (Alexander 2004b). Membership on a large research team may lead to a single scientist being a co-author⁴⁷ of ten or more publications per year, which is far in excess of the normal publication rate of one or two articles per year per scientist (Narin 1976). Not only does incidence vary according to the tendency to follow a “team” approach, but the average number of authors per collaborative work does so as well. For example, in particle physics, in which experiments often involve large teams, it is not unknown to have an author list that exceeds one hundred names⁴⁸ (Stephan &

⁴⁶ One interesting deviation is the fairly high incidence of co-authorship in the social sciences, which may be the result of a high incidence of co-authorship and co-editorship of books, rather than of articles (DACST 1998b).

⁴⁷ In accordance with other literature on the subject (e.g., Demetrulias 1986), the terms “multiple authorship” and “co-authorship” are used synonymously to describe an article that has two *or more* authors.

⁴⁸ One extreme example, an article from CERN, listed 138 persons as authors (see Kyvik 1989).

Levin 1992; Kyvik 1989). Even within homogenous fields, the extent of multiple authorship depends on whether the work is basic or applied, or theoretical vs. experimental (Stephan & Levin 1988).

The extent of bias that is introduced by a normal count procedure would depend on the degree to which the tendency to co-author papers is associated with the variable(s) under study – in this case, gender. If there is a difference in the frequency with which men and women co-author articles, the results of a study on gender differences in publication productivity that does not adjust for multiple authorship may be misleading. Research on gender differences in the tendency to co-author papers has thus far produced inconclusive findings (see Chapter 2, section 2.3.3.3). Nevertheless, gender may be associated with other variables, such as discipline, that influence the tendency to co-author. Keller's (1991) criticism of the normal count procedure illustrates this point:

“The number of papers on which the name of a principal investigator appears will, in general, depend directly on the size of the laboratory or group he or she heads. Suppose that (for whatever social or psychological reasons) most women scientists prefer to lead small groups. These scientists would obviously tend to have a lower ‘productivity’. If such measures of productivity are used to infer quality of science, it would follow that large labs (or groups) produce better science than small ones – a proposition that no one would accept if it were stated so directly” (233).

Therefore, a more sophisticated approach than the normal count procedure is advisable. In order to correct or adjust for the effect of multiple authorship on publication productivity, a system of fractional counts, referred to as “article equivalents”, is employed in SA Knowledgebase. This implies weighting each article by the inverse of the number of authors involved - in other words, assigning the fractional count of $1/n$ of a point for the occurrence of an author's name among n authors of an article. Thus, if five authors are associated with one article, each author's share is counted as the fraction 0.2; if there is only one author, the article is counted as 1.0. This adjustment for multiple authorship is commonly applied in studies of publication productivity (cf. Long 1992; Stephan & Levin 1992; Garland 1990; Kyvik 1990; Lindsey 1980; Wilkie & Allen 1975), and is considered the only reasonable way to deal with the attribution problem⁴⁹ (Narin 1976).

⁴⁹ An alternative is to use so-called “straight counts”, which disregard all but the first author who then receives all the credit (Lindsey 1980:146). The use of straight counts, however, under-represents those members of a collaborative team who consistently occupy a junior role, while overestimating the contribution of the senior partner. To the extent that women might be junior authors more often than men are, straight counts may lead to the measurement of artificial gender differences in publication productivity. Kyvik and her colleagues have also experimented with various other options, for example, merely dividing a publication by two, irrespective of the

Empirical justification for this adjustment has been found in Norway, where Kyvik and Teigen (1996) found that publication productivity differences between disciplines are altered substantially if a system of fractional counts is used. Without the adjustment, average publication productivity is the highest in the medical sciences and lowest in the humanities, reflecting the above-mentioned differences in publishing practices between disciplines. When the effect of multiple authorship is adjusted for, differences in publication productivity between the medical sciences, the social sciences, and the humanities disappear. However, adjusting publication counts for collaboration does not seem to change gender differences in publication productivity (Long 1992). Nevertheless, in the bibliometric analysis SA Knowledgebase it was considered methodologically preferable to define the dependent variable as weighted article equivalents, instead of normal article counts.

3.1.4.2 *Adjusting for author position*

As is the case with most studies on publication productivity, the system of fractional counts employed in SA Knowledgebase assigns an *equal* portion of the partial credit for multiple authorship. However, collaborative research may, of course, entail either equal or unequal contributions (Kyvik 1989). In order to address this issue, a distinction is sometimes drawn between different author positions in the order of authors listed on a given article. Incorporating such a weighting system is important from a gender perspective, as there may be gender differences in the rate of being first or senior author. Gender differentials in the rate of senior author contribution may provide an indication of women's stature in the collaborative process, or of their general status in a discipline (*cf.* Mackie 1985; Wilkie & Allen 1975; Rosenblatt 1970, cited in Kirk & Rosenblatt 1980).

However, adjustments for authorship position are hampered by methodological problems. Although it would be reasonable to assume that the name order of authors listed on a given paper reflects the level of contribution, and some evidence supports this assumption (Heffner 1976, cited in Lindsey 1980), author order does not invariably reflect author contribution. Practices with regard to the ordering of names among joint authors - and therefore the meaning of an author position - tend to vary too much across and even within different fields to allow the drawing of reliable conclusions in this regard (see Kyvik 1989; Narin 1976). Journals may also differ in terms of requirements and conventions concerning co-authorship (Labuschagne &

number of authors (Kyvik & Teigen 1996; Kyvik & Larsen 1994; Lodge 1976), or when there are two *or* three authors, allocating half a publication "point" to each, and when there are more than three authors, allocating a third of the points to each (Kyvik 1989).

Watkins 1990). Authors are often ordered alphabetically regardless of contribution (Narin 1976; Wilkie & Allen 1975), or there may be an agreement to rotate author order on a series of articles. An author may be listed first because of senior academic rank. Conversely, a generous supervisor may practice *noblesse oblige* (Zuckerman 1968), by letting a student's name appear first, in order to help the student's career. Such practices make it difficult to infer the relative contributions of collaborators from authorship position, and equal allocation of credit still seems the best course to take.

3.1.5 **Period of exposure**

When measuring publication productivity, one needs to arrive at a decision on the “exposure” (Xie & Shauman 1998:849), or time period over which the dependent variable will be measured. In surveys where faculty are the source of data about their publications, a distinction can be drawn between “cumulative” measures and “short-term” measures of publication productivity. The former refers to total publication output over the complete span of an individual's professional career, and is usually referred to as “lifetime” publication productivity (Nakhaie & Brym 1999:338; Noordenbos 1992:24; Cole & Cole 1973:135). Short-term measures, on the other hand, gauge publication output that is accomplished during a relatively short interval – usually two to five years prior to a survey.

Contrary to surveys, in bibliometric studies published articles are the source of information. This means that the distinction between cumulative and short-term measures is not applicable to bibliometric analyses. The same is true for an analysis of SA Knowledgebase. Because of logistical constraints, the database is restricted to information on articles that were published from 1990 to 2001 (see Chapter 1). Consequently, the database only includes data on authors of articles that were published in this window period of eleven years. This does not imply, however, that for each author publication data are available for the whole span of eleven years – some authors, especially the younger ones, may have only started publishing later in this period. However, in both bibliometric studies and surveys the time interval chosen for analysis can make a difference to research results. Thus, in this section the issue of exposure will be discussed with particular reference to SA Knowledgebase.

Over short intervals of time there is a great deal of variation in the publication productivity of a population of scientists. In South Africa, for instance, it is highly probable that publication productivity may have fluctuated considerably from one year to the next during the past decade, because of policy changes in higher education, that have impacted on research funding and

teaching loads (see Chapter 1, section 2.2). It is therefore preferable to aggregate data over a reasonably long period of time, usually defined in publication productivity studies as at least three years. Over a longer interval, variation in publication productivity tends to cancel out, short-term fluctuations in publishing are controlled for, and one achieves a more stable perspective (Najman & Hewitt 2003; Phelan 2000; Teodorescu 2000). It may be argued that the eleven years of article productivity that is covered by the present analysis of SA Knowledgebase is long enough to “smooth out” short-term variations.

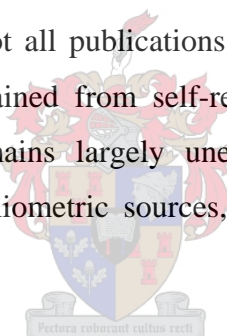
However, the results of any analysis of authors’ publications, as recorded in SA Knowledgebase, are confounded by the time (and therefore opportunity) an author has had to be productive. Those who had established careers before data collection started (1990) simply have had more time to publish the articles that are included in SA Knowledgebase, than those who are relatively new in their careers. This bias is particularly problematic in an analysis of SA Knowledgebase that focuses on gender differences in publication productivity, if one considers that women are mostly newcomers to academia. This is indicated by the relatively recent increase of the number of women entering HEIs in the country: between 1988 and 1998 the overall proportion of women academics at universities increased from 27 to 35 percent and at technikons from 30 to 37 percent (Cooper & Subotzky 2001). Since the number of academics typically grows by increments of young people beginning their careers (few entrants are older people moving from other jobs), women academics as a group are apt to be on average considerably younger professionally than men. This is further supported by findings from the South African NRTA of human resources in SET, that females are better represented in the lower age categories of academic staff than in the higher ones (DACST 1998a).

Thus, it needs to be taken into account that any gender differences in publication productivity that are found as a result of an analysis of SA Knowledgebase may be partly an artefact of the relative “professional youth” of the population of women academics in South Africa. Ideally, for the sexes to be compared on a fair basis, one should divide the number of article equivalents by the number of years in the data collection period that a person could, realistically, have been expected to publish, and only compare authors on the basis of this “rate”. Unfortunately, the data necessary for such an adjustment were not available in the SPSS dataset that was derived from SA Knowledgebase. Since this problem only biases against those who entered academia after data collection had already started (1990), an alternative approach would be to exclude young authors (e.g., those in their 20s, or even those in their 30s as well) from the analysis, or to at least

control for age statistically. The latter option will be discussed in more detail in section 3.3.1.1 below.

3.1.6 **The reliability of bibliometric vs. survey data on publication productivity**

On a more positive note, the reliability of productivity measures based on bibliographic sources, such as SA Knowledgebase, is likely to be superior⁵⁰ to that of self-reported counts. This is primarily because bibliometrically collected publication data are not based on self-reported information, as is the case with surveys. As is true for most surveys, the accuracy of faculty responses depends on the extent to which they can recall information – in this case their number of published writings. According to Sax *et al.* (2002), “Some faculty may glance at their resumes to determine the number; others will merely estimate” (428). Social desirability pressures may also lead respondents to misreport or even fabricate publication information, in an attempt to cast themselves in a favourable light. Although the incompleteness and inaccuracies that might arise could arguably be checked through standard bibliometric analyses (CENIS 2001), one needs extensive resources to do so, and not all publications are contained in bibliometric databases. Therefore, the publication data obtained from self-reports are usually “unaudited” (DACST 1998b:54), and their accuracy remains largely unexamined⁵¹. This stands in contrast to productivity measures based on bibliometric sources, which have been verified to be highly reliable (e.g., Allison 1980).



In summary, in the bibliometric analysis of SA Knowledgebase publication productivity is considered an indicator of research productivity. It is measured as the number of full-length articles, divided by the number of authors involved, that were published in DoE accredited journals during the period 1990-2001. Publication productivity is for the most part analysed as a continuous variable, but is also categorised into an interval variable.

⁵⁰ This is not to say that publication counts based upon available indices, abstracts and databases are not without error (Hargens *et al.* 1976, cited in Wanner *et al.* 1981).

⁵¹ One example, a study by Allison and Stewart (1974), estimated the reliability of responses from chemists in their sample by comparing self-reported information with publication counts from the index *Chemical Abstracts*. The correlation they found was very high ($r = .94$), which suggests that the self-reported data were reliable.

3.2 Measuring research collaboration

Because a system of article equivalents is adopted in SA Knowledgebase, it is possible to determine if individuals differ in their propensity to co-author articles. The ratio between the number of unweighted articles connected to an author's name and the article equivalents recorded for each author provides an indication of the relative amount of co-authorship versus sole authorship for each author. It has become standard practice to use such measures of co-authorship of published, refereed articles as the main quantitative indicator of research collaboration between individuals, institutions and even countries (Ward & Grant 1991; Mackie 1985). In accordance with most empirical examinations of scholarly collaboration, co-authorship will be used as a measure of research collaboration in the bibliometric analysis of SA Knowledgebase.

However, this practice is not without its problems. Cross-disciplinary differences in publishing customs that determine how likely scientists are to work alone or in teams, and consequently, to publish solely or jointly, tend to confound the findings (see section 3.1.4.1 above). In addition, there is a conceptual distinction between collaboration and co-authorship. As Ward and Grant (1991:251) note, "Although the two often go hand in hand, they are not the same". For one, co-authorship as a single indicator represents only one form of collaboration⁵² (DACST 1998b; Mackie 1977). Secondly, the co-authorship measure seems to under-estimate the level of collaboration, as indicated by Edge and Mulkay's (1976, cited in Edge 1979) study that showed several instances where researchers had collaborated closely, but had written up the results as separately-authored papers. Moreover, when measuring gender differences in research collaboration, it is important to note that the issue of collaboration may be more subtle than reflected by rates of co-authorship: "even when women publish jointly, it may be that they have more difficulty finding collaborators and have fewer collaborative partners available to them" (Fox 1991:198). In summary, the analysis of gender differences in the tendency to co-author that is undertaken in the present study represents at best an indirect measure of possible differences between men and women in their inclination to collaborate with other researchers.

⁵² For examples of the use of alternative indicators to measure research collaboration, see DACST (1998b:114).

3.3 Independent variables

In addition to measuring gender differences in publication productivity and the tendency to co-author articles, another objective of the bibliometric analysis of SA Knowledgebase is to determine if the observed gender differences in publication productivity are confounded by potential covariates of gender and publication productivity. Unfortunately, SA Knowledgebase does not include information on many gender-related variables that have proven relevance to publication productivity, as reported in the literature (see Chapter 2). These include marital and parental status, time lag between bachelor's and doctoral degrees, years of work experience, teaching load, research funding, and research assistance. Thus, the effect of these variables on gender differences in publication productivity must remain untested here for lack of data.

In accordance with Fox's (1983) literature review of publication productivity studies, the independent variables for which data are available in SA Knowledgebase are clustered into three blocks: individual ascriptive, individual achievement, and institutional characteristics. The first block includes personal background variables that cannot be controlled by the individual, in this case race and age, whereas the second contains the variables of academic rank and highest qualification. The block of institutional characteristics, also known as "location variables" (Fox 1981:73), refers to properties of the scientists' context of employment. In this study, the data allow controlling for differences between scientists in terms of their employing institution and the discipline in which they work. The measurement of each of the variables contained in these three blocks will be discussed in the following section.

3.3.1 **Individual ascriptive variables**

3.3.1.1 *Chronological age*

In South Africa, females are better represented in the lower age categories of academic staff than in the higher ones⁵³. A younger age implies that, on average women scientists have less professional experience than men, tend to be lower qualified than male authors, have less seniority, and are in more junior positions than their male colleagues. On the other hand, factors that have a positive effect on publication productivity, e.g., experience, rank, level of qualification, and opportunities for collaborative research, all increase with age, or at least as one's career progresses. While these factors that facilitate research productivity tend to come at the later stages of one's career, the barriers to productivity in academia are more likely to affect

⁵³ See Chapter 1, footnote 16.

those at the early stages of their careers. As chronological age represents a crude⁵⁴ proxy of the length of an academic career and years of professional experience – variables for which no data are available in SA Knowledgebase - it is an important variable to control for⁵⁵. In addition, the fact that, in the SPSS dataset the author derived from SA Knowledgebase publication productivity is potentially confounded by the window of opportunity an author has had to be productive (see 3.1.5), controlling for chronological age partly addresses this problem, and allows a fairer comparison between individuals.

In SA Knowledgebase, year of birth is recorded for most of the authors. On the basis of this data, the chronological age of an author may be calculated for any particular year, by subtracting a scientist's birth year from, for example, the year at which an analysis is performed. A common threat in a bibliometric database such as SA Knowledgebase is that data on variables that change over time are not updated, or are only valid at the time at which an author's publication is recorded in the database. Using birth year as a fixed point of reference prevents the data on age from becoming "outdated".

However, the SPSS dataset derived from SA Knowledgebase did not include data on the year of publication of each article produced by every author between 1990 and 2001. For example, if the chronological age is defined as the age of authors in 2003, when the SPSS dataset was created, and categorised into 10-year intervals, starting at 25, problems emerge. Authors who are categorised, for example, between the ages of 35 and 44, were between 22 to 31 years old in 1990, and between 33 to 41 years old in 2001. It follows from this that an age category such as "35 to 44" actually refers to academics who could have been at any age between 22 and 41 when they authored an article. If one follows the same reasoning with regard to the next age category, one finds that "45 to 54" may actually refer to academics who authored articles when they were at any age between 32 and 51.

⁵⁴ Career age, measured as the number of years since the doctoral degree was awarded, is more preferable as a proxy of these variables. As an indicator of productivity, chronological age can be misleading, because people earn their degrees at quite different ages (Blackburn & Lawrence 1995). Unfortunately, SA Knowledgebase does not include the data necessary for an estimation of career age.

⁵⁵ It needs to be noted that in a cross-sectional analysis, age and generational (or cohort) effects are intermingled, as Stephan and Levin (1992:58) explain: "the 60-year-old is not only 25 years older than the 35-year-old but was also born in a different era when values and opportunities may have been significantly different". Cohort effects have particular relevance for any analysis of publication productivity that focuses on gender as a central explanatory variable. One could, for instance, argue that young women who were professionally socialised in the past decade, which has been characterised by a focus on gender equity issues at South African tertiary institutions, should be publishing more than their older counterparts, who began their careers under quite different circumstances. For instance, the apartheid system, in particular, reinforced male dominance and hierarchical patterns in institutions where women were marginalized and not given the same opportunities as their male counterparts (NRF 2001). However, the fact that SA Knowledgebase data is limited to only eleven years of publication output decreases the

Even though one may argue that this problem affects women and men equally, and therefore does not influence comparisons between the sexes, the range of possible ages at publication implied in the age categories is not only too wide to draw any useful conclusions with regard to the influence of family-related or rank-related variables, but there is also a significant overlap between the “real” age ranges included in the categories. In order to address this issue, or at least reduce its effect, it was decided to measure chronological age as a continuous variable, calculated by subtracting a scientist’s birth year from a mid-point between 1990 and 2001, i.e. at 1995. Unfortunately, this implied excluding very young authors, who were not “eligible” to publish in 1995, from multivariate analyses involving age. The cut-off point was defined as 25, as this was the lowest age recorded for any author in the database in 2003. On the other end of the age scale, authors who were already retired in 1995, by virtue of being older than 64 at that time, were excluded from the analysis as well.

3.3.1.2 *Race*

In the United States, significant differences between the publication productivity of different racial groups have been found⁵⁶. For instance, Pearson (1985) reports that in the physical, biological, and social sciences blacks publish less than whites across their career, and Toutkoushian (1998) found that blacks have the lowest level and Asians the highest level of output. In South Africa one recent study of women academics at HBUs reported that white respondents publish more than respondents in the other racial categories (Maürtin-Cairncross 2003). In terms of national output, in 1998 the percentage of scientific publications by black scientists amounted to only eight percent (DST 2002). The strong relationship between race and publication productivity reflects the economic and socially disadvantages, and in particular inferior schooling and training, experienced by blacks as a result of racial discrimination during South Africa’s apartheid past. The resulting huge disparities between different race groups that still remain, require that a central place be accorded to race as a variable in research on issues related to redress and equity interventions (Maürtin-Cairncross 2003).

Apartheid legislation restricted academic employment at South African established universities predominantly to whites in the period before 1985 (Cresswell 1992). As a consequence, the South African higher education system was, and still is deeply divided along

chances of cohort effects having any significant influence on the findings or the way in which they should be interpreted.

⁵⁶ However, results are not consistent, as Sax *et al.* (2002) found “trivial effects” of race on publication productivity: among their national sample of American faculty being African American had a slight negative effect on research productivity, and only for non-tenured women.

racial lines. This is reflected by a continuing low research capacity among HDIs (see 3.3.3.1 below), the fact that whites represent by far the majority (73%) of academic staff in the country, and are much more likely to occupy the upper ranks in academia than faculty of colour (Subotzky 2003; Cooper & Subotzky 2001).

Although women across racial categories experience difficulty in reaching the most senior positions, gender disparities criss-cross racial divisions (Mabandla 2002; Tema 2002), indicating that in South Africa the issues of gender and race are closely interwoven. Walker (1997) contends that the lives of white and black women are differently shaped by gender. Even the experiences of gender oppression by African women are likely to be qualitatively different from those of Indian and coloured women. Similarly, Bailey and Cooper (2003) contend that, in the context of South African postgraduate education, the experiences of white females are markedly different from those of African or other black females, and therefore they analyse race and gender categories conjointly. Their findings suggest that the barriers to doctoral education are greater for African women than for other race categories, which “speaks to the double disadvantage of being African and female under the apartheid system” (110). It is highly probable that a similar situation exists among faculty members: since the academic culture is not only male but also white, the problems experienced by female faculty members as outsiders to this male milieu are compounded in the form of a double burden (Reid 1990; Fox 1984), or “double discrimination”, consisting of the cumulative effects⁵⁷ of race and gender discrimination, that black women experience, particularly in the South African context (Maürtin-Cairncross 2003; May 1999:91). As Walker (1998:338) asks rhetorically: “Surely if White middle-class women are othered in the academy, the position is likely to be even more difficult for Black women, or working-class women?”

Research among women academics at HBUs has indeed shown that self-confidence with regard to publishing appeared to be racialised, as stark differences were found in the levels of confidence (in relation to publishing) between black and white academics. This may be attributed to black academics’ experience as students in HBUs, where the primary focus of the academic project was traditionally geared to teaching and community development, rather than to research and publications. Furthermore, an additional contributor to the lack of confidence of black academics may be that HBUs seldom have institutionalised staff development programmes to assist in the development of research and publication skills (Maürtin-Cairncross 2003).

⁵⁷ It is important to note, however, that there has been a growing awareness of the danger of introducing such an additive model of oppression (De la Rey 1997, cited in Shackleton *et al.* 2004).

Elsewhere, it has been found that race appears to interact with gender in the academic reward system. For example, Park (1996) notes that in the United States minority men have been more successful than minority women, but less successful than white men in gaining promotion. Toutkoushian (1998) found that race appears to interact with gender where salary patterns are concerned. Olsen *et al.* (1995) found, surprisingly, that gender and race effects operated in opposite directions with regard to certain variables. For example, women reported significantly less recognition and support and minority faculty reported more.

However, worldwide very little research has addressed the dual impact of race and gender on publication productivity (Ward & Grant 1996). This is often ascribed to the fact that the numbers of non-white faculty are small, and in many instances too low to allow for multivariate analysis, such as gender comparisons of publication productivity that control for discipline and/or institutional type (Reid 1990). Not only is the actual population of non-white faculty (in particular professors) small, but in America their response rate has been noted to fall below an acceptable level: “so low one cannot have confidence that the findings are reliable and can be generalised” (Blackburn & Lawrence 1995:63).

Consequently, little is known about how the statuses of race and gender combine to affect authors’ publication productivity. In the bibliometric analysis of SA Knowledgebase it was therefore decided to examine the effect of race on gender differences in publication productivity. Although one cannot argue that race potentially confounds, “explains” or mediates between gender differences in publication productivity (as, for example, rank does), controlling for race would show to what extent gender differences in publication productivity vary within certain race categories. By ascertaining if men and women from previously disadvantaged races evince equally low publication productivity, or if gender “overrides” race as a disadvantaged status (in that minority men fare better than their female counterparts), an indication will be provided of the relative effect that race and gender have on publication productivity.

The racial categories of “African”, “Asian”, “coloured”⁵⁸ and “white”, which were created during apartheid, are commonly distinguished in research on the higher education system of South Africa. However, people historically classified as “African”, “Asian” and “coloured” represent a small minority of authors in SA Knowledgebase. In order to prevent the above-mentioned problems caused by a small numbers of cases in multivariate analyses, Africans,

⁵⁸ In these “various categories of blackness”, Asians refer to mainly people of Indian origin, African to blacks, and coloured indicates being of mixed origin (Maurtin-Cairncross 2003:107).

Asians and coloureds, who were all subject to similar political discriminatory practices through apartheid, are grouped together as “black”⁵⁹ (*cf.* DACST 1998a).

3.3.2 Individual achievement variables

3.3.2.1 Highest qualification

In South Africa, as in the rest of the world, faculty holding a doctorate have been found to be significantly more productive than those without (Jacobs 2001). Research has also shown that the likelihood for women in HEIs in South Africa to be involved in research clearly increases with the level of qualification⁶⁰ (NRF 2001). At the same time, women faculty at our HEIs are characterised by a lower degree attainment than men are: a mere 27 percent of faculty who are in possession of a doctorate, are women. Even at the lower master’s qualification level women represent less than half (44%) of academics that have attained this qualification (DACST 1998a). This is not a uniquely South African phenomenon. On the contrary, in an international study of the academic profession in fourteen countries, it was found that in all the countries included⁶¹, males are more likely than females to hold the highest degrees in their disciplines (Altbach & Lewis 1996). Thus, in South Africa - as elsewhere in the world - part of the lower publication productivity of women may be due to their lower degree attainment.

As a variable, highest qualification is also important because it may serve as a proxy for various other variables on which data are lacking in SA Knowledgebase. First, highest qualification provides a direct indication of the level of research skills, and an indirect representation of the capacity a person has for research performance (Fox 1981). Secondly, highest qualification is usually considered to be an indicator of confidence or feelings of self-efficacy to do research⁶², which in turn has been found to be positively associated with research productivity (Vasil 1993). Considering the above-mentioned figures on South African women faculty’s lower degree attainment, it is not surprising that many of them report a low level of confidence with regard to writing and publishing, and a concomitant need for further training in

⁵⁹ This practice is more in line with the use of the term “black” in the 1970s and 1980s in South Africa, when it was used in the democratic movement to refer to all oppressed groups (African, coloured and Indian) and was an explicit rejection of apartheid-created ethnic identities. The reader should note that the term “black” is now most often used to refer only to Africans (Walker 1997).

⁶⁰ Thirty-eight percent of respondents at doctoral level, as opposed to only 21 percent of those at masters level and even lower percentages at lower postgraduate and undergraduate qualification levels, were involved in research for non-degree purposes (NRF 2001).

⁶¹ Australia, Korea, Japan, Hong Kong, Brazil, Chile, Mexico, the United States, England, Germany, the Netherlands, Switzerland, Russia, and Israel.

⁶² Indeed, the South African audit among women in the social sciences and humanities has clearly shown a positive relationship between confidence in the ability to conduct research, and level of qualification attained (CSD 1999).

respect of research-related skills (Mabandla 2002; NRF 2001; CSD 1999). Thirdly, in accordance with Jacobs (2001), highest qualification may be considered a proxy of academic status, defined as a scientist's position in the academic arena with regards to his/her qualification.

In studies undertaken in the United States, highest degree is usually measured as a dichotomous variable that distinguishes between those with a PhD, and those without. In South Africa a finer distinction needs to be drawn, as less than half of the academic staff at our universities hold a doctorate degree (DACST 1998a), and the vast majority of technikon staff continue to hold qualifications below master's level training (Cooper 1995; also see section 2.2.1.2 above). Four levels of degree attainment can be distinguished in the South African higher education context: undergraduate or bachelor's degree; lower postgraduate (e.g. an honours) degree; master's degree; and doctoral degree. These four levels will form the categories of the variable "highest qualification".

Finally, it needs to be noted that data on highest qualification in SA Knowledgebase may be outdated for any number of authors in the database. This issue will be discussed in more detail at the end of the following section, which concerns the other time-varying variable, academic rank.

3.3.2.2 *Academic rank*

A strong positive relationship between academic rank and publication productivity has been established by a multitude of studies in both the United States and Europe. Some researchers (e.g., Nakhaie 2002; Stack 2002; Kyvik 1990) even report rank to be the variable that best predicts, or is most closely associated with, publication productivity. In South Africa, Maürtin-Cairncross (2003) and Jacobs and Ingwersen (2000) have also provided evidence that lecturers are much less productive than faculty at the higher academic ranks. At the same time women's under-representation in high academic ranks has been documented worldwide. For instance, in an international study of the academic profession in fourteen countries, it was found that in all the countries included⁶³ males are more likely than females to hold the higher academic ranks (Altbach & Lewis 1996; also see Chapter 2, section 2.3.2.1). Not surprisingly, the same holds true for faculty in South Africa (Cloete & Bunting 2000). Since women represent the fastest-growing subpopulation of faculty, and since the number of academics typically grows by increments of young people beginning their careers, it is not surprising that women academics

⁶³ Australia, Korea, Japan, Hong Kong, Brazil, Chile, Mexico, the United States, England, Germany, the Netherlands, Switzerland, Russia, and Israel.

are found at the lower ranks, often in positions that offer few resources necessary for research and publication. It is therefore highly possible that publication productivity disparities between the genders may be a function of the higher concentration of women in lower ranks. This potential confounding effect of rank requires that one controls for this variable when comparing men and women's publication productivity.

However, it is also possible that women are found predominantly at lower ranks, because they do not publish enough to be promoted to higher ranks. Controlling for rank and investigating the effect that rank has on gender differences in publication productivity will also provide an indication as to which interpretation is more valid in the South African context. For instance, gender differences in publication productivity that narrow or even reverse as rank rises would support the notion that promotion depends on productivity, not the other way around. (*cf.* Xie & Shauman 1998).

As was mentioned in section 2.2.2.1 above, among non-instructor (research) staff at higher education a lack of uniformity with regard to job titles frustrates any attempts at meaningful categorisation of the rank variable⁶⁴. On the other hand, the academic ranks of instructors tend to be easier to define and, because they are quite uniform across institutions, easier to compare as well. Consequently, rank is only controlled for in a smaller subset of authors in SA Knowledgebase who are employed as instructors at HEIs. Among instructor staff at South African HEIs, one finds a very similar hierarchy of five ranks – junior lecturer, lecturer, senior lecturer, associate professor and professor – which provide the categories for the academic rank variable.

A second issue that needs to be taken into consideration when using SA Knowledgebase data to control for variables that can take on different values over time, such as rank and highest qualification, is the reliability of the data. Data on these “time-varying” variables (Long *et al.* 1993:706) might be dated for some scientists in SA Knowledgebase, but not for others, depending on when (between 1990 and 2001) their bibliographic data were collected and linked to their article data. For instance, some of the scholars who now have a doctoral degree would have only been in possession a master's degree when their biographic data were collected and linked with their article data. The same is true for rank, as data on an author's rank are not updated in SA Knowledgebase every time the author is promoted. However, these problems should not *differentially* affect the results for men and women, and consequently gender

⁶⁴ This seems to be a common problem, as the SSRD, which formed part of the NRTA, was also reported as being handicapped by different ranking systems within the higher education sector (DACST 1998b).

comparisons should be unbiased. On the other hand, the results of the analysis that is undertaken to determine the characteristics of the subset of authors (see Chapter 4) must be viewed with caution.

3.3.3 Institutional variables

3.3.3.1 Institutional affiliation

Research in the United States has found that productivity differentials between men and women scientists are reduced when the institutional affiliation of men and women is taken into account. This is because the prestige and/or “research orientation”⁶⁵ of the institution where a scientist is employed is one of the strongest correlates of publication productivity (Fox 1983), while at the same time a pattern referred to as women’s “institutional ghettoization” (Davis & Astin 1990:95) obtains in the United States. The latter refers to the fact that a higher concentration of females are found in less prestigious or predominantly black institutions (Astin 1978) that are oriented more to teaching than to research (e.g., teaching colleges), while men are more likely to be employed at more prestigious institutions, particularly large research universities (see Chapter 2, section 2.3.2.3). Consequently, institutional affiliation within the academic sector is one of many factors that might confound gender disparities in publication productivity, and is always controlled for – at least in North American research.

In SA Knowledgebase, such statistical controls are possible, as data on institutional affiliation are obtained from the institutional address recorded on the most recent article published by an author. However, the extent and nature of the variation of academic institutions in the relatively large North American academic system - as well as the findings regarding its relationship to gender and publication productivity - are not necessarily applicable to academic systems in other countries (see section 2.2.2.1 above). Nevertheless, South African HEIs do vary considerably with respect to standards of education, quantity of publications, development and overall progress (Jacobs & Ingwersen 2000). Although the Education White Paper 3: A Programme for

⁶⁵ A classification scheme developed by the *Carnegie Foundation for the Advancement of Teaching* (1994) is generally used in North American studies on publication productivity, in order to differentiate between research institutions and non-research institutions. The types of institutions range from research universities, whose faculty train the majority of doctorates and which house much of the funded research, to two-year colleges, where there is little expectation that faculty produce or publish scholarly work (Wanner *et al.* 1981). However, institutional differences seem to be receding: more recent evidence shows that a research emphasis cuts across the full range of institution (Haas 1996), and that faculty in almost every institutional type perceive pressure to obtain external funding, conduct research, and publish their findings (Blackburn *et al.* 1991). In Canada a well-known *Maclean’s* magazine classification is used in order to distinguish between doctoral, comprehensive and mainly undergraduate universities (*cf.* Nakhaie 2002).

the Transformation of Higher Education (DoE 1997) outlines a single co-ordinated higher education system in South Africa, historical processes have left their mark in the form of a stratified higher education system, in which a number of major distinctions may continue for a while (Wolpe 1997).

First, a distinction may be drawn between universities and technikons, on the basis of their historically different missions, and therefore the extent to which they are oriented towards research, rather than teaching. Secondly, there are equally large differences within these two groups of institutions, which are directly related to the apartheid system's structuring of the higher education system. Consequently, a distinction is commonly drawn between historically "white" or advantaged institutions (HAIs), and historically "black" or disadvantaged institutions (HDIs). Thirdly, within the sub-type of HAUs, finer distinctions may be drawn on the basis of other criteria, such as language medium, the number of front-line researchers, and research output. In order to develop a categorisation scheme that places together those institutions that are most alike in research orientation, research capacity and gender proportion of academic staff, these distinctions will be discussed in more detail.

- Historical differences in mission: technikons vs. universities

Up until the early 1990s technikons were defined as non-research, teaching institutions⁶⁶, until recently precluded from undertaking research and offering postgraduate research training. Universities on the other hand, were to focus on research in addition to teaching, and therefore have a long history of research and postgraduate education. Consequently, technikons have for a long time been considered as the "minors" (Cooper 1995:243) or "poor relations" (Meyer 1997:189) of higher education in South Africa. In the recent move toward a single, co-ordinated system of higher education in South Africa, the DoE is making a conscious effort not to differentiate between universities and technikons when designing and implementing policy (e.g., DoE 2003). In 1993, technikons were given the right to award degrees, and in 1995 to implement degree programmes (CHE 2000). They are also now allowed to offer postgraduate (BTech) degrees, and at the time of writing several of these institutions were being merged with universities into comprehensive institutions. Moreover, attempts by to raise awareness and output of research at technikons seem to have paid off, as the publication output from this sector has shown more than a sevenfold improvement from 1991 to 1999 (Bawa & Mouton 2002).

⁶⁶ The United Kingdom is characterised by a similar division between universities on the one hand, and polytechnics and colleges on the other (Fulton 1996).

Nevertheless, given their historical different mission, technikons have many hurdles to negotiate in their attempts to establish a significant research profile. The teaching loads of faculty at technikons are probably higher than those of universities⁶⁷, and technikon staff are significantly under-qualified in comparison with their counterparts at universities (DACST 1998a; Cooper 1995). Technikons have not yet been able to establish any extensive research capabilities, though good potential exists at a few institutions (CHE 2000). Provision for more significant levels of research funding for technikons was only introduced in 1994, and in a system characterised by the disbursing of research funds on the basis of already demonstrated research and graduate output, a lack of research reputation makes it difficult for these institutions to be successful in bidding for research funds (Fransman & Rowley 1999). In addition, perceptions of inferiority and lower status are still associated with the name technikon (DoE 2002; Cooper 1995), which has a negative effect on the morale of staff, the attraction of donors, the attitude and support of the public, and development of international partnerships.

It is therefore not surprising that university staff still outperform their technikon counterparts in terms of indicators, such as average number of research projects per individual, average time spent on research⁶⁸, and average expenditure per project (CSD 1999; DACST 1998b). The technikon sector has also been found to be weaker than the university sector in relation to output benchmarks set by government (DoE 2002). In order to take into account the historical differences between technikons and universities, the DoE has adjusted performance indicators and benchmarks. With regard to publication outputs in particular, academic staff at technikons are expected to produce only half as much as university staff do (*ibid.*).

Moreover, the lower status of technikons vis-à-vis universities (in the case where they do not merge into comprehensive institutions) is unlikely to change, as the National Working Group advising the Minister of Education on the restructuring of the higher education system recently proposed that universities and technikons should in general “continue to render their services to society within the bounds of the broad role-definitions and functional differentiations that have characterised their development historically” (DoE 2002:8). In addition, Cooper (1995) argues that powerful university lobbies and cultural stereotypes that place universities above technikons make any change in the status quo highly unlikely.

⁶⁷ The lower publication rate of the United Kingdom counterparts to South African technikons - polytechnics and colleges – are also attributed to their different mission and greater teaching loads (Fulton 1996).

⁶⁸ For example, data from the SSRD indicates that technikon staff spend ten percent less of their time on research than their university counterparts do (DACST 1998b).

Thus, it is safe to say that the historically differentiation between technikons and universities still has a marked effect on their research orientation, and as such, it might be an important confounding variable in a gender comparison of publication productivity. However, controlling for the effect that variations between technikons and universities has on gender differences in publication productivity is only justified if women are under-represented at universities, and over-represented at technikons. This does not seem to be the case, as the male to female ratio in the higher education system is approximately 2:1 in both universities and technikons (Cooper & Subotzky 2001; DACST 1998a). This represents a deviation from the pattern of women's institutional ghettoization that has been observed consistently in the United States, and implies that a distinction between the more research-oriented, prestigious universities and the more teaching-oriented technikons is not necessarily relevant when investigating gender differences in publication productivity in the South African higher education context.

- Historical inequities: advantaged vs. disadvantaged institutions

During apartheid education, funding and support for research in the higher education system was based on racial grounds. Consequently, some institutions of higher learning were more favoured than others with regard to state funding (Bailey & Cooper 2004). This has led to huge inequalities in terms of research capacity within the higher education system (Cloete & Bunting, 2000; Walker 1998). The historical, apartheid-embedded disparities in the allocations of resources are reflected in the commonly drawn distinction⁶⁹ between the better resourced, historically advantaged or “white” institutions (HAIs) and historically disadvantaged or “black” institutions (HDIs)⁷⁰. Because HDIs, more often than not, lack a coherent and established research infrastructure, they have difficulty attracting funds from alternative sources. In short, they are caught in what is in essence a catch 22 situation, in that:

“...research experience is conditional on there being a research framework within which to conduct it; this in turn is conditional on availability of the necessary financial and other resources to make this possible” (Pityana 1992:75).

At the same time, the original mission of HDUs in particular, was similar to that of technikons, not of universities. HDUs were not designed as knowledge-producing institutions (CHE 2000). Rather, they were established mainly as undergraduate teaching institutions for African, coloured

⁶⁹ A similar distinction is drawn in the US between traditionally white institutions, and historically black colleges and universities. The latter are private liberal arts colleges and have a high proportion of African American faculty (Blackburn & Lawrence 1995).

⁷⁰ Of South Africa's twenty-one universities and fifteen technikons at the time, eleven universities and six technikons were specifically set up to cater for the black population (Shackleton *et al.* 2004).

and Indian students⁷¹ to serve the homelands as civil servants, as part of apartheid policies of separate development (CSD 1999; DACST 1996). This socio-political origin of the HBUs has translated into institutional cultures that are characterised by a very strong emphasis on teaching, academic development, community-based research and community development, while publications are “relegated to a more peripheral component of the academic project” (Maürtin-Cairncross 2003:3). Staff members at HDUs “appear to be involved in other, more varied but nevertheless relevant academic activities, such as: popular publications, outreach and community-oriented presentations, seminar and workshop papers, commissioned reports, artistic productions and so on” (EPU 1997, cited in CSD 1999). This is especially true for those HDUs situated in rural locations, as the staff members tend to be more heavily involved in community outreach programmes and community projects, than in publication.

Also, many of these HDUs draw their students from formerly DET schools, and from the impoverished rural communities within which they are located (Cooper & Subotzky 2001). These students are severely disadvantaged, both socio-economically and academically, by the time they arrive on campus. The fact that they are inadequately prepared for tertiary education, implies a heavier burden in terms of teaching responsibilities (in particular student counselling and formal, as well as informal, academic support programmes) for faculty at HDUs⁷². Besides teaching content, staff have to deal with language, reading, writing, studying, financial and personal problems⁷³. This situation is further exacerbated by the fact that HDUs are very often understaffed, partly because of an exodus of good academics from these institutions to HWUs, which increases and diversifies the teaching and committee duties of academics at these institutions (Bawa & Mouton 2002; Subotzky 2001, cited in Maürtin-Cairncross 2003; CSD 1999; Reddy 1992). Since 1994, there has been a further weakening of the research base at the majority of the HDIs, as many of these institutions have suffered substantial administrative difficulties, financial mismanagement, and student and staff strife (Bawa & Mouton 2002). Consequently, the research output of staff at HDU is more in line with that of scientists working at technikons than at HAUs.

⁷¹ Within the general category of HBUs, a further hierarchy in terms of the allocation of funding and resources existed, in that “Indian” institutions received more than “coloured” institutions, while “black-African” institutions were allocated the lowest funding (Cooper & Subotzky 2001).

⁷² This is not necessarily supported by findings that have emerged from recent research among women researchers, which indicates that most women in HAUs have more teaching duties when compared to women from other institutions (NRF 2001). These findings need to be treated with caution, however, as they may be artefacts of the data, insofar as the response rate was much higher among academics at HAUs than those at other institutions.

⁷³ Although one may argue that the same applies to HWUs, the demands that the democratisation of tertiary education places on staff at these institutions, are not as extensive (CSD 1999).

In addition to racially differentiated funding and missions, most HDIs were disadvantaged by a campaign to isolate them physically, politically and academically (Jacobs 2001; Pityana 1992; Reddy 1992). For example, the rural location of a university such as the University of Venda isolated it geographically from other universities. Isolation limited access to resources, as well as to colleagues and other supportive networks at other institutions, as it ensured that renowned or “progressive” academics did not take up appointments at these institutions, and thus provided very little opportunity to expose staff and students to other institutions⁷⁴ (Maürtin-Cairncross 2003; Jacobs 2001). In addition, isolation from the mainstream of the country’s socio-economic and political life made it more difficult for HDIs to establish an infrastructure for research and to establish favourable relations with industry.

All these factors have contributed to seriously disadvantaging the HDIs, and continue to beleaguer these institutions. Their limited research capacity in comparison to their historically advantaged counterparts is clearly seen in the concentration of R&D output in the higher education sector between five and seven universities and between three and five technikons, *all of which are historically advantaged*. Even the ten top universities in the country, based on subsidised publication from 1986 to 1998, are all HAUs (CENIS 2001).

Despite concerted efforts since 1994 by the Government to develop research capacity at HDIs, relatively limited change has taken place in terms of equalising the resources of HAIs and HDIs (Bailey & Cooper 2003). Remnants of the above-mentioned historical differences are reportedly reflected in the reported absence of academic staff development programmes at HBUs (Subotzky 2001, cited in Maürtin-Cairncross 2003), as well as the findings of recent South African research among women researchers (Maürtin-Cairncross 2003; NRF 2001; CSD 1999), which clearly indicate that women at HDIs have less access to adequate facilities for the accessing of information - in particular computer and library facilities - than those at HAIs, and that these inadequacies are perceived as impeding their publishing endeavours. It has to be recognised that the building of research capacity and infrastructure is cumulative and occurs in a long timeframe (DoE 2001). In addition, the fact that research funds are allocated on the basis of already demonstrated research and graduate output, reproduces existing inequalities by continuing to operate against HDIs, who – like technikons - have developed little or no research reputation thus far.

⁷⁴ These factors were actually recently reported as barriers to publishing by women academics at the University of Venda (Maürtin-Cairncross 2003).

Thus, it is not surprising that HDIs are still characterised by a low research capacity. Less than ten percent of the subsidised research publication outputs in the country are produced by the ten HBUs^{75,76} (Cloete & Bunting 2000). Scientists from the HBUs have very few papers published, especially in prestigious journals, or presented at international conferences. Scientists from HAUs, on the other hand, have been found to present a larger number of papers both at conferences and workshops as well as published greater numbers of papers both nationally and internationally. (Jacobs 2001). Many other indicators, such as the number of projects listed, the average time spent on research⁷⁷, per capita expenditure, per capita output, total volume of output and R&D funds raised, number of master's and doctoral degrees awarded⁷⁸, ratio of master's and doctoral students to doctoral academics, and qualification level of academics all point to the same skewness in the higher education system (CSD 1999; DACST 1998a, b; Wolpe *et al.* 1997).

Distinguishing between institutional types on the basis of their historically disadvantaged or advantaged status is therefore important in any analysis of publication productivity, as it provides an indication of the richness of a scientist's research environment. However, institutional differences are again only relevant in a comparison between men and women's publication productivity, if women tend to be "institutionally ghettoized" by virtue of being more concentrated in the HDIs than in the HAIs. This does not seem to be the case in South Africa, as Wolpe *et al.* (1997) - and more recently Subotzky (2003:5) - report that women are uniformly under-represented at around a third of the total at all institutional types⁷⁹. Furthermore, research indicates that most women in HAUs have *more* teaching duties when compared to women from other institutions (CSD 1999; NRF 2001⁸⁰)

⁷⁵ Gross inequality is evident even within the group of HBUs, with just two institutions – the University of Durban-Westville and the University of the Western Cape – accounting for the bulk of this ten percent (DoE 2001)

⁷⁶ Although the contribution of the HBUs is still low, it is important to note that these institutions have more than doubled their contribution from 1986 to 1999. On a further positive note, two of the HBUs (the University of Durban-Westville and the University of the Western Cape) have increased their output to a level comparable with some of the HWUs (Bawa & Mouton 2002).

⁷⁷ Actually, in the case of universities, the proportions of time that women academics in the social sciences and humanities allocate to *both* instruction and research are higher at HWUs than at HBUs (CSD 1999).

⁷⁸ In the period 1991 to 1995, the HWUs were responsible for approximately 90 percent of all the master's and doctoral degrees awarded (DACST 1998a).

⁷⁹ A higher proportion of women is found at Unisa and the special-purpose HDUs (which can be accounted for by the vastly higher proportion of women at Vista) is evident, but is most probably a function of the range of fields offered in these institutions namely, humanities (especially education in the case of Vista) and the social sciences-fields in which women are traditionally strongly concentrated (Subotzky 2001). However, as Wolpe *et al.* (1997) point out, the high number of women at Vista may also be a function of the fact that a large number of posts at this university have been temporary and part-time, which women tend to fill.

⁸⁰ These findings need to be treated with caution, as they may be artefacts of the data insofar as the response rate was much higher among academics at HAUs than those at other institutions.

- Alternative classifications

HAUs may further be categorised according to various research-related criteria. Language-medium is sometimes used to distinguish between institutions (*cf.* Cooper & Subotzky 2001; Reynhardt 1982). Although it is not immediately clear why language medium would relate to research output, Reynhardt's (1982) early analysis of South African scientists' publication output in international journals does indeed show that English medium universities outshine Afrikaans medium ones as far as research is concerned (based on a comparison of publication time in manpower years per article). This may well be an artefact of Reynhardt's focus on "international" or ISI accredited journals, in which staff at English medium universities would have arguable published more readily at the time, than staff at Afrikaans-medium universities did. More recent statistics, based on number of permanent staff with doctoral degrees, show the high-capacity universities (defined in terms of) to be a "mix of historically white English- and Afrikaans-medium institutions" (Gibbon & Kabaki 2002:213). In fact, while the research output of Afrikaans-medium HWUs has increased moderately from 1986 to 1999, the proportion of outputs from English-medium HWUs declined substantially during the same time period (Bawa & Mouton 2002). Moreover, there seems to be no tendency for women to be more concentrated in either Afrikaans- or English-medium universities (Wolpe *et al.* 1997).

What research has shown clearly, is that since the early eighties five universities - the Universities of Cape Town⁸¹, Pretoria, the Witwatersrand, Natal and Stellenbosch - have consistently emerged as the top research institutions in the country. This pattern is consistent irrespective of the criterion used: e.g., research output, based on number of international publications (Pouris 1989b), or on the number of subsidised research publication outputs in South Africa⁸² (CENIS 2001; DoE 2001; Cloete & Bunting 2000), the number of front-line researchers, as identified by a large-scale peer evaluation (Pouris 1989b), expenditure of the R&D funds available within the higher education system⁸³ (Cloete & Bunting 2000), and production of master's and doctoral graduates (DoE 2001).

Interestingly, with the exception of the University of the Witwatersrand, which is on par with the average percentage of women academic staff at our universities, these top five institutions

⁸¹ Not surprisingly, in terms of mainstream scientific output the University of Cape Town is also the most productive of all African institutions (Narváez-Berthelemot *et al.* 2002:234).

⁸² The five dominant universities produce approximately 60 percent of all scientific output within the university sector (Bawa & Mouton 2002).

⁸³ In South Africa, 61 percent of all R&D funds available within the higher education system is expended by these five universities (Cloete & Bunting 2000). A similar situation has been reported for the UK, where the country's

fall mostly below (between 29% and 33%) this average. This again provides some indication – albeit it on a much smaller scale than the pattern which has been observed in the United States – of women’s “institutional ghettoization” in South Africa: in general, the higher the prestige of an institution, the lower the proportion of women working at that institution, and *vice versa*. As with rank, causal reciprocity needs to be taken into account before jumping to the conclusion that women’s lower publication productivity may be partly explained by their institutional affiliation. In other words, it may be that *because* of their higher publication productivity, men’s chances of finding a career at one of the top universities are higher than women’s, as these universities hire the best scientists. Stated otherwise, women’s lower publication productivity may be either the effect or the cause of their institutional ghettoization. However, previous longitudinal studies undertaken in the United States, which have monitored the publication histories of scientists between locations and over time, indicate a stronger causal effect of institutional location upon productivity than *vice versa* (Fox 1991). It is therefore more probable that the most productive scientists are found at the aforementioned five HAUs, because these institutions are able to encourage and facilitate the productivity of their members, not because they appoint productive faculty.

In summary, it seems that in the South African context institutional affiliation should only be considered a potentially confounding variable when comparing the publication productivity of men and women who are working in the university sector. As a control variable, it will consist of three categories that distinguish between (1) the top five HAUs, (2) the other HAUs, and (3) HDUs, in order to test if the prestige of the university at which men and women are employed, in part explains differences in publication productivity between the sexes.

3.3.3.2 *Scientific domain*

Over 50 years ago, Meltzer observed that for research on scholarly productivity there is “wisdom in treating each discipline...separately” (1949:29, cited in Wanner *et al.* 1981). So many publication productivity-related differences exist across disciplines, that disciplinary norms are posited as one of four broad explanations⁸⁴ for the general variance in publication productivity among a population of faculty. This explains why, in bibliometrics, fields are rarely compared directly to one another. Rather, comparisons are made within a single field (Phelan 2000). For instance, in a report compiled by CENIS (2001), results from the NRTA are reported only for the

twenty large universities with medical schools (known as the Russell group) secure 75 percent of all research awards and contracts (Bagilhole 2002).

natural science respondents, “in order to ensure that “disciplinary” difference would not affect the analyses in any major way” (27). Moreover, differences between the sexes in terms of their participation in various disciplines have been proven so consistently (see Chapter 2, section 2.3.2.4), that it is controlled for in most studies on gender differences in publication productivity.

First and foremost, disciplines vary in the amount of published research that is accepted and rewarded as the norm. Some disciplines (e.g., the visual and performing arts) place a greater emphasis on creative outputs, than on traditional research publications. In its NPHE, the DoE (2001) recognises this bias against certain disciplines in the arts and humanities, as not all creative output, such as music and drama are recognised in current policies and procedures to measure output. In addition, more practitioner-oriented disciplines (e.g., education and social work) place a greater emphasis on application and practice than on research and publication. According to United States data, women tend to be located in these disciplines more than in others (Simeone 1987). In South Africa, it may be argued that an increase in contract research both from Government and the private sector (DoE 2001) may have substantially increased the number of policy reports produced by faculty in the social sciences. These reports are usually not published or peer-reviewed, and are therefore not recognised in measures of research output.

Secondly, disciplines vary in the format in which research findings are published: where a substantial proportion of the publications in the “soft disciplines” (the humanities and the social sciences) consists of books, faculty in “hard disciplines”, such as the natural sciences, are more likely to publish in the form of the shorter, less narrative journal article (see 3.1.2.3 above). It is therefore not surprising that in South Africa the results of the SSRD, which counted journal article publications, revealed a higher overall rate of scientific publications for the natural than for the social sciences (DACST 1998b).

Thirdly, disciplines vary in the relative ease of publication of research findings that they provide (Franklin 1988). For instance, scientists in the laboratory sciences probably publish more articles than those in the social sciences and the humanities, due to the fact that they conduct controlled experiments, which yield publishable papers more readily⁸⁵ (Hamovitch & Morgenstern 1977). On the other hand, social scientists tend to produce more narrative pieces -

⁸⁴ The other three explanations which Teodorescu (2000:204) identifies in the literature, are psychological-individual characteristics, cumulative advantage and reinforcement.

⁸⁵ However, combining motherhood with research publication might be more difficult in the laboratory sciences, as access to laboratory facilities might require women who are caring for young children to be away from home at specified times, for a considerable period of the day. On the other hand, a woman working in the arts, social sciences, or law can combine looking after a baby or young children for part of the day with reading and writing-up

longer articles than natural scientists (*ibid.*), and books that are “harder” to publish (Astin 1991:68). There are also dramatic differences in the acceptance rates of journals in various disciplines. While most papers submitted for publication in the physical sciences are accepted, rejection rates tend to be higher in social science journals (Astin 1991; Zuckerman & Merton 1973, cited in Cole 1979). This contrast has also been noted in South Africa by Alexander (2004a:1), who reports anecdotal evidence that, typically, “the time lag between the submission of a natural science article and its publication is about a month and a half, which compares to perhaps a year and a half in a typical social science publication”. Cole and Cole (1967) ascribe this difference to the relative “maturity” of the natural sciences, which lead to less resistance to new ideas. Among the less mature social sciences, there is less consensus as to what constitutes acceptable work, and therefore resistance may be a more significant problem in these disciplines.

Other publication-related variations between disciplines include the fact that they differ from one another in the time required to earn the PhD (over ten years in the humanities and about five in the natural sciences)⁸⁶, the custom of working alone or in teams, and therefore to publish solely or jointly (see section 3.1.4.1 above), teaching loads, particularly as a function of the size of undergraduate enrolments (greater among the social sciences and humanities⁸⁷), the value accorded to teaching and the time accorded to it (usually higher in the humanities), the number of publication outlets, in particular journals (lower in the humanities⁸⁸), and research funding. With regard to the latter, a larger slice of the available funding “cake” is usually set aside for the natural sciences, engineering and technology. According to current South African government policy, for example, universities are given half the level of funding for social science students that is paid for natural science students (Alexander 2004a).

In South Africa a much greater majority of women faculty (61%) than their male counterparts (50%) work in the social sciences and humanities, and a much smaller percentage of women (21%) than men (38%) are located in the natural sciences and engineering (Bailey & Mouton 2004). Thus, women faculty in this country also tend to be concentrated in disciplines with lower average rates of publication, in particular journal publication. They are also clustered in

her work. As such, the latter may make more progress than the former, whose research is more likely to suffer (Sutherland 1985).

⁸⁶ It stands to reason that the longer the time spent on achieving a doctorate, the less time is concentrated on other research that may lead to publications.

⁸⁷ This is also a feature of the South African disciplinary landscape, with social scientists, in particular, teaching more students, “draining them of the time and energy that might otherwise be given to scientific enquiry” (Alexander 2004a:4).

⁸⁸ For example, the social sciences do not have any journals with a similar status to *Nature* and *Science*, both of which appear weekly (Alexander 2004a).

disciplines in which resources are less easily transformed into publication. Thus, women's lower publication productivity may in part be a function of their greater likelihood of working in the social sciences and humanities. It is therefore important to control for discipline, either by conducting a field-specific study, or statistically, by comparing the publication productivity of men and women within a single discipline and not across disciplines. In the analysis of SA Knowledgebase, publication and gender-related variation between three clusters of disciplines, known as scientific domains, is controlled for statistically in order to test to what extent gender differences in publication productivity are a function of this variation in the South African context.

According to Phelan (2000), there are two main ways to define disciplinary field when analysing bibliometric data. The first, and most commonly used, is a journal-to-field approach, where a field is identified according to a list of journals that seem to represent that field. The definition of field is therefore journal-based: journals are assigned to fields, and all papers in a given journal are assigned to that journal's field. The journal-to-field approach is to a certain extent problematic in the case of multidisciplinary journals⁸⁹. More importantly, if bibliometric data are used to analyse not articles, but *authors* as a unit of analysis, the journal-to-field approach is inappropriate, as authors may publish articles in a variety of journals, each of which may imply a different field categorisation for that author. This is complicated even further by findings elsewhere that many of the publications that emerge from scholars affiliated with particular disciplines appear in journals that are not associated with those disciplines (Najman & Hewitt 2003).

The second approach, which identifies a field according to the particular department in which a scientist is working, is therefore followed in the present analysis of authors in SA Knowledgebase. The data were gleaned from the institutional address of the author of an article, which includes the name of the department with whom the author is affiliated. This approach is, however, also characterised by some limitations. It needs to be noted that discipline and department are conceptually distinct, as several disciplines may be grouped together in one department. The potential classification problems resulting from this practice were partly addressed in the present study, by aggregating disciplines into three broad clusters or domains: 1) social sciences and humanities, 2) medical sciences, and 3) natural sciences and engineering. The South African Research Classification System, a national classification system for scientific

fields, disciplines and areas of specialisation (see DACST 1998b, Appendix, List A), was used as a basis on which to both classify and aggregate disciplines. SARCS was initially developed by a task team of the NRTA. It was subsequently refined through empirical validation, and is believed to be “ideally suited to the South African context” (DACST 1998b:137). The categorisation of disciplines into these three scientific domains is also consistent with other studies on research productivity-related issues in South Africa, for example, the NRTA surveys (DACST 1998a, b), and the Women in Science Project (Bailey & Mouton 2004).

4 Conclusions

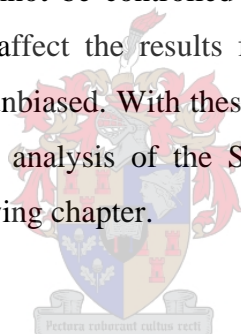
Bibliometric databases provide efficient and objective means for comparing the research performance of nations, scientific disciplines, journals and individual scientists. The unobtrusive data collection methods employed by bibliometricians tend to produce more reliable data than a survey design. In addition, as a large, national bibliometric database, SA Knowledgebase allows the analysis of data on a far greater number of cases than is usually possible to obtain from surveys. However, there are a number of issues associated with the definition of the study population, and the conceptualisation and measurement of publication productivity used in SA Knowledgebase, that have implications for a study of gender differences in publication productivity. As SA Knowledgebase implies a contribution-based definition of the population of scientists to be analysed, it excludes those of whom publication is expected, but who do not publish. Considering that women are usually disproportionately represented among non-publishers, excluding non-publishing women will probably reduce gender differences in levels of publication productivity. Direct comparisons with findings from surveys that include non-publishers can therefore not be drawn. A bias in sampling in favour of a select group of publishing women also reduces the generalisability of the findings of the analysis.

The definition of research productivity as publication output, measured by a single indicator – a count of mainstream journal articles – in SA Knowledgebase, is the most common conceptualisation and operationalisation of research productivity that is found in scientometrics. In addition to practical advantages associated with such a measure, proven high concurrent validity and the fact that peer-reviewed journals are the primary and most highly regarded medium of communication between scientists in most fields, further justify such an approach.

⁸⁹ According to Pouris (1989a; 1988), journals that contain papers from several different fields may be apportioned among those fields according to the approximate share of the journal that is devoted to each field. Each paper from that journal is then given the same field assignment as the journal as a whole, so that it is split among the fields.

However, this essentially crude measure captures neither the multidimensional nature of research productivity, nor the heterogeneous nature of publication productivity. In particular, the mono-operation bias (Cook & Campbell, cited in Mouton 1996) introduced by employing a single indicator in order to measure the construct of research productivity, may very well be gender-related: because it does not capture proven gender diversity in publication format and/or style, a single indicator of publication productivity might not provide a clear picture of real gender disparities in research productivity.

The results of any analysis of authors' publications, as recorded in SA Knowledgebase, may be confounded a number of variables. Fortunately, SA Knowledgebase data allow one to control for a few of these. However, a lack of data on a number of other gender-related variables that have proven relevance to publication productivity, as reported in the literature, limits the extent to which gender differences in publication productivity may be explained. In addition, the fact that information on highest qualification and rank is most probably outdated for some authors in the database, but not for others, cannot be controlled for. However, the potential bias it may introduce should not *differentially* affect the results for men and women, and consequently gender comparisons should remain unbiased. With these limitations and considerations in mind, the author now turns to the actual analysis of the SA Knowledgebase data, which will be presented and discussed in the following chapter.



CHAPTER 4

A Secondary Analysis of SA Knowledgebase

1 Introduction

This chapter presents the results of a secondary analysis of data that are contained in SA Knowledgebase, a national database of scientific journal article publications and their authors. The analysis is aimed primarily at describing the nature and extent of gender differences in publication productivity among authors in South African HEIs. It involves four distinct objectives: (1) quantifying gender differences in publication productivity, by comparing publication productivity averages and distributions between men and women, (2) longitudinally analysing changes in gender differences over the period 1990-2001, (3) controlling for potential covariates of gender and publication productivity by means of multivariate analysis, and (4) determining whether there are gender differences in the tendency to co-author scientific articles.

In 2003 the author imported SA Knowledgebase data into the *Statistical Package for the Social Sciences* (SPSS), in order to create a dataset of 6 763 South Africans working in the higher education sector who authored at least a part of one full-length article in a recognised scientific journal between 1990 and 2001. The original database comprised a few fields: name and title, qualification, year of birth, citizenship, gender, race, department/field, employing organisation, position/rank, and number of article equivalents published. Most of the fields (excluding year of birth and number of article equivalents published) were in string format. In order to facilitate their statistical treatment in SPSS, the fields had to be transformed into variables with categories to which numerical codes could be assigned¹. Data validation was also performed, by checking for obvious errors and inconsistencies, such as between gender and title, or between degree and rank. After processing and cleaning, data were analysed using SPSS v. 10.

The data analysis proceeded through five stages. First, the subset of authors was described in terms of simple frequency distributions involving seven variables: gender, chronological age, race, highest qualification, rank, institutional affiliation, and scientific domain. Secondly, in

¹ Even with the use of the automatic recode function in SPSS, this proved to be an extremely time consuming task, made difficult by variations in the manner in which different data capturers entered the same data, especially their inconsistent use of capitalisation and/or abbreviations.

order to determine the extent and nature of gender differences in publication productivity, the sexes were compared in terms of the arithmetic mean and other measures of central tendency². As a given difference in mean publication productivity may be generated by a variety of distributions, comparisons between men and women's publication productivity frequency distributions and standard deviations were also drawn.

In order to determine if there have been any noticeable changes in gender differences in publication productivity since 1990, a longitudinal comparison of the annual ratio of publications authored by men and by women from 1990 to 2001 was undertaken. Whereas the previous analyses involve comparing individual authors in terms of their publication productivity, trends over time in productivity differences between the sexes can only be analysed by comparing published article equivalents, as these are connected to particular years (of publication) in SA Knowledgebase. Data on the total number of articles equivalents published each year from 1990 to 2001 by males and females (irrespective of the R&D sector in which they are employed) were extracted from the original SA Knowledgebase. This allowed a comparison between the percentage of article equivalents authored by males and the percentage authored by females on a year-to-year basis, in order to identify any trends over time in this differential.

Previous research has found that gender differences in publication productivity are confounded by gender differences in other factors that are related to productivity (see Chapter 2, section 1.3.4.2). The extent to which some of these variables mediate between gender and publication productivity in South Africa was determined next, by performing multivariate analysis that allows one to observe the effect of controlling various variables on the observed gender difference in publication productivity. Finally, gender differences in publication productivity may be attributed in part to women participating less often than men in collaborative research (Cole 1979). In order to determine the validity of this hypothesis in the South African context, one needs to determine if the extent of multiple authorship is indeed lower among women than men. By comparing the sexes in terms of the ratio between number of unweighted articles and number article equivalents published, an indication is provided of possible gender differences in the tendency to collaborate in publication.

² Since population data (or at least data that is available for a subset of a population) and not randomly selected sample data are presented, tests of statistical significance (such as the chi-square statistic, t-tests, etc.) were not computed in order to test the significance of the observed gender differences. Significance tests, which assess the probability of findings resulting from sampling error, are generally considered inappropriate when applied to population data, because there is no larger population to which one wants to generalise, and therefore no risk that the observed gender differences could be the result of sampling error (Babbie & Mouton 2001:484-487).

The presentation of the results of the secondary analysis are followed by an interpretation of the main findings, which will include putting forward possible explanations for the findings, and drawing comparisons with results reported in the literature. Such comparisons are useful in order to establish which features of the gender difference in publication productivity are unique to the South African context. In conclusion, the possible implications of the findings for women staff at HEIs are highlighted and, in the light of the limitations of the database and analysis, recommendations for further research are made.

2 Results

2.1 Description of the subset of authors

The subset of authors analysed in this study, is predominantly male, as less than 30 percent of authors are female:

Table 1
Gender Distribution of the Authors

<i>Gender</i>	<i>N</i>	<i>%</i>
Female	1937	28.6
Male	4826	71.4 ³
Total	6763	100.0

The mean age of authors is 43, and only one fifth of authors are under 35 years of age. However, on average, women authors are four years younger than their male counterparts (40 as opposed to 44 years). It is clear from Table 2 below that women tend to be clustered in the younger age categories to a greater extent than men are. While more than two-thirds of women authors are under 35 years of age, only approximately half of the male authors is that young.

³ It is interesting to note that a census of scientists and technologists, which was carried out in 1983 in Venezuela, produced a very similar result: that 70.8% of the population of scientists and technologists in that country were men (Lemoine 1992).

Table 2
Age Distribution of the Authors, by Gender

<i>Age categories</i>	<i>Women</i>			<i>Men</i>			<i>Total</i>		
	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>
< 35 years	420	29.8	29.8	674	17.3	17.3	1094	20.6	20.6
35-44 years	546	38.7	68.5	1296	33.3	50.6	1842	34.7	55.3
45-54 years	348	24.7	93.2	1383	35.5	86.1	1731	32.7	88.0
55-64 years	87	6.2	99.4	476	12.2	98.3	563	10.6	98.6
> 64 years	9	.6	100.0	62	1.6	100.0	71	1.3	100.0
Total	1410	100.0		3891	100.0		5301	100.0	
Mean age		40.2			44.1			43.1	

With regard to the racial composition of the subset, authors tend to be predominantly (89%) white, with almost equally small percentages of Africans (4.6%), Asians (4.2%), and a very small percentage of coloureds (2.5%) that constitute the subset of black of authors. As Table 3 shows, the race distribution within the two gender groups closely resembles the pattern that is found within the subset as a whole:

Table 3

Race Distribution of the Authors, by Gender

<i>Race</i>	<i>Women</i>		<i>Men</i>		<i>Total</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
White	1492	90.4	3587	88.2	5079	88.8
African	52	3.1	210	5.2	262	4.6
Asian	68	4.1	170	4.2	238	4.2
Coloured	39	2.4	102	2.5	141	2.5
Total	1651	100.0	4069	100.0	5720	100.0

Considering that a PhD is often a pre-requisite for conducting research at HEIs, it is not surprising that two-thirds (67%) of the authors in this R&D sector have attained a doctorate qualification, while only a quarter (26%) are in possession of a master's degree. The frequency table below shows, not surprisingly, that those authors with an undergraduate or lower

postgraduate degree comprise less than ten percent of the subset. However, a greater proportion of women authors (12%) compared to the proportion of men authors (5%) have not yet attained their master's degree, and while slightly more than half of all women authors have a doctorate, a far greater majority of men (72%) have reached this highest qualification.

Table 4
Highest Qualification Distribution of the Authors, by Gender

<i>Highest qualification</i>	<i>Women</i>			<i>Men</i>			<i>Total</i>		
	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>
Undergraduate	93	6.4	6.4	105	2.6	2.6	198	3.6	3.6
Lower postgrad.	82	5.7	12.1	99	2.5	5.1	181	3.3	6.9
Masters	505	34.9	47.0	929	23.0	28.1	1434	26.1	33.0
Doctoral	769	53.1	100.0	2905	71.9	100.0	3674	67.0	100.0
Total	1449	100.0		4038	100.0		5487	100.0	

With regard to the type of institution that authors are affiliated to, Table 5 below shows that a negligible percentage (less than 3%) is employed at a technikon, while by far the greatest majority is affiliated to a university. The vast preponderance (85%) of the university affiliated authors are located at HAUs, in particular the five universities ranked as the top research institutions in the country: more than half (57%) of the authors are employed at these institutions, while a mere twelve percent of authors are located at a HDU.

Table 5
Institutional Affiliation Distribution of the Authors, by Gender

<i>Institutional type</i>	<i>Women</i>			<i>Men</i>			<i>Total</i>		
	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>
Top 5 HAU ⁴	1016	52.5	52.5	2851	59.2	59.2	3867	57.3	57.3
Other HAU ⁵	615	31.8	84.3	1275	26.5	85.7	1890	28.0	85.3
HDU ⁶	233	12.0	96.3	578	12.0	97.7	811	12.0	97.3
Technikon	71	3.7	100.0	115	2.4	100.0	186	2.8	100.0
Total	1935	100.0		4819	100.0		6754	100.0	

Table 5 further shows that neither gender group significantly deviates from the pattern described above. The greatest difference is observed at the most prestigious HAUs: a greater proportion of male authors (almost 60%) are employed at one of the top five HAUs, while only slightly more than half of the women authors are affiliated to these institutions. On the other hand, the proportion of women at other HAUs and technikons is higher than the proportion of men who work at these institutions. No gender difference is evident with regard to HDUs, as equal percentages of men and women (12% in each case) are affiliated to these institutions.

Based on available data, less than half of the authors at HEIs (45.5%) can be classified as “instructors” in the regular academic positions of junior lecturer, lecturer, senior lecturer, associate professor or professor. Of these approximately 3 000 cases, slightly less than half (48%) fill the professorial ranks, while the ranks of senior lecturer and lecturer are represented by 28 percent and 22 percent of the subset of authors, respectively. Not surprisingly, junior lecturers comprise a mere 1.7 percent of the instructors who are authors of articles published in accredited journals.

⁴ The Universities of Cape Town, Pretoria, the Witwatersrand, Natal and Stellenbosch.

⁵ The Universities of the Free State, Port Elizabeth, Potchefstroom, Rhodes, South Africa, and Rand Afrikaans University.

⁶ The Universities of Fort Hare, the North, Transkei, Venda, Zululand, Durban-Westville, the Western Cape, North West University, Vista University and Medunsa.

Table 6
Academic Rank Distribution of the Authors, by Gender

<i>Academic rank</i>	<i>Women</i>			<i>Men</i>			<i>Total</i>		
	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>
Junior lecturer	29	3.5	3.5	24	1.1	1.1	53	1.7	1.7
Lecturer	316	37.8	41.3	372	16.6	17.7	688	22.4	24.1
Senior lecturer	286	34.2	75.5	576	25.7	43.4	862	28.0	52.1
Associate prof	86	10.3	85.8	277	12.4	55.8	363	11.8	63.9
Professor	119	14.2	100.0	993	44.3	100.0	1112	36.1	100.0
Total	836	100.0		2242	100.0		3078	100.0	

When the data on rank distribution are disaggregated by gender, it is evident that women authors are far more concentrated below professorial ranks, than men authors are: three-quarters of women authors, as opposed to less than half of the men, are employed below the rank of associate professor. While women authors' proportionate representation is greater than men's at all three lecturer ranks, it is interesting to note that almost equal proportions of the sexes are found at the associate professor level. However, only 14 percent of women authors as opposed to 44 percent of men authors have reached the rank of full professor.

Finally, with regard to scientific domain, 41% of the subset of authors work in social sciences and humanities fields, while only a half of that percentage of authors are located in the medical and health sciences. A third of the subset may be classified as natural scientists or engineers.

Table 7
Scientific Domain Distribution of the Authors, by Gender

<i>Scientific domain</i>	<i>Women</i>		<i>Men</i>		<i>Total</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Social sciences & humanities	960	51.7	1791	39.3	2751	42.9
Natural sciences & engineering	406	21.9	1811	39.7	2217	34.6
Medical & health sciences	490	26.4	958	21.0	1448	22.6
Total	1856	100.0	4560	100.0	6416	100.0

Slightly more than half of the female authors work in the social sciences and humanities, but only 22 and 26 percent are publishing in the natural sciences and engineering, and in the medical and health sciences, respectively. Among male authors, a quite different pattern emerges: this gender group is equally divided between the social sciences and humanities (39.3%), and the natural sciences and engineering (39.7%), while a lower percentage of men (21%) than women authors are found working in the medical and health sciences.

In summary, the subset of authors that is analysed consists predominantly of white males over the age of forty, who have attained their doctorate degree, and are employed as professors at HAUs. The women authors in the subset are on average younger and less qualified, and more concentrated in the lower academic ranks and in the social sciences and humanities fields than their male counterparts. In comparison with the male authors, the women are also slightly less likely to be employed at one of the top five research institutions in the country. Although these characteristics are relatively consistent with previous findings on the human resources profile in higher education (e.g., Bailey & Mouton 2004; Cooper & Subotzky 2001; DACST 1998a), it is important to bear in mind that the subset of authors analysed here consists of a selective group of *actively publishing* academic women and men. This is especially relevant point to keep in mind when drawing conclusions about women authors, as the findings are only generalisable to those female academics who have managed to publish, despite domestic responsibilities and other structural barriers to publication faced by women in particular. In addition, the results reported here cannot be taken as representative of all actively publishing authors at South African HEIs, because of possible biases resulting from missing data and outdated information on time-varying variables (see Chapter 3). However, they do provide a useful background against which the results may be interpreted.

2.2 Quantifying gender differences in publication productivity

2.2.1 **Measures of central tendency**

A comparison of the mean number of article equivalents published by women and men provides a rough indication of gender differences in publication productivity. However, as the arithmetic mean is sensitive to the influence of a small number of extremely productive authors who publish a high number of article equivalents, and males have been found to be more highly represented among these authors than females are (Zuckerman 1991; Primack & O'Leary 1989; Cole & Zuckerman 1984), it is useful to also consider other measures of average productivity

that are not sensitive to extreme values. In Table 1 the mean and the median (the number of article equivalents above and below which half the authors fall) are reported in order to compare the number of article equivalents that the two gender groups publish on average.

Table 8

Means, Medians and Modes of Number of Article Equivalents by Gender

<i>Gender</i>	<i>Number of article equivalents</i>	
	<i>Mean</i>	<i>Median</i>
Female	2.99	1.98
Male	5.25	3.00
Total	4.60	2.55

N = 6763

Both the mean and the median indicate that the men author at least a third more article equivalents than their female counterparts do. The men publish a mean of 5.25 article equivalents, while the mean is lower for the women at approximately 3. When the medians are considered, the women publish on average two article equivalents, while the men publish three. However, the male-to-female ratio of means (.57) is much lower than the ratio of medians (.66). In other words, if the mean is considered, the women author on average 43 percent fewer article equivalents than the men do, but the median indicates that they publish only 34 percent less than males. This probably reflects differences between the sexes in terms of the range and distribution of the number of article equivalents published, which necessitates a closer look at how publication productivity is distributed among the women and men.

2.2.2 A gender comparison of publication productivity distributions

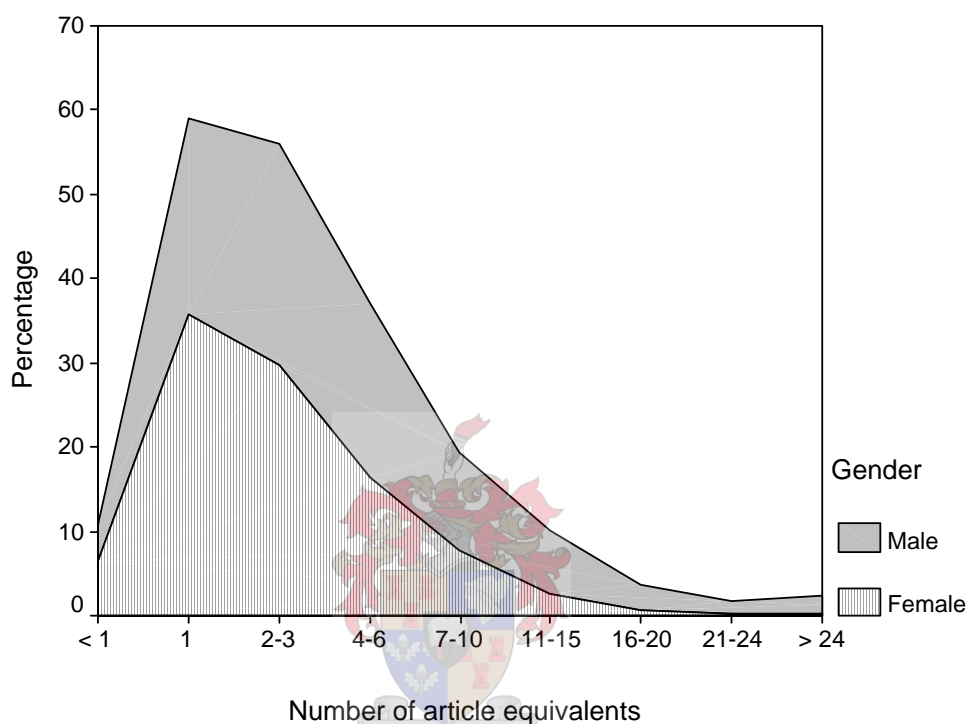
Are the differences in average publication output due to a disproportionate number of males having extremely high productivity, a disproportionate number of females having low productivity, or some combination of these patterns? In order to answer this question, frequency distributions of number of article equivalents for women and men need to be compared. The number of article equivalents was rounded off to whole numbers and grouped into categories⁷ to

⁷ The cut-off points are not completely arbitrary, but were chosen in accordance with Price's (1963) seminal research on the skewness of distributions of publications in science. Moreover, Cole and Zuckerman (1984), who measured publication productivity over a very similar time period (12 years) as the 11-year period covered in the present study, used Price's cut-off points when they compared the publication productivity distributions of men and women scientists in America.

create an interval scale of article equivalents. A comparison between the men and women authors in terms of their distribution on this scale is graphically represented in a stacked area chart:

Figure 1

Distribution of Number of Article Equivalents for Men and Women Authors



N = 6763

Figure 1 clearly illustrates what is known as a “concentration and dispersal effect” (Yablonsky 1980:4), or “over-dispersion” (Xie and Shauman 1998:853) among both the women and men authors. That is to say, the distributions are characterised by the dispersion of article equivalents over a large number of authors with relatively low publication productivity, and the concentration of publications of a few highly productive authors. In other words, among both men and women authors a minority is highly productive in comparison to most authors who tend to publish a relatively low output – in this case the mode is one article equivalent for both sexes. The relative rarity of a high number of publications among authors results in a highly skewed distribution of publication productivity for both the men and women. Over-dispersion is also apparent if one considers the following statistics based on the raw article equivalent data, as presented in the following table:

Table 9

Descriptive Statistics on the Number of Article Equivalents for Women and Men Authors

<i>Women</i>		<i>Men</i>	
Mean	2.9936	Mean	5.2510
Std. Deviation	3.5106	Std. Deviation	6.4848
Variance	12.3245	Variance	42.0525
Skewness	3.279	Skewness	3.380
Maximum	38.00	Maximum	75.72
N = 1937		N = 4826	

In the case of both sexes the variance of publication productivity far exceeds the mean of publication productivity, and the standard of deviation is quite large. Also, among the men and women it is the standard deviation, rather than the variance of article equivalents published, that is closest to the mean. Indeed, among both sexes the mean and the standard deviation tend to have nearly the same numerical values – a result that is consistent with previous research on publications (e.g., Allison 1980). The distribution of number of article equivalents is almost as skewed for the female than for male authors, as suggested by the skewness index, which is only slightly lower for the women (3.3), than for men (3.4).

Apart from these similarities between the pairs of publication productivity distributions of the men and women authors, differences are also apparent. In particular, a more severe over-dispersion is observed among the male authors than among their female counterparts, as indicated by a larger standard deviation and the much larger extent to which the variance exceeds the mean among male authors. In addition, the number of article equivalents published by the men stretches over almost exactly twice the range that women's do. This difference is primarily the result of the fact that the maximum number of article equivalents published by a woman in the dataset is 38, while the maximum publication output recorded for a male author is almost exactly twice as high at 75.7 article equivalents. Thus, even the most productive women publish less than their male counterparts. Although the area chart and descriptive statistics provide an overall view of the situation for the women and men, for finer gender comparisons to be drawn, the data presented in Figure 1 is also reported in table format:

Table 10

Distribution of Number of Article Equivalents for Men and Women Authors

<i>Number of article equivalents</i>	<i>Women</i>			<i>Men</i>			<i>Total</i>		
	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>	<i>N</i>	<i>%</i>	<i>Cum %</i>
Less than 1	126	6.5	6.5	209	4.3	4.3	335	5.0	5
1	692	35.7	42.2	1120	23.2	27.5	1812	26.8	31.7
2-3	574	29.6	71.9	1270	26.3	53.9	1844	27.3	59.0
4-6	319	16.5	88.3	995	20.6	74.5	1314	19.4	78.4
7-10	152	7.8	96.2	555	11.5	86.0	707	10.5	88.9
11-15	50	2.6	98.8	364	7.5	93.5	414	6.1	95.0
16-20	13	.7	99.4	146	3.0	96.5	159	2.4	97.4
21-24	5	.3	99.7	70	1.5	98.0	75	1.1	98.5
25 or more	6	.3	100.0	97	2.0	100.0	103	1.5	100.0
Total	1937	100.0		4826	100.0		6763	100.0	

It has already been observed above that the publication output of the most productive male author is almost exactly twice as high as that of the most productive female author. In order to determine if women as a group are under-represented among the extremely productive authors, one first needs to operationalise “extremely productive”. Two approaches will be followed here. First, previous researchers (e.g., Cole & Zuckerman 1984) have defined “prolific” authors as those who publish approximately 1.5 to 2.0 papers annually. If one applies this operationalisation to SA Knowledgebase, which measures publication productivity over an 11-year period, sixteen or more total article equivalents over this period may be considered “prolific”. Although 6.5 percent of the male authors fall into this category, only 1.2 percent of the women published sixteen or more article equivalents.

Alternatively, one may define “prolific” authors as those that fall into the top stratum of the subset of authors as a whole. If the top twenty percent is arbitrarily taken to represent this stratum, the top 20th percentile provides a cut-off point of seven or more article equivalents for the subset as a whole. Thus, to be included in the group of authors that may be considered extremely productive relative to the subset as a whole, authors must have published at least seven article equivalents in the period 1990-2001. Of this group slightly more than a tenth, or about 11.7 percent are women, while more than a quarter (25.5%) of the male authors are top

producers. In summary, independent of how “prolific” authors are defined, a smaller share of women than men turn up among those who publish large numbers of article equivalents.

However, the data summarised in Table 10 also shows that gender differences in productivity are not only the result of differences in the upper extremes of productivity. Although the high concentration of authors at the lower end of the interval scale prevents one from using percentiles to determine clear cut-of points, the data do show a clustering of the women among the less productive authors. Among the least productive who have authored less than one article equivalent (i.e., those who have not yet sole-authored⁸ an article), a greater percentage of the women (6.5%) than men (4.3%) publish less than one article equivalent. Moreover, a far greater concentration of the women (36%) than the men (23%) is found among those who have authored only one article equivalent. Consequently, almost three quarters (72%) of the whole subset of women authors have not published more than three article equivalents, while only slightly more than half (54%) of the male authors are represented in this group. Thus, in addition to being under-represented among the productive authors, the women are also over-represented among the relatively unproductive authors.

One may therefore conclude that the difference in means reported in Table 8 above is determined by gender differences in both extremes of publication productivity: the most productive male authors exceed the productivity of the most productive women, and a greater proportion of the men authors may be described as “prolific”, while a greater proportion of the women authors have very few article equivalents to their name.

2.3 Longitudinal analysis: investigating changes in gender differences over time

Whereas the sexes have been compared thus far in terms of their output of article equivalents, the next objective is to compare the annual number of article equivalents published by men and women scientists from 1990 to 2001, in order to determine if the gender differences have been more or less constant over this period, or if they have grown or diminished with the passage of time. Data extracted from SA Knowledgebase on the number of article equivalents published each year, as well as women and men’s share of this output, are presented in the following table:

⁸ The reader should note that, although no authors with less than one article equivalent to their name could possibly have published a sole-authored article, this does not necessarily imply that an author of one or more article equivalents has sole-authored an article. Authors may accumulate one or more article equivalents from publishing a number of multi-authored articles.

Table 11
Gender Differences in Publication Productivity Over Time, 1990-2001

<i>Year</i>	<i>Total no. of article equivalents published</i>	<i>Article equivalents authored by women</i>		<i>Article equivalents authored by men</i>	
		<i>Raw number</i>	<i>%</i>	<i>Raw number</i>	<i>%</i>
		1990	2993.69	478.12	15.97
1991	3128.37	489.01	15.63	2639.36	84.37
1992	3252.41	569.76	17.52	2682.65	82.48
1993	3329.35	611.66	18.37	2717.69	81.63
1994	3579.44	688.77	19.24	2890.67	80.76
1995	3552.87	705.09	19.85	2847.78	80.15
1996	3597.99	784.19	21.80	2813.80	78.20
1997	3494.98	701.05	20.06	2793.93	79.94
1998	3374.02	733.26	21.73	2640.76	78.27
1999	3545.07	761.08	21.47	2783.99	78.53
2000	3820.01	826.78	21.64	2993.23	78.36
2001	3440.45	819.46	23.82	2620.99	76.18
Total	41108.65	8168.23	19.87	32940.42	80.13

Table 11 provides further evidence that women authors publish a smaller number of article equivalents than men do. During the entire period for which data are available, women authors as a group published just less than one-fifth of the total number of article equivalents recorded in SA Knowledgebase, while men published the remaining 80 percent. However, since 1991 women's contribution has steadily increased – albeit in small increments – from less than 16 percent to almost 24 percent in 2001, while male authors' contribution has decreased accordingly.

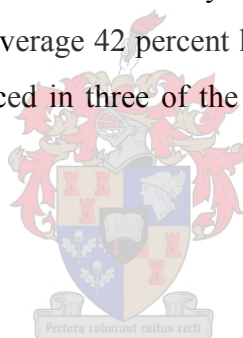
2.4 Multivariate analysis: controlling for relevant variables

When comparing women authors with their male counterparts, it is important that one compares like with like. In other words, it is necessary to take into account the influence of variables that are associated with both gender and publication productivity, by holding these factors constant when comparing the sexes in terms of their publication productivity. The variables that are

controlled for in this analysis include the biographic variables of age and race⁹, as well as structural variables that facilitate publication productivity, but are usually unequally distributed between men and women authors. These are represented by highest qualification and rank and two institutional variables: the type of institution and the field in which an author works. In order to control for the confounding effect of these variables, six separate multivariate cross-tabulations were performed. The male-to-female ratio of mean¹⁰ article equivalents in each of the categories of the control variables is compared with the ratio found for the subset of authors as a whole¹¹, in order to determine the relative effect of each of these variables on the gender gap in publication productivity.

2.4.1 Chronological age

Table 5 presents the results of a gender comparison of mean article equivalents, with age held constant. If the smaller number of authors for whom data on age are available in SA Knowledgebase, and who were older than 24 and younger than 65 in 1995¹², are taken into account, female authors publish on average 42 percent less article equivalents than male authors do. However this difference is reduced in three of the four age categories, as indicated by the data presented in Table 12:



⁹ Although one cannot argue that race potentially confounds, “explains” or mediates between gender differences in publication productivity, controlling for race is still important in order to determine to what extent gender differences in publication productivity vary within certain race categories (see Chapter 3, section 3.3.1.2).

¹⁰ Maintaining the dependent variable on an interval level by comparing means is considered preferable to reducing it to an ordinal-level variable. Not only does this approach take advantage of the greater amount of information conveyed by an interval variable, but if publication productivity were to be categorised as “high”, medium, or “low”, it is conceivable that women could be concentrated in the lower end of each publication category. Thus, for example, the women in the “high” category may have published less than the men in that category.

¹¹ In order to counteract possible bias because of missing data on the control variables, the ratio is re-computed for each cross-tabulation, based on the cases for which data are available. This led to some variation (between .55 and .58) in the ratio that is used as a basis for the comparisons in each case.

¹² Very young authors, who were not “eligible” to publish in 1995, were excluded from this particular cross-tabulation. The cut-off point was defined as 25, as this was the lowest age recorded for any author in the database in 2003. On the other end of the age scale, authors who were already retired in 1995, by virtue of being older than 64 at that time, were excluded from the analysis as well (see Chapter 3, section 3.3.1.1)

Table 12

Gender Differences in Average Publication Productivity, Controlling for Age

<i>Age categories</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
25-34 years	Female	2.4	366
	Male	3.7	618
	Ratio	.65	
35-44 years	Female	3.6	546
	Male	5.8	1 296
	Ratio	.62	
45-54 years	Female	3.5	348
	Male	6.0	1 383
	Ratio	.58	
55-64 years	Female	4.3	87
	Male	7.1	476
	Ratio	.60	
Total	Female	3.3	1 347
	Male	5.7	3 773
	Ratio	.58	

N = 5120

The reduction is most evident among the youngest group of authors, with women under the age of 35 publishing only 35 percent less than their male counterparts in this age group do. In the second youngest age group the gender difference is also reduced, but to a lesser extent, with women publishing 38 percent less than their male counterparts. For the next group of 45 to 54 year old authors the gender gap widens quite substantially to the same level as that which was observed for the subset of authors as a whole. There is not, however, a completely linear trend in this regard, as the gender gap narrows again slightly among authors who neared retirement age in 1995. It is also in this age group that productivity peaks for women and men.

As it is possible that the categorisation of the age variable may mask important patterns, a more detailed analysis was performed with age as a continuous variable. The results are presented in the following multiple line graph:

Figure 2

Average Number of Article Equivalents for Men and Women Authors, by Age

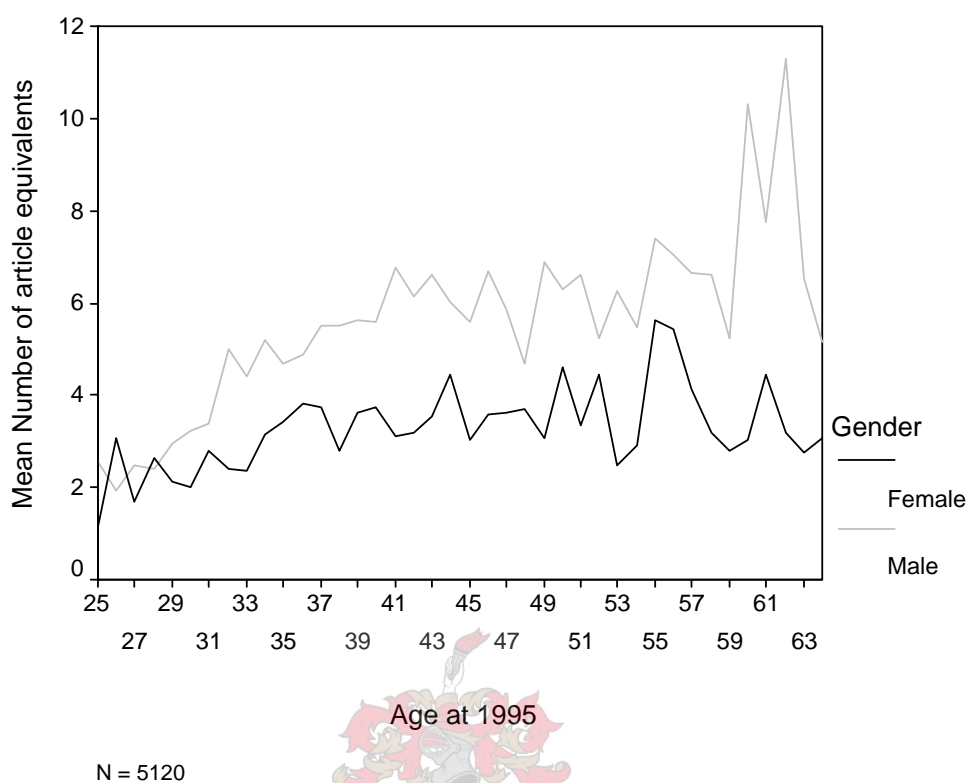


Figure 2 shows clearly how small the gender difference in average productivity is among the authors who are younger than 30. Moreover, women who are 26 and 28 actually outpublish men who are of the same age. The graph also illustrates a general widening of the gender gap as older authors are compared. In addition, it shows that the men who are near retirement age (specifically those in their early sixties) tend to produce an extremely high average output, while women at this later stage in their careers do not display the same tendency. In summary, when age is controlled for, the gender difference in average number of article equivalents published is reduced among the relatively young authors who are under 45 years of age, and particularly among authors under the age of 30. As older authors are compared, however, the gender gap widens, partly because women authors experience a levelling off of their productivity in their late forties and early fifties, which men authors do not.

2.4.2 Race

In order to determine the relative effect that race and gender have on publication productivity, gender differences in average number of article equivalents are compared for two race categories: white and black (African, Asian and coloured). The results are summarised in the following table:

Table 13
Gender Differences in Average Publication Productivity, Controlling for Race

<i>Race</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
White	Female	3.2	1 492
	Male	5.8	3 587
	Ratio	.55	
Black	Female	2.6	159
	Male	3.5	482
	Ratio	.74	
Total	Female	3.2	1 651
	Male	5.7	4 069
	Ratio	.56	

N = 5 720



If only white women and men are compared with each other, the male-to-female ratio of mean article equivalents is very similar to the ratio observed for the subset as a whole. However, the gender gap in average publication productivity is substantially smaller among black authors. Whereas white women publish only slightly more than half of the article equivalents that white men do, among blacks the ratio is 3:4. A closer inspection of the results provides an indication of why this is so. Black women publish on average only 20 percent less than white women do, while black men publish approximately 40 percent less than white men. Indeed, the output of black men is more on par with that of white women. Thus, the gender difference in publication productivity among blacks is smaller than among whites, because of black men's relatively low output in particular.

2.4.3 Highest qualification

Data presented in Table 14 show that, when controlling for highest level of qualification, the gender difference in average number of article equivalents authored is reduced for each and every qualification level:

Table 14
Gender Differences in Average Publication Productivity,
Controlling for Highest Qualification

<i>Highest qualification</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
Undergraduate	Female	2.1	93
	Male	3.5	105
	Ratio	.60	
Lower postgraduate	Female	1.4	82
	Male	2.0	99
	Ratio	.70	
Masters	Female	2.2	505
	Male	2.9	929
	Ratio	.76	
Doctoral	Female	4.4	769
	Male	6.8	2 905
	Ratio	.65	
Total	Female	3.3	1 449
	Male	5.7	4 038
	Ratio	.58	

N = 5 487

In some cases the reduction is more dramatic than in others. For instance, among those authors who have only attained an undergraduate degree, the gender difference is quite similar to that found for the subset as a whole, with women producing 40 percent less than their male counterparts. On the other hand, if one compares only women and men who have attained their master's degree, the smallest gender difference is observed, with women maintaining an average output that is merely one quarter less than men's. Even among those who have received their doctorate, the gender gap is decreased to a male-to-female ratio of approximately 2:1.

2.4.4 Academic rank

Among the approximately 3 000 authors who are employed in regular academic ranks as higher education instructors, the gender difference in average number of article equivalents produced is slightly more pronounced (45%) than for the subset as a whole (43%). However, when one controls for rank a dramatic reduction in the gender difference is visible in all of the ranks for which data are summarised in Table 15:

Table 15
Gender Differences in Average Publication Productivity, Controlling for Rank

<i>Instructor Ranks</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
Junior lecturer	Female	1.6	29
	Male	1.7	24
	Ratio	.94	
Lecturer	Female	2.1	316
	Male	2.8	372
	Ratio	.75	
Senior lecturer	Female	3.6	286
	Male	4.4	576
	Ratio	.82	
Associate professor	Female	5.5	86
	Male	6.6	277
	Ratio	.83	
Full professor	Female	6.0	119
	Male	8.7	993
	Ratio	.69	
Total	Female	3.5	836
	Male	6.3	2 242
	Ratio	.55	

N = 3 078

First, among junior lecturers the sexes are almost equal with regard to their average publication productivity. However, among lecturers, women lag one quarter behind their male counterparts in the productivity stakes. If academic authors in the ranks higher than lecturer are considered, the gender gap narrows again: for each five article equivalents authored by men in these ranks, their female counterparts author slightly more than four. Most notable is the finding that, when male and female professors are compared, the greatest gender difference is found, with women

full professors authoring approximately 30 percent less article equivalents than men in this highest rank do.

Although women publish less than men in the same positions, they are more productive than men in positions directly below them. Thus, female lecturers publish more than male junior lecturers, female senior lecturers publish more than male lecturers, and female associate professors more than male senior lecturers. However, again one finds an exception among women full professors, who publish on average less than men one position (at associate professor level) below them.

The data presented in Table 15 may show the effect of gender differences in rank attainment on men and women's publication productivity levels. On the other hand, it may also indicate that gender differences in publication productivity affect the extent to which men and women attain higher ranks. Without longitudinal data, one cannot determine exactly to what extent publication productivity influences promotion and rank attainment over time (*cf.* Long *et al.* 1993). However, by comparing men and women in terms of rank while keeping publication productivity constant, some indication is provided as to which interpretation is probably the most valid.

For this cross-tabulation, number of article equivalents was categorised into low (up to 2 article equivalents), medium (between 2 and 5.5 article equivalents) and high output (more than 5.5 article equivalents). These categories are not dependent on arbitrary cutting points, but, in accordance with the practice of researchers such as Kaplan *et al.* (1996) and Blackstone and Fulton (1975), are the result of a division of the subset of authors who are employed in regular academic ranks into three equal groups on the basis of the number of article equivalents published. In order to prevent empty cells or cells with unreliably small numbers of cases, rank was recoded into a dichotomous variable, consisting of the category "non-professorial" (junior lecturers, lecturers and senior lecturers) and "professorial" (associate professors and full professors).

Table 16
Gender Differences in Rank¹³, Controlling for Publication Productivity

<i>Instructor Ranks</i>		<i>Publication Productivity</i>						<i>Total</i>	
		<i>Low</i>		<i>Medium</i>		<i>High</i>			
		<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>
Non-professorial	%	89.7	64.0	72.5	45.4	46.1	24.4	75.5	43.4
	N	(357)	(463)	(198)	(299)	(76)	(210)	(631)	(972)
Professorial	%	10.3	36.0	27.5	54.6	53.9	75.6	24.5	56.6
	N	(41)	(260)	(75)	(359)	(89)	(651)	(205)	(1270)
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N =		(398)	(723)	(273)	(658)	(165)	(861)	(836)	(2242)

N = 3 078

Table 16 shows that gender differences in rank achievement remain substantial even after controlling for level of productivity. Men and women at equivalent publication productivity levels do not hold the same ranks: men are more apt to hold professorial ranks than women. Even if women produce an output equal to that of the top 30 percent of the subset as a whole, only slightly more than half of them are in professorial ranks, while three-quarters of males with such a high output¹⁴ are associate or full professors. Actually, while males who produce a *medium* output are almost equally distributed among the ranks, such a distribution is only observed among women who produce a *high* output. In other words, only if a woman publishes more than 5.4 article equivalents does she have the same chance of becoming a professor than a man who produces between two and 5.4 article equivalents. These results do not support the hypothesis that gender differences in publication productivity affect the extent to which men and women attain higher (professorial) ranks. It is therefore more likely that the data presented in Table 15 reflect the effect of gender differences in rank attainment on men and women's publication productivity levels, than *vice versa*.

¹³ The reader is reminded that data on rank, as a time-varying variable, is problematic, as data on an author's rank are not updated in SA Knowledgebase every time the author is promoted. However, this problem should not *differentially* affect the results for men and women, and consequently gender comparisons should remain unbiased.

¹⁴ It needs to be taken into account that this categorisation is relatively crude. As Blackstone and Fulton (1975) note, it is conceivable that women are concentrated in the lower end of each publication category. For example, the women in the "high" category may have published less than the men in that category.

2.4.5 Institutional affiliation

The results of a gender comparison of means within four institutional types, which are presented in the following table, show that, in contrast to age, highest qualification and rank, the type or prestige of authors' employing institution seems to have very little effect on the gender differential in the average number of article equivalents authored.

Table 17

Gender Differences in Average Publication Productivity,
Controlling for Institutional Affiliation

<i>Institutional affiliation</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
Top 5 HAU	Female	3.2	1 016
	Male	5.6	2 851
	Ratio	.57	
Other HAU	Female	3.1	615
	Male	5.5	1 275
	Ratio	.56	
HDI	Female	2.2	233
	Male	3.7	578
	Ratio	.59	
Technikon	Female	1.2	71
	Male	2.3	115
	Ratio	.52	
Total	Female	3.0	1 935
	Male	5.3	4 819
	Ratio	.57	

N = 6758

At the top five HAUs of Cape Town, Pretoria, the Witwatersrand, Natal and Stellenbosch, the gender difference that was found for the subset as a whole, is replicated. At other HAUs, the gender difference is marginally larger, and at HDIs marginally smaller. Among technikon staff one finds the largest gender difference, with women producing slightly more than half the number of article equivalents that men at these institutions do.

2.4.6 Scientific domain

Controlling for scientific domain reduced the gender difference in publication productivity, but only for those academic authors in the social sciences and humanities:

Table 18
Gender Differences in Average Publication Productivity,
Controlling for Scientific Domain

<i>Scientific domain</i>	<i>Gender</i>	<i>Mean</i>	<i>N</i>
Social Sciences & Humanities	Female	3.2	960
	Male	5.1	1 791
	Ratio	.63	
Natural Sciences & Engineering	Female	3.2	406
	Male	5.9	1 811
	Ratio	.54	
Medical & Health Sciences	Female	2.6	490
	Male	4.8	958
	Ratio	.54	
Total	Female	3.0	1 856
	Male	5.3	4 560
	Ratio	.57	

N = 6416

In the social sciences and humanities fields the gender difference in average publication output is much smaller than among the subset of authors as a whole. It is also much smaller than the difference that obtains in other scientific domains. While women working in the social sciences and humanities author 37 percent less article equivalents than their male colleagues in the same disciplines do, in all the other disciplines they produce 46 percent less than men. It is interesting to note that, although women in the social sciences and humanities produce exactly the same average output than women in the natural sciences and engineering, the gender gap is larger in the latter fields, because the men in these fields publish a very high average number of article equivalents.

2.5 Gender differences in co-authorship

In this study the ratio of distinct articles to article equivalents is taken as a measurement of the extent of co-authorship versus sole authorship. Authors who have never co-authored would have a ratio of 1. Thus, the closer the article-to-article equivalent ratio is to 1, the greater tendency the tendency to sole authorship, and the lesser the tendency to collaborate with other authors¹⁵. After aggregating the data by calculating the ratio for each author, the average ratio for men and women was determined. In Table 19 these average ratios are presented, in order to facilitate a comparison between the sexes in terms of their tendency to co-author articles:

Table 19
Mean Co-Authoring Ratio by Gender

<i>Gender</i>	<i>Mean article-to- article equivalent ratio</i>
Female	.6151
Male	.5898
Total	.5971
N = 6763	

The mean article-to-article equivalent ratio for women authors is approximately .62, while for men it is .59. In other words, women authors show a slightly more pronounced tendency to author articles on their own, while men seem to collaborate somewhat more readily with others when authoring articles.

¹⁵ The author is indebted to the former database manager of SA Knowledgebase, Melt van Schoor, for the idea of using the ratio of distinct articles to article equivalents as an indication of the tendency to co- or sole author articles.

3. Interpretation and discussion of the findings

3.1 Comparisons between the sexes

Among the subset of South African academics who have at least co-authored an article between 1990 and 2001, one finds that a small number of faculty are highly productive in comparison to most. Most men and women authored only one article equivalent between 1990 and 2001¹⁶, while some of their colleagues – albeit a very small minority - have authored at least 30 times as much. The resulting extreme skewness of the distribution of publication productivity among South African faculty has also been observed recently in a select group of subject fields (Jacobs & Ingwersen 2000) and in top-producing institutions, where it is estimated that less than 50 percent of the academics are productive in publishing (Cloete 2002). In fact, this pattern obtains for all nations in which publication output has been examined, and in every scientific discipline studied (Cole & Singer 1991).

Although publication productivity is almost equally skewed for both gender groups, more severe over-dispersion is apparent among male authors, because the range found among males extends to a maximum twice as high as that found among women. Thus, even the most productive women lag behind their most productive male counterparts. On average, male authors are also almost twice as productive in terms of publication productivity as women. The extent of this gap is quite similar, though somewhat smaller, than that which was found in the only South African study that has measured the gap: White (1989) reports that, on average over a three year period during the mid-eighties, women academics at UCT produced less than half the publications that men did.

If one compares the current finding that women publish on average 57 percent as much as men with results from studies conducted elsewhere¹⁷, it seems that the gender gap observed for 1990 to 2001 is very similar to that found *two to three decades ago* in America. A review conducted by Cole and Zuckerman (1984) of more than fifty (mostly American) studies

¹⁶ Although this study was not aimed at investigating the output of our academics in general, it is important to note that these figures are lower than expected. Granted, some authors entered academia during this period, and could not have published during the whole period. In addition, attempts by to raise awareness and output of research at technikons were only initiated during the 1990s. However, less than five percent of the subset of authors is represented either by relatively young authors under the age of 35, or by technikon staff. Considering that the Department of Education and certain universities take as the benchmark (and ideal) that a university staff member should produce at least one scientific publication per year (DoE 2002; DACST 1998b), one would have expected a higher average article equivalent output.

¹⁷ Such comparisons need to be treated with caution, however, as the populations that were studied and the measures of publication productivity that were used, differ from those in the present study.

published between 1973 and 1982 shows that women on average 50-60 percent as much as men. Moreover, in Cole and Zuckerman's (1984) own landmark study of gender differences in the 12-year long publication histories of matched pairs of American men and women scientists (who received doctorates in 1969-1970), the male-to-female ratio was exactly the same (.57) as that which was found in the present study. Although Cole and Zuckerman only studied the first twelve years of scientists' careers, they mention that the gender differences in publication productivity in their cohort are consistent with data on earlier cohorts in the United States. In particular, the extent of the differences is similar in magnitude to those found for groups of men and women who received PhDs as far back as the 1920s. By implication, the findings from this South African study will also be consistent with those earlier American findings, which points towards a relatively strong consistency in research findings on the average gender differences in publication productivity are, irrespective of the time period or country studied.

However, more recent large-scale faculty surveys that have been conducted both in the United States and in other countries consistently produce smaller gender differences in publication productivity than that which is found for South African authors. For example, Xie and Shauman (1998) report that in 1993 women faculty in the United States were publishing only 24 percent less than male faculty; in Europe during the 1980s women researchers were found to publish on average 37 percent less than their male counterparts in a three-year period (Franklin 1988); and during the early 1990s Kyvik and Teigen (1996) found that women faculty in Norway publish 20 percent fewer articles than men.

Nevertheless, it is not valid to conclude that at 43 percent less article equivalents published, South African female academics necessarily fare worse relative to their male counterparts than women in other countries do. Comparisons are hampered by the fact that all of these studies measure publication productivity over a period of two to three years, while the present study measures output over an eleven-year period. The smaller the fragments of time over which productivity is measured, the smaller the differences in productivity by gender¹⁸. Studies conducted in the United States (Xie & Shauman 1998) and Canada (Nakhaie 2002) have shown that women faculty publish approximately three-quarters of the output that their male counterparts do if publications are measured over a short time period (i.e., 2-3 years). If total publications over a career are taken into account, women produce half as much as men do.

¹⁸ There are at least two reasons for this pattern. First, women have only recently increased their participation in science and therefore have fewer years of experience than men on average. In this sense, the use of cumulative measures "works against" women. Secondly, women on average have shorter careers during which to publish than

3.2 Changes over time: 1990 to 2001

Although the results thus far paint a rather bleak picture, it is heartening to note that the narrowing in the gender gap that has been observed in a variety of countries (e.g., Goel 2002; Lewison 2001; Xie & Shauman 1998; Ward & Grant 1996; Bentley & Blackburn 1992) has also taken place among South African higher education staff. Whereas in 1990 women produced approximately 16 percent of the total number of articles published in accredited journals, their contribution increased to approximately 24 percent in 2001, while the male contribution decreased comparatively.

Only two studies – one in Iceland and one in Poland- could be identified that longitudinally compared the sexes in terms of their relative contribution to a set of articles over the last decade¹⁹. In Iceland, Lewison (2001) - who counted the numbers of papers in the SCI linked to Icelandic authors in the life sciences²⁰ for the years 1980 to 2000 - found that in 1990 females published approximately 14 percent of the total number of papers. This female contribution rose to about 22 percent in 1996, but appears to have levelled off at 20 percent since then. Although Lewison based her analysis on papers in the SCI, authored by those in the life sciences, there is a close resemblance between the Icelandic and South African figures, which indicates that the size of the gender differences in publication productivity and trends over time in this regard, are not necessarily unique to South Africa.

However, cross-country comparisons do not always produce such similar results. For instance, Webster (2001) discovered that of all papers in the SCI linked to Polish authors, women authored a much higher 30 percent in 1990 than the 16 percent found in South Africa. Polish women's high level of participation in science has been observed by others as well, and is generally attributed to Poland's official policy of active promotion of gender equality and women's participation in all sectors of society (Chakravarthy *et al.* 1988; Stolte-Heiskanen 1983, cited in Luukkonen-Gronow 1987). In the early to mid-1990s a dramatic drop in Polish women's contribution to 27 percent was observed, whereafter it climbed back to 32 percent in the late 1990s. In contrast, the present study indicates a relatively steady increase since 1990 of just less

men do, because of their temporary withdrawal from active research due to child-bearing, child-rearing and other family-related responsibilities (Nakhaie 2002; Xie & Shauman 1998).

¹⁹ The reason for the scarcity of such data is that it is usually not possible to differentiate between male and female authored articles that are indexed in international databases such as the *SCI*, as only surnames of authors are recorded. The fact that Icelandic and Polish surnames allow gender identification of the author (see Chapter 1, footnote 30) explains why the *SCI* index can be analysed by gender for these countries.

²⁰ The life sciences include biomedical research, biology and clinical medicine.

than eight percent in women authors' contribution to the total scientific publication output of South Africa.

Although the data do not allow one to account for this trend empirically, two explanations may be posited. Considering the fact that higher education staff are analysed in the present study, the increase in the proportion of article equivalents published by women may simply be the result of a change in the gender composition of staff at these institutions. Between 1988 and 1998 the proportion of women employed as instruction or research staff increased from 27 to 35 percent at universities, and from 30 to 37 percent at technikons (Cooper & Subotzky 2001). Thus, the observed changes over time may just as well reflect the increase of women in the academic profession that took place during the 1990s.

However, since the number of academics typically grows by increments of young people beginning their careers (few entrants are older people moving from other jobs), this increase is made up predominantly of young women at the lower ranks and with lower qualifications, and would therefore not necessarily translate into a growth trend in women's publication productivity. In addition, those who entered the higher education sector after 1990 are disadvantaged by the fact that they have had less "time" to publish the articles that are included in SA Knowledgebase, than those who are relatively established in their careers (see Chapter 3, section 3.1.5). Considering this bias in the subset of authors extracted from SA Knowledgebase, it is improbable that female newcomers to academia have contributed in any significant way to a narrowing of the gender gap.

An alternative explanation that seems more plausible is that the trend reflects a marked increase, since 1990, in opportunities afforded in particular to women to undertake research and to publish. It is quite possible that there were more barriers - in the form of prejudice and or discrimination - that women in HEIs had to face prior to 1990, while gender inequality in the academic workplace (especially with regard to the distribution of resources and structural positions) has become less pronounced and less normative over the past decade. In addition to formal institutional pressure for gender equity exerted by the government, affirmative action programmes have been adopted by the main research funding organisation in the country, the NRF. These programmes are specifically aimed at increasing funding awards to women scholars, and may have already enhanced women's productivity by the mid-1990s. In summary, a narrowing of the gender gap in publication productivity is more likely the result of the introduction of more "female-friendly" programmes and policies in our higher education sector.

3.3 Accounting for women's lower publication productivity

3.3.1 **Distribution patterns**

Women's lower average publication productivity is partly a function of the fact that they are indeed under-represented among the extremely productive authors who publish large numbers of articles. Other researchers have reached a similar conclusion as well (Etzkowitz *et al.* 2000; Kaplan *et al.* 1996; Kyvik & Teigen 1996; Zuckerman 1991; Primack & O'Leary 1989; Cole & Zuckerman 1984; Bayer 1973; Astin 1978). While Zuckerman (1991) suggests that gender differences in productivity are mainly the result of differences in the proportions of men and women who publish at a very high rate, the results of this study suggest that differences in the least productive authors may be just as important. Women are over-represented among the relatively unproductive authors, which further accounts for their lower average productivity. These findings are also consistent with results from studies conducted elsewhere – not only in the United States, but also in Venezuela (Lemoine 1992). In conclusion, both tails of the distribution are important for understanding gender differences in publication productivity in South Africa.

Although the results thus far do not allow for us to explain the observed gender differences, the way the differences between men and women are *patterned* may help us explore the most probable causes of the differences. First, the fact that almost no women are as extremely productive as some men, or stated differently, that almost all of the most productive scholars are men, to a certain extent disproves explanations that refer to women's family responsibilities. It is reasonable to expect that some proportion of the women in the subset of authors are single and without families, and should therefore be able to compete on an equal footing with men, but even these women do not establish publication records that parallel those of their most productive male peers. Secondly, the fact that the distribution of number of article equivalents is almost as skewed for female than for male authors²¹, indicates that the degree of inequality in publication productivity is much the same for both sexes, which means that gender in itself is a poor predictor of publication productivity. This supports Keller's (1991) argument that the variability that exists among men and women goes well beyond the variability between the gender categories of male and female. The best predictors of productivity are other factors, some of which are related to gender.

3.3.2 Factors that mediate between gender and publication productivity

In most cases, the introduction of the control variables reduces the gender difference in publication productivity, which leads one to conclude that the unequal distribution of these variables by gender (see Section 2.1 above) helps explain the observed gender gap in productivity. The independent effect of each control variable on the gender difference in average publication productivity is discussed in more detail below.

3.3.2.1 Chronological age

In general, the younger authors are, the smaller the difference between women and men's average publication productivity. Although controlling for age does not substantially reduce gender differences in average publication productivity between the gender groups, the results do indicate that women as a whole publish less than men, partly because they are concentrated in the younger age groups, and therefore have less professional experience and seniority than male authors have.

Among the youngest group of authors under the age of 45 gender differences in publication productivity are smaller than among authors who are older. It is in particular among the authors in their late forties and early fifties that significant gender differences in publication productivity emerge. These findings are consistent with some American research, which has shown the productivity gap between men and women to increase with age (Cole 1979; Cole & Zuckerman 1987), or over the course of scientists' careers (Keith *et al.* 2002; Long *et al.* 1993; Long 1992; Zuckerman 1991; Cole & Zuckerman 1984; Reskin 1978).

However, the increase in the productivity gap between men and women as they grow older is not necessarily a universal trend. Kyvik and Teigen (1996) report that male faculty members under age 40 publish twice as many article equivalents as their female counterparts, whereas differences between men and women are small (10-15 percent) for faculty over age 40. In their investigation of ecologists in the United States, Primack and O'Leary (1993) found that the gender difference in the publication of research papers is smaller among those of a higher career age than among those of a lower career age. Also in the United States, Long (1990) found that gender differences in publication productivity usually start decreasing at a later stage in the academic careers of biochemists in the United States. This implies that a significant proportion of women not only maintain their productivity, but increase it, whereas the average man's

²¹ Researchers in other countries, such as the United States, Norway and India, have also noted that rates of publication productivity are as skewed for women scientists as it is for men (Gupta *et al.* 1999; Kyvik & Teigen

productivity levels off. Cole (1979) found that younger female authors are more productive than older female authors, while the opposite is true for men.

The results of the present analysis differ from these findings: the older the male authors, the higher their productivity, while woman authors' productivity starts levelling off at the age of 45. Only women who near retirement age show a rise in their average publication productivity level.

Do the findings reflect the "typical" career pattern of female academics, as reported by researchers such as Cole (1979:114)? In the early part of their academic careers, when academics begin to publish and build up their reputation among colleagues, it has been found that women authors are almost as productive as their male peers. This seems to be the case in South Africa as well: among the youngest age group, the smallest gender gap in publication productivity is observed. In their middle or late thirties one may argue that a significant proportion of women interrupt their careers in order to bear and raise children. If women's family responsibilities during these relatively early years of their careers have an impact on women's publication productivity, a greater gender gap should be observed in the average productivity among those authors who are in their mid-thirties to mid-forties. The results do indeed show that the average gender difference in publication productivity is greater for the childbearing age group, than for their younger counterparts²². This might reflect a tendency among women authors to interrupt their research careers because of childbirth and maternity leave in their thirties, and the fact that women have more caring responsibilities in their early forties than men do.

One would expect publication discrepancies between men and women to diminish as time goes on and children turn into teenagers and become more independent. However, the data show that in South Africa the greatest gender gap in publication productivity is not found between women who are rearing and caring for young children and their male counterparts, but rather among those authors who are older than forty-five. This widening of the gender difference in average publication productivity with the increase in age may be partly explained by referring to the sociological processes of accumulative advantage and disadvantage. The crucial period, during which the foundations for a successful academic career are laid, coincides with the childbearing and childrearing age range (Stolte-Heiskanen 1991; Sutherland 1985). The effect is that women in their late thirties and early forties not only start lagging behind men in terms of publication productivity, but in the development of their careers as well. In other words, career

1996; Cole & Zuckerman 1984; Cole 1979).

²² It stands to reason that these generalisations do not necessarily apply to all women. Some may have their first child much earlier, and even before starting their academic career, as Toren (1991) found to be the case among a large majority of Israeli women professors.

interruptions and heightened family responsibilities during the mid-thirties to mid-forties disrupt the momentum of women's careers, and the effects thereof tend to be cumulative for women as time passes.

When women have the opportunity to divest more time and energy into their careers, they are already in a disadvantaged position, particularly with regard to the professional recognition that they had amassed thus far in their careers. Professional recognition is of utmost importance, as it leads to greater access to resources that are needed for research and publication. In South Africa in particular these women's NRF rating, which is based on a peer evaluation of recent research outputs, may be negatively affected. This limits their access to outside research funding, and consequently, prevents them from increasing publication productivity. This, in turn, further decreases their chances for recognition and resources.

However, such an interpretation of the findings should be treated with caution for two reasons. First, the results show a slight *decrease* in gender differences in publication productivity among the oldest group of South African authors who are in their mid-fifties to mid-sixties. The cumulative advantage hypothesis, according to which an accumulative deficit is produced at later stages in women's careers, cannot account for such a reversal, which suggests that processes other than cumulative advantage may become important later in the career. For example, women's career paths are structured differently from men's. Often women's careers start later in life. Therefore - as revealed by qualitative research among South African professors - women are still shaping their careers, working to gain professional recognition and to reach their peak at ages where men are often retiring. It is in this sense that they may be described as "late achievers" in academia (De la Rey 1999; Karp 1985).

Secondly, most studies that have examined the relationship between family-related factors (e.g., marital status, parental status, and number and age of children) and publication productivity in other countries do not find them to have a negative effect on women's research productivity (see Chapter 2, section 2.2.2.1). However, one may argue that these findings – although nearly universal - cannot necessarily be generalised to South Africa:

“The association between traditional sex roles and occupational careers is not a mere ‘fact’ independent of our conceptions and theories, and should therefore be examined within the relevant ideological, cultural, and political contexts” (Toren 1991:651).

South Africa is likely to be characterised by less egalitarian gender-role attitudes and different ideological assumptions about maternal responsibility than those found in most developed countries. For example, there seems to be general agreement among white South African couples that women with pre-school children ought not to be employed, and women who are working still carry by far the greater load in terms of domestic tasks and childcare than their husbands do (Maconachie 1992, 1990). In addition, if one accepts that societal expectations with regard to the importance of a mother's care for children to a certain extent determines the provision or lack of provision for child-care services to which the working mother can confide her child during working hours (Sutherland 1985), the lack of appropriate childcare facilities in South Africa, which has been noted by researchers such as Maconachie (1990), reflects the strong emphasis that is placed on the essential nature of the mother's care for children in this country. It is therefore quite possible that child-bearing women in this country tend to interrupt their careers for longer periods of time and have to take more responsibility than their male colleagues for preschool and early school-age children than is the case in, for example, the United States.

Nevertheless, there are some indications that the dominant ideology governing women's roles in our society does not affect female faculty's work in any noticeable way. A recent audit found that very few of women in research consider family commitments a major research-related problem (NRF 2001). In addition, the ready availability of domestic help in South Africa²³ can be expected to have a positive influence on white married women's participation in the labour force (Maconachie 1989)²⁴, and most probably counteracts the negative effects of family responsibilities on the publication productivity of women academics (who are predominantly white). Lemoine (1992) makes a similar observation with regard to Venezuela:

"...neither marriage nor motherhood seem to explain the differences in scientific productivity between the sexes, because in [Venezuela] it is relatively easy to find domestic servants and the society rotates around the extended family, which helps with the care of home and children" (293).

Indeed, Etzkowitz *et al.* (2000) note that, perhaps ironically, it may be easier for an upper middle-class female scientist to pursue a demanding scientific career in a Third World country where a personal support structure of servants is assumed.

²³ In 1992 Maconachie reported that 81 percent of her sample of white married couples employed a domestic worker, and 80 percent of domestic workers were employed full time. In 1993 Du Toit reported similar findings: 36.6% of married working women in South Africa have a full-time, live-in domestic servant at their disposal, while 34.4% have permanent, though part-time, domestic help.

²⁴ The ready availability of cheap household help from women of lower socio-economic backgrounds is also argued to have facilitated elite women's participation in the labour force in Turkey (Acar 1990).

However, with the exception of Maconachie's studies, there is no empirical evidence regarding the connection between domestic obligations, the availability of domestic help and levels of occupational involvement and accomplishment among women in South Africa. Moreover, the empirical evidence provided here for the effect of maternity leave and the caring of children on women's publication productivity in South Africa is weak. Therefore, further research is necessary to illuminate the effect (most probably cumulative) of family-related factors as a possible explanation for gender differences in publication productivity.

Apart from the influence of family-related factors, the increasing disparity in men and women authors' average publication productivity as they grow older may be related to other factors. According to Zuckerman (1991), it may indicate that women's access to research and publication-related resources relative to men's diminishes with time, or that women's commitment to research and publication wanes as they receive fewer rewards and incentives to continue publishing. However, these explanations do not quite match the finding that South African women (and men) who near retirement age are on average more productive than those who are on average ten years younger.

Alternatively, one may argue that the women in the different age categories were born in a different era when values and opportunities were significantly different. These so-called "time-period effects" (Stephan & Levin 1992:62) might explain why women under the age of 30 in 1995 evince a publication productivity that is much more similar to (and in some cases even higher than) their male counterparts' output, than that which is found among the older authors. The youngest group of women authors were professionally socialised in the past decade during which there has been an increased focus on gender equity issues at South African HEIs, and presumably, a move towards more egalitarian gender-role attitudes among South African men and women in general. In fact, Boshoff (2005) recently found no differences in either rank or employment status (full-time/part-time) for women and men younger than 30 years. These younger female academics do not only face less gender discrimination, but may also be driven as their young male counterparts, because opportunities are now opening for them in academia.

On the other hand, women authors who are older began their academic careers under quite different circumstances, characterised by stronger gender-role stereotypes and the apartheid system that reinforced male dominance at HEIs (NRF 2001). Consequently, these women were marginalized to a much greater extent, and in relation to their male counterparts, were afforded much less opportunity - including the development of the necessary skills - to undertake research and to publish. Because of the processes of cumulative disadvantage it could be

expected that the greater disadvantages experienced by older women in relation to their male counterparts continued to work against them (and in favour of their male counterparts) in the more equitable environment of the 1990s.

Unfortunately, SA Knowledgebase data do not extend further back than 1990, and it is therefore not possible to determine empirically if gender differences among young authors were greater in the past, than among young authors in the 1990s. Further empirical work - in particular longitudinal research – will be needed to verify the link between socio-historical context and gender differences in publication productivity in South Africa.

3.3.2.2 *Race*

The race distribution within the two gender groups resembles very closely the pattern that is found within the subset of authors as a whole. Therefore one cannot argue that race mediates between gender and publication productivity, or that race “explains” gender differences in publication productivity: men tend to publish more than women, irrespective of their race. Nevertheless, interesting patterns were observed when the publication productivity of men and women in different race groups were compared. First, the output of black women is lower than that of black males, and lower than white authors, both male and female. Thus, not only are the barriers to doctoral education greatest for African women, as Bailey and Cooper (2003) recently reported, but black academic women in general face the greatest challenges with regard to their publication productivity as well. This is not surprising, since the academic culture is not only male but also white. Consequently, the problems experienced by female faculty members as outsiders to this male milieu are compounded in the form of a double burden for black women (Reid 1990; Fox 1984).

However, the focus of this research is on gender differences in publication productivity, and it is in this regard that an interesting difference was found between the races: black men and black women authors are much more similar in terms of their publication output than white men and white women are. While black men are still more productive than black women, they are much less productive than white men. In fact, black men’s output is very similar to the average output of white women. On the other hand the difference between black women and white women’s productivity is much smaller than the gap one finds among men. In conclusion, the study shows that race appears to interact with gender, but that it also has a differential impact on the publication productivity of black men and black women. Interestingly, it seems that the

disadvantages associated with race have less of a negative effect for black women authors, than for their black male counterparts.

3.3.2.3 *Highest qualification*

The findings show that the greater prevalence of women authors without graduate training, in particular on a doctoral level, may contribute to the observed gender differences in productivity. When authors with the same highest qualification are compared, the gender difference in average publication productivity is lower than that which is found for the subset of authors as a whole. Thus, part of the lower productivity of women in relation to men is probably due to women's lower degree attainment. One may argue that because of their tendency to have a lower qualification level than men, women on average are characterised by a lower academic status, a lower level of research skills, and lower perceptions of self-efficacy for research (Vasil 1993). Indeed, in recently conducted research many women faculty in South Africa reported a low level of confidence with regard to writing and publishing (Mabandla 2002; NRF 2001).

Interestingly, the smallest gender difference is found among those authors with a master's degree. It may be possible that men with this qualification tend to work towards achieving their doctorate, and are therefore less able to concentrate on further research for publication than their female counterparts - who tend not to pursue doctorate training - are. Such an interpretation of the findings is indirectly supported by the fact that women faculty at our HEIs are characterised by a lower degree attainment than men are, which indicates that women are more likely to remain at the master's qualification level, than to advance to a doctoral degree.

Although the gender gap generally narrows as one moves up the qualification hierarchy, it is significant that it widens again for those women and men who have the highest qualification of a PhD. Thus, even though doctoral training should provide authors with equal status, opportunities access to resources that are critical for research and general academic success, in South Africa women with this qualification still publish on average a third less than their male counterparts. Moreover, among authors who should be on an equal footing because they have the smallest possible advantages for research productivity that a higher academic degree provides, i.e., those with an undergraduate degree, gender differences are also very large and close to the average found for the subset as a whole.

Similar results are reported for American authors of articles published in social work journals: male faculty with doctorates had significantly higher publication rates than female faculty with doctorates, yet there were no significant differences among faculty with master's degrees (Kirk

& Rosenblatt 1980). These findings indicate that gender differences in qualification level cannot account for much of the publication productivity differential between South African female and male authors. This conclusion is supported by the fact that productivity differences between men and women are only slightly reduced, and certainly not eliminated, when one compares authors who have attained different levels of qualification.

3.3.2.4 *Academic rank*

The gender difference in average publication productivity is substantially reduced when comparisons are made by rank – a finding that is consistent with other research results (e.g., Fulton 1975). In fact, of all the possible mediating factors that were investigated in this study, controlling for rank reduced the observed gender disparity in publication productivity most dramatically. This is not surprising, as rank has been found to be the variable that best predicts, or is most closely associated with, publication productivity (Nakhaie 2002; Stack 2002; Kyvik 1990). Jacobs and Ingwersen (2000) have also recently confirmed the close relationship between rank and publication productivity among South African academic scientists. Based on the findings presented here, it seems more than likely that women's lower average publication productivity is partly a function of the fact that there are relatively few women in senior positions where one finds the highest levels of publication productivity.

The observed gender gap in publication productivity generally narrows as academic rank rises, but again there are exceptions. Among those authors in junior lecturer positions the gender difference of six percent is smaller than that which was found for any of the categories of the other control variables. This finding is consistent with earlier American research results that gender differences are not evident at more junior levels of academic appointment (Kirk & Rosenblatt 1980; Guyer & Fidell 1973, cited in Over 1982). Another exception is found among full professors. Although a very small gap in publication productivity is evident if male and female associate professors are compared with each other, the gender disparity is far greater among full professors. This pattern does not, however, seem to be unique to South Africa academics: Sheehan and Welch (1996) found that differences in the output of scholarly articles between men and women academics in Australia tend to be greatest at the highest end of the academic hierarchy. However, contrary to the findings presented here, they also found the greatest gender difference at the *lowest* end of the academic hierarchy.

Other studies have found that full professors are more productive than associate professors (Bailey 1992, cited in Nakhaie 2002; Noordenbos 1992) and that this pattern applies to women

and men alike (Kyvik 1990). This seems to be the case among South African academic authors as well: women are generally more productive than men in positions directly below them²⁵, but again this patterns does not hold for women full professors, who are less productive than men at the associate professor level. And while male full professors average a much greater publication output than their male colleagues one rank below them, women full professors are only slightly more productive than women who are associate professors.

Women's concentration in lower academic ranks, where the level of resources necessary to bolster publication productivity are not necessarily available, may contribute to their lower publication productivity in relation to men, but the findings of this study are not conclusive in this regard. Even though the productivity differences between men and women are reduced when one compares authors in different academic ranks, nevertheless, they still remain. In other words, in all ranks male authors evince higher publication productivity than female authors do. Secondly, even if – and in fact, particularly if - women reach the highest academic rank of full professor, they publish less than male full professors. Cole and Fiorentine's (1991) theory of “normative alternatives” may throw some light on this seemingly contradictory finding that among South African academics the greatest gender gap in publication productivity is found not among the lower ranks, but among full professors. According to these authors,

“Whereas occupational success is virtually the only route to adult status open to men, women can attain adult status in an affiliative way through marriage and family. Because there are normative alternatives open to women, which are not open to men, there is substantially more pressure on men to be occupationally successful” (222).

In a socio-cultural context where it is more socially acceptable for a woman to “settle” for a lower level of occupational attainment than for a man to do the same, women full professors are already an enormous success, and should therefore, on average, experience *less* cultural pressure to concentrate all energies on occupational attainment through maintaining very high levels of publication productivity²⁶.

On the other hand, the findings might reflect the fact, which has been documented in research on women managers in business settings (Bielby 1991), that gender stereotypes, which can lead to self-fulfilling prophecies are especially difficult to undermine in groups with highly skewed

²⁵ Kyvik (1990) found the same result among academics in Norway.

²⁶ This notion actually has a much earlier origin, as Williams *et al.* are quoted in 1974 as saying: “It is possible that by actually becoming a university teacher [women academics] perceive their status as being high enough, since it is indeed so rare for women, and do not strive to compete for more than this...[they] tend to be satisfied with simple membership of the high status professions” (383,396).

sex ratios. As a result, the social-psychological barriers faced by women faculty are likely to be the greatest in the top academic ranks, where one finds the smallest proportional representation of women. However, both of these interpretations are inconsistent with the finding that the second greatest publication productivity gap is found among men and women academics in the relatively low rank of lecturer, where women are better represented than men.

When interpreting these findings, it is important to bear in mind that, although gender differences in rank may lead to gender differences in productivity, the causality may run opposite the direction assumed. In other words, because women are less productive than men, there are few women professors. However, when publication productivity was controlled for, the results showed that the women authors are still at a disadvantage in terms of rank, independent of how much they publish. These findings are corroborated by a large body of evidence that gender differences in rank achievement remain substantial even after controlling for research performance (Sonnert & Holton 1995; King 1994; Long *et al.* 1993; Toren 1991; Zuckerman 1991; Cole 1979). Therefore, it seems more justified to argue that women publish less than men, because they are more often in lower academic ranks, than *vice versa*.

3.3.2.5 *Institutional affiliation*

Of all the variables controlled for, institutional affiliation has the smallest effect on the average gender difference in publication productivity. Among the different types of universities - the top five research universities, other HAUs, and HDUs - the size of the gender gap does not vary in any significant way and corresponds very closely to the average difference that was observed for the subset of authors as a whole. These findings are inconsistent with the general trend reflected in research undertaken elsewhere, in particular in the United States, where controlling for type of institution places women much nearer men in terms of their publication productivity²⁷ (see Chapter 2, section 2.3.2.3).

It seems, therefore, that there is much less of a tendency towards “institutional ghettoisation” (Davis & Astin 1990:95) of women faculty in South Africa, than their counterparts in the United States²⁸. Although men are slightly more concentrated at institutions that are most able to encourage and facilitate the publication productivity of the academics that work there (or that tend to recruit and hire the most productive academics), this has no effect on the difference in

²⁷ While institutional affiliation accounts for a large proportion of the differential productivity by gender among American scholars in general, some research indicates that it may not be as important a factor for scientists in particular (Cole 1979; Zuckerman & Cole 1975).

average output between women and men. In fact, the gender gap is actually increased when controlling for the differences in research prestige or emphasis that exist between universities and technikons. The findings show that the small gender difference in institutional location that does indeed obtain in the South African academic context (see Chapter 3, section 3.3.3.1) does not provide an explanation for the gender gap in publication productivity in this country.

3.3.2.6 *Scientific domain*

In addition to “vertical” segregations along the professional and institutional hierarchies in academia, controlling for the horizontal segregation between different specialities throws some light on gender differences in publication productivity. The findings show that gender differences are reduced, but not significantly, and only for academics working in the social sciences and humanities. In all the other scientific domains (the natural sciences and engineering, and the medical and health sciences), the gender gap is actually wider than that which was found for the subset of authors as a whole. These results generally do not match those reported elsewhere: in Australia (Asmar 1999) and Norway (Kyvik 1988, cited in Lie 1990) gender differences in publication were reduced for all the discipline that were controlled for. Moreover, in Norway (*ibid.*) publication productivity differences between men and women were actually found to be *smaller* in the natural sciences than in the social sciences and humanities. Although Prpić (2002) found that gender differences in publication productivity are the greatest in the natural sciences, her results only refer to young Croatian researchers under the age of 36.

In this South African subset of authors, disciplinary gender segregation²⁹ produces only a small part of the observed gender differences in publication productivity across disciplines. Moreover, the fact that a narrowing of the gender gap was not observed for all three scientific domains does not allow one to conclude that the publication culture and practices of various fields affect the gender gap in publication productivity in any significant way. Nevertheless, the variation between the average male-to-female productivity ratios observed for the different scientific domains may indicate that the conditions conducive for women’s publication productivity differ according to field. Authors in the natural sciences and engineering fields should publish a higher rate of journal articles than those in the social sciences and the humanities, because of differences between these disciplines with regard to preferred research

²⁸ It should be noted, however, that there is a greater variation of academic institutions in the larger North American academic system than in South Africa, which might account for this finding.

²⁹ In South Africa a much greater majority of women faculty (61%) than their male counterparts (50%) work in the social sciences and humanities, and a much smaller percentage of women (21%) than men (38%) are located in the natural sciences and engineering (Bailey & Mouton 2004).

output format, methodology, teaching loads, the number and acceptance rate of journals, and available funding (see Chapter 3, section 3.3.3.2). However, this pattern seems to hold only for male authors in the natural sciences and engineering, as women in these fields publish exactly the same average output as their female counterparts in the social sciences and humanities.

These findings support the argument that, in the social sciences and humanities there are fewer barriers to the publication productivity of South African academic women than in the natural sciences and engineering. The reason why this is so, cannot be answered empirically with the data at hand, but it is highly possible that, the higher the number of women who are working in a field, the less likely there is to be gender discrimination. As women become more numerous in a field, gender discrimination becomes more visible, sanctions for gender discrimination are more frequent, and men are less apt to define women as incapable of doing the work involved in those fields (Cole 1979). This might explain why gender disparities in publication productivity are less pronounced in social science and humanities fields, but more research is needed to determine the exact relationship between gender minority size, type of discipline and research productivity.

3.3.3 **Women's lesser tendency to collaborate**

Collaboration may be linked to stronger publication productivity over the academic career, therefore it is important to note that women seem to co-author to a slightly lesser extent than men do, as co-authorship is one means of collaboration. Findings of previous research on women faculty's authorship and collaboration styles have not been consistent: quite a number of examinations of co-authorship trends among various samples in the United States failed to find evidence of gender differences in levels of co-authorship (Long 1992; Astin 1991; Mackie 1985; Cole & Zuckerman 1984; Zuckerman & Cole 1975), while an even greater number of studies found that women co-author more than men (Stack 2002; Kyvik and Teigen 1996; McNamee *et al.* 1990, cited in Ward & Grant 1991; Ward & Grant 1991; Ferber 1988; Thompson *et al.* 1980, cited in Ward & Gant 1991). The fact that this subset of South African women faculty are more likely than their male counterparts to publish as sole authors is a less common trend – one that has been found to obtain only among Croatian and Australian academics at the early stages of their careers (Prpić 2002; Asmar 1999), among psychologists at Australian universities (Over & Moore 1980), physical educators (Knoppers 1989) and educators in general the United States (Demetrulias 1986), and among American sociologists who published between 1967 and 1973 (Mackie 1977).

Although the difference between the sexes is quite small, the fact that women exhibit a lower propensity than men to collaborate with others when authoring articles is a factor that may very well contribute to women's lower publication productivity. As early as 1966 Price and Beaver established that scientists who publish the most joint papers are the most productive, even if corrections are made for multiple authorship (such as the system of article equivalents used in this study). Thus, teamwork itself seems to stimulate productivity. As a faculty member's level of intellectual and social connectedness is related to publication productivity (see Chapter 2, section 2.3.3.1), it makes sense that academics who work alone, who in South Africa seem more likely to be women than men, would be handicapped in their publication rates. Moreover, research elsewhere has shown that women who do not collaborate with other colleagues in research are less productive than their male *and* female colleagues (Kyvik & Teigen 1996).

Furthermore, if co-authorship of journal articles is taken as an indicator of *access* to research collaboration opportunities, the findings may indicate that women have more difficulty finding collaborators and/or have fewer collaborative partners available to them, than their male counterparts do. For instance, if norm for collegiality in academia is "male homosociality" – the preference and the enjoyment by men for the company of other men – this may exclude women from research collaboration with men (Maürtin-Cairncross 2003; Lipman-Blumen 1984, cited in Knoppers 1989). Thus, the "exclusion hypothesis" (Kyvik & Teigen 1996:56), that women lack integration into informal networks of collaborators at male-dominated academic institutions (see Chapter 2, section 2.3.3), may be considered a possible explanation for South African women academics' lower publication productivity. Additional support of the exclusion hypothesis is also provided by a recent South African study (CSD 1999), which found collaborative research and networking to be one of the needs identified by the women researchers in the social sciences and humanities.

Alternatively, the somewhat greater tendency among women to author articles alone may be connected to disciplinary norms. In the natural, engineering and medical sciences where men are clustered, team research and collaboration are strongly encouraged within the disciplinary ethos. Consequently, in South Africa the degree of multiple authorship has been found to be higher in these disciplines, than in the social sciences and humanities (DACST 1998b). Thus, women authors may be less involved in collaborative research than men authors are, not necessarily because they are barred from access to male networks, but simply because they are concentrated in the social sciences and humanities, where the traditions of the solitary scholar, the idea of the "individual character" of research, still persist (Hemlin & Gustaffson 1996:430).

4. Conclusions and recommendations

It is widely recognised that an analysis of the published outputs of academics provides a good indicator of their research activities. Although article publication in refereed scholarly journals is only one outlet for dissemination of research, it is generally considered to be the most important criterion for evaluating a researcher's work. Comparing the sexes in terms of their output of this form of publication can therefore be a valuable tool in mapping women's current research performance and participation, as well as their status in academia in relation to that of men. As most of the research on this issue has been undertaken in the Anglo-American context, it is important to investigate gender differences in publication productivity in other socio-cultural settings. This study, the first to address this issue in South Africa, demonstrated that men at HEIs in South Africa publish in aggregate almost twice as many articles in DoE accredited journals than their female counterparts do. This difference is determined by gender differences in both extremes of publication productivity: the most productive male authors exceed the productivity of the most productive women, and a greater proportion of men authors may be described as "prolific", while a greater proportion of women authors have very few article equivalents to their name.

The results indicate that women are lagging quite far behind their male counterparts in their publication productivity. This is particularly worrisome if one considers that the women and men who were compared in this study are a select group of faculty who authored at least part of a journal article between 1990 and 2001. Jacobs and Ingwersen (2001) recently reported that in South Africa very high proportions of especially lecturers and senior lecturers do not publish at all. Considering findings from research conducted elsewhere that women are usually disproportionately represented among non-publishers (Sheehan & Welsh 1996; Long 1992; Cole & Zuckerman 1984; Astin 1978; Cole & Cole 1973), it is highly probable that the gender gap in publication productivity reported here would have been even greater had non-publishing faculty been included in the study population. Not only do these findings imply that the scientific community pays a price in reduced growth of knowledge, but within the context of the recently introduced performance-based academic reward system (*cf.* DoE 2001) the publication productivity of women cannot remain a matter of indifference to policymakers. Under these more competitive conditions, which amplify the role of publication productivity in decisions concerning promotion and salary increases, women's lower publication productivity raises concerns about their future status within these institutions.

On a more positive note, women authors' contribution to the total scientific publication output of South Africa has at least increased since 1990. Although this study cannot provide definite answers as to which conditions, practices, and policies have a positive effect on women's publication productivity levels, it seems that the narrowing of the publication productivity gap between women and men that occurred during the 1990s was the result of deliberate, designed increases in the provision of research support, funding opportunities and capacity building programmes for women faculty. These special initiatives for women in research were largely driven through the science councils, and implemented by the DoE. Women-friendly funding policies might have increased funding awards to women academics and hence enhanced their publication productivity. However, much more work is needed if the future publication productivity of women is to increase substantially.

Moreover, a trend of increasing female participation in publication productivity cannot necessarily be expected in the future: the introduction of a more competitive academic reward system may lead to a future increase in gender differences in publication productivity, as Prpić (2002) found to be the case among young researchers in Croatia. The potentially negative effect of performance-based funding on our female faculty is compounded by an increase in the presence of young women faculty, as proposed by the National R&D Strategy (DST 2002). Such a strategy will lead to a greater proportional influx of women who have not yet attained their doctorate, generally do not qualify for outside research funding, have yet to establish a reputation for themselves in their fields, and - because of their lower rank - probably have to cope with increasingly demanding undergraduate teaching loads. In addition, their ages usually fall within the childbearing and childrearing range. An academic reward system that places an inordinately high level of stress on the accrual of large numbers of publications is more consistent with the professional roles, opportunities and life cycles of male faculty members than of these females, who will most probably fail to conform to the ideal-type, male academic.

Some may dismiss the substantial gender gap in research productivity among South African academics as "proof" that the female gender simply does not have "what it takes" biologically, or that women face too many time and energy constraints as they balance marriage, family and work, to succeed in an academic career. However, this study shows that both these explanations are overly simplistic for at least three reasons. First, no women are as extremely productive as some men are, *including some women who presumably have no families*. Secondly, the fact that the degree of inequality in publication productivity is much the same for both sexes indicates that gender in itself is a poor predictor of publication productivity. In other words, "Knowing

whether scientist-authors are men or women will tell little about their rate of publication” (Zuckerman 1991:45). Thirdly, there are important variations in gender differences in productivity for academics of various ages, with various qualification levels, and in various ranks and fields. This again provides evidence that it is not gender *per se* that contributes significantly or meaningfully to the explanation of differences in publication productivity.

Of all the possible factors that have been investigated in this study, controlling for rank reduces the observed gender disparity in publication productivity most dramatically, while controlling for institutional variables did not produce the reduction in the gender difference in publication productivity that was expected, based on findings reported in the literature (see Chapter 2, sections 2.3.2.3 and 2.3.2.4). In particular, academic women’s institutional ghettoisation, which exists only to a small extent in South Africa, does not account for the gender gap in publication productivity: differences in publication productivity between men and women academics are independent of the research prestige of the university at which they hold appointment.

Some notable patterns were also observed. First, the productivity gap between men and women to increases with age, primarily because men’s publication productivity does not level off, as women’s do at the age of 45, but increases with greater increments than women’s do. There are some indications of a negative, cumulative effect of career interruptions and heightened family responsibilities on a women’s publication productivity, but results are inconclusive, and may equally well be explained as the consequence of time period effects that reflect recent changes toward a more gender equitable environment in academia.

With regard to qualification level, the smallest gender difference in publication productivity is found among those authors with a master’s degree, while the difference is greatest for those authors at the two opposite extremes of the qualification hierarchy: undergraduates and doctorates. On the other hand, gender differences are very small at the most junior level of academic appointment, but they are most pronounced among full professors. Finally, there is quite extensive variation between the average male-to-female productivity ratios for the social sciences and humanities, and for the other two domains, which may indicate that the more numerous the women in a discipline are, the less the barriers to the publication productivity for those women. At the same time women’s concentration in the social sciences and humanities, where research collaboration is less common than in the other two domains, might cause women to co-author to a lesser extent than their male counterparts do.

The fact that the size of the gender gap varies among the categories of control variables provides some evidence of interaction between these variables themselves. This is particularly true for age, qualification level and rank. Thus, gender differences in publication productivity are likely to result from combinations and accumulations of these and other possibly interactive variables, rather than a single variable³⁰. Nevertheless, the general conclusion that may be drawn from the separate cross-tabulations is that the gender gap in publication productivity narrows most substantially when women's position in the academic hierarchy, as indicated by their younger age, lower qualification level and lower rank as a gender group, is held constant. In other words, part of what we see on the surface as gender differences in publication productivity can be explained by examining dissimilarities between men and women in terms of these particular variables. It is possible that some of these dissimilarities may stem from one or more types of discrimination, but such inferences cannot be drawn on the basis of the present analysis. One may, however, conclude that the influence of gender on publication productivity is to a certain extent an indirect one, as its relationship with publication productivity is mediated by such variables as age, qualification level and academic rank.

Actually, in a certain sense, women do not have "what it takes" to reach publication parity with men: women have on average less professional experience and status that comes with age, lesser skills, self-confidence and commitment to research because of their poorer qualifications, and less research-facilitating resources that are associated with an appointment in the higher, professorial ranks. Considering that high rank is also a requirement for full participation in the inner circles of scientific activity (Cole 1981), it is therefore not surprising that women, who are concentrated in the lower ranks, may lack integration into informal networks of collaborators, as indicated by their lesser tendency to co-author publications. If the aim is to bring women's research productivity on par with men's, it will be important to address women's subordinate position in the academic hierarchy.

Many studies have taken into account mediating variables similar to the ones controlled for in this study, and most show a dramatic reduction in gender differences in publication productivity. This seems to be the case cross-nationally, and in both developed and less developed countries (Teodorescu 2000). The gender gap is often narrowed to the point where women are not significantly less productive than men, and/or gender is shown to be unrelated to number of pub-

³⁰ Interactions between these variables can be assessed (*cf.* Rubin & Powell 1987; Bayer & Astin 1975), but it is generally agreed that the significance tests on which such an assessment would be based, are inappropriate when applied to population data, such as SA Knowledgebase data (see footnote 2 above).

lications (*cf.* Stack 2002; Teodorescu 2000; Asmar 1999; Bellas & Toutkoushian 1999; Xie & Shauman 1998; Bentley & Blackburn 1992; Wanner *et al.* 1981; Blackburn *et al.* 1978; Ferber & Loeb 1973; Robinson 1973; Simon *et al.* 1967; Bernard 1964). In this South African study the productivity differences between men and women are reduced, in particular when one compares authors younger than 45 years of age, at different qualification levels, in non-professorial ranks, and in the social sciences and humanities. However, women still publish less than men do, even after controlling for these covariates. In fact, after women have achieved a PhD and full professor status, the gap between their publication productivity and that of male professors with PhDs is greater than the gap that is found when women and men at lower qualification levels and ranks are compared with each other.

Before concluding that women academics in South Africa present a unique case, it is important to take certain methodological issues into account that might have influenced the findings. First, publication productivity is only measured as the output of articles published in accredited journals. Considering that gender differences in publication productivity are sensitive to how broadly or how narrowly research output is defined (see Chapter 3, section 3.1.2.3), a much smaller gender difference may be found if a wider array of publication types (in particular monographs, edited books and book chapters) is taken into account.

The way in which research productivity was defined and measured in this study may be criticised from an ideological standpoint as well. By taking article counts as the only indicator of research productivity implicitly accords a higher value to this form of output than to others. According to Etzkowitz *et al.* (2000:242), such a definition of research productivity is “implicitly masculine”. Moreover, it produces practices that might not be advantageous to the advancement of knowledge. An unintended consequence of the high value that is placed on article counts when allocating research funding, promotion and salary raises, is the increasingly common practice among academics of subdividing findings into numerous LPUs, or “least publishable units” (Boice & Jones 1984:572) – that is, the minimum material accepted as an article – which contributes to a flood of papers that clogs the communication system (Mooney 1991, cited in Long *et al.* 1993).

Women authors’ lower publication productivity might indicate that they are less willing than men to play this game of publication maximisation. It may even be the case that, although women publish less, they publish less fragmented, more comprehensive and synthetic work that is useful to their author colleagues, and therefore they contribute less to the cluttering the literature than men do (Cole & Zuckerman 1984). Some American research indeed suggests that

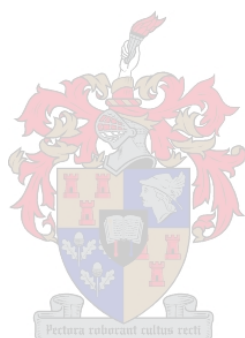
women choose to emphasise quality over quantity, by taking a more measured or meticulous approach to research (Kolpin & Singell 1996; Sonnert & Holton 1995; Long 1992; Persell 1983; Over 1982). However, such a style of work disadvantages them in the academic reward structure, which emphasises the quantity of article publications. As Persell (1983:41) states, “If quantity is the indicator of performance, men do better. But, if quality is the indicator, men and women perform equally well”. In this sense, simply counting numbers of article publications may not be the best way to assess productivity. An important objective for future research in South Africa would therefore be to compare men and women’s publication output not only in terms of quantity, but also in terms of quality by means of, for example, citation analysis.

The second point that needs to be considered is that SA Knowledgebase includes publications published over an eleven-year period. It has been consistently proven that the larger the fragments of time over which productivity is measured, the larger the differences in productivity by gender (see section 3.1 above). Therefore, if a focus were to be placed on the most recent years of publication, there should be less of a difference in publication productivity between men and women authors.

Thirdly, it was not possible to control for a number of variables that have been tested as confounding variables in other research, as data on these variables are not included in SA Knowledgebase. According to Xie and Shauman (1998), because of the large influence of the potential covariates of gender and publication that may mediate between these two variables, one has to include a large number of covariates in a multivariate analysis in order to fully account for gender differences in publication productivity. Most faculty surveys collect data that allow controlling for additional covariates, such as time lag between bachelor and doctoral degrees, years of experience as a faculty member or beyond the doctoral degree, available resources, such as teaching load, research funding, access to appropriate research facilities and/or assistance, and marital status and the number and age of children. However, the data contained in SA Knowledgebase prevented the author to capture these critical variables than could explain the gender difference in publication productivity.

These limitations highlight the need for improved quantitative data, if we are to move toward an empirically based explanation for gender differences in the publication productivity of South African scientists. However, increased attention to qualitative data is also important. Research on women in HEIs is predominantly quantitative, and little is known of the qualitative experiences of women as they progress through their academic careers. Consequently, many feminist researchers are of the opinion that qualitative research may be “added” to quantitative studies, to

gain a better understanding of the findings (Maürtin-Cairncross 2003:76). With regard to the topic of women academics' publication productivity in particular, a need has been highlighted here and abroad for detailed, qualitative accounts of the standards these women subscribe to, the decisions they have made, and the constraints they have encountered which affect their publication productivity (Maürtin-Cairncross 2003; De la Rey 1998; Cole & Zuckerman 1984).



CHAPTER 5

A Qualitative and CV Analysis of Gender Differences in Publication Productivity through the Course of Sixteen Academic Careers

1 Introduction

The majority of researchers who study publication productivity do so within a quantitative methodological framework. The gender equity debate in higher education in South Africa, and in the African context in general, has also been dominated thus far by numerical indices of sex ratios. Some observers do, however, argue that qualitative research will best inform strategies for gender equity (*cf.* Bennett 2002). The secondary analysis of SA Knowledgebase data on journal publications has yielded important findings on differences in academic publication productivity between women and men, as reported in Chapter 4. However, it was also found that the data contained in SA Knowledgebase are not adequate to provide a satisfactory explanation of differences in the publication productivity of men and women academics in South Africa.

Thus, although the research reported in this dissertation was originally conceived as primarily a quantitative, secondary analysis, as the research progressed it became clear that the complexity of the productivity puzzle calls for a more nuanced understanding of differences between the sexes in terms of motivations, attitudes, behaviour and experiences, particularly in relation to the publication aspect of their academic career. Also, a review of the literature (see Chapter 2) has shown that large-scale surveys have not (yet) provided a sufficient answer to the question why women publish less than men, and it is generally accepted that studies based on multivariate analysis are not sufficient, in isolation, to draw conclusions about causal processes (Hakim 2000).

It is therefore the main objective of the second part of the dissertation to generate a more detailed understanding of the possible origins¹ of the gender gap in academics' publication productivity by means of a more qualitatively oriented research design.

¹ Rather than being aimed at explanation *per se*, this qualitative research attempts to understand the reasons for gender differences in career aspects related to publication productivity from the respondents' perspectives.

2 Research methodology

2.1 Advantages associated with a qualitative research design

According to Babbie and Mouton, “[t]riangulation is generally considered to be one of the best ways to enhance validity and reliability in qualitative research” (2001:275). The qualitative research, combined with CV analysis, that is outlined in this chapter allows for such a triangulation of methods in the dissertation as a whole, and as such may overcome some the deficiencies that flow from an understanding based solely on a quantitative analysis of existing data. As a qualitative study is very likely to provide a more detailed understanding of gender differences in publication productivity than statistical averages and multivariate analysis do, it should enrich the picture sketched by the quantitative analysis of SA Knowledgebase.

An analysis of qualitative data, particularly when combined with CV data, would also allow one to study career publication histories over time. This may enhance our understanding of the possible reasons for some contradictions that emerged from the secondary analysis. Qualitative interviews may also partly overcome some limitations inherent in the quantitative studies of gender issues in science (Vasil 1992). For example, women (and men, for that matter) seem to be more reluctant to describe their family and personal commitments in the negative terms of a questionnaire item that implies that their children represent some kind of barrier, inhibitor or problem area in their life, than when they narrate their family-related experiences in a qualitative interview (Asmar 1999). In addition to alleviating social desirability effects, qualitative interviews also tend to unearth more readily those subtle forms of discrimination that are not easily measured and quantified² (Cole 1981).

A particular focus of the research discussed in this chapter, is to compare men and women’s perspectives on what they view to be factors that have influenced or affected *one* aspect of their occupational achievement, i.e., their publication productivity. This strategy requires a chronological reconstruction of a relatively small number of “publication success stories”. For this purpose, semi-structured interviews with a relatively small number of women and men academics, complemented by an analysis of their CVs as personal documents, were undertaken. In the remainder of this chapter, a more detailed account will be provided of the data sources utilised and the topics that were focussed on during interviews, after which the data are analysed and interpreted.

² In recognition of this fact, most of the existing research on gender discrimination in academia has been qualitative (Bronstein & Farnsworth 1998).

2.2 Data sources

2.2.1 **Individual interviews**

In order to collect qualitative data on academics' publication experiences during the course of their careers, sixteen semi-structured interviews of a qualitative, semi-structured nature were conducted telephonically³, tape-recorded and transcribed verbatim (see Appendix C for the transcribed interviews). The respondents were selected according to a purposive sampling technique, as informed by the purpose of the study. The findings should therefore not be treated as statistically representative, and the main concern is not with generalising to a larger population of academics. Rather, it is to provide a more detailed understanding of gender differences in career aspects related to publication productivity.

2.2.1.1 *Sampling criteria*

Before conducting any fieldwork, a number of sampling criteria were identified as pertinent to the study. The first criterion concerns the gender of the respondents. Most studies on gender issues in academia, in particular those conducted thus far in South Africa, have investigated women only. Although these studies provide, in part, an understanding of factors that affect the productivity of female academics (*cf.* Maurtin-Cairncross 2003; NRF 2001; CSD 1999), such an approach does not provide a clear understanding of whether the experiences women faculty report are to a large extent *gender specific*. As Karp (1985) explains, one needs to draw on the experiences of men in order to place the women's lives in proper perspective. Therefore, the present study included an equal number of women and men.

Potential respondents were further narrowed down to only those academics that are most "successful" or prominent in terms of scientific publications. This extreme version of a contribution-based definition of what constitutes a scientist is not uncommon. Studies that, for a variety of reasons, have concentrated on an elite group of scientists who are major producers of scientific publications, include those of Astin (1991), Cole and Singer (1991), Davis and Astin (1990), and Sonnert and Holton (1995).

In the context of this study, such an approach may shed more light on gender differences in publication productivity for the following reasons: First, all of these academics have already reached the highest academic qualification (a PhD) and position of seniority, i.e., that of full professor. Thus, the course of publications and promotions from entry rank (such as junior

³ On the insistence of one respondent, a face-to-face, tape-recorded interview was conducted in his case.

lecturer) up to the highest rank in the academic hierarchy can be traced for these individuals. The analysis of SA Knowledgebase and other North American research (e.g., Long 1992) indicate that gender differences in publication productivity do not remain stable over a career. In particular, the productivity gap between South African men and women does not necessarily decrease linearly as age increases or as one moves up the qualification and rank hierarchy. These findings suggest the need to examine gender differences over more than the first or even second decade of the academic career.

Secondly, the respondents in positions of seniority would have had sufficient opportunity to experience barriers – both visible and unseen - to publishing, and would therefore be able to provide an account thereof. At the same time, South African researchers have argued that respondents in more senior positions are also able to report on the advantages of being in such positions, with regard to publication productivity (*cf.* Maürtin-Cairncross 2003; Dlukulu 2000; De la Rey 1999). In other words, the respondents may be considered as “thoroughly enculturated” (Spradley 1979, cited in Babbie & Mouton 2001:288) in academia. Thirdly, it is highly probable that major producers of scientific publications entered academia at approximately the same time. Such a purposive sample therefore controls for varying historical contexts that influence both the work environment (e.g., the probability of promotion) and values relating to women’s role in society. Finally, the data would allow one to investigate a crucial question raised by the SA Knowledgebase analysis: why do even the most productive women – women that are chronologically and professionally mature and at the top of the academic qualification and rank hierarchy - publish less than their male counterparts?

SA Knowledgebase was again utilised, but in this project only to select the respondents, as the database allows one to identify the most prolific South African producers within each gender group, in terms of a count of accredited journal articles. This quantitative criterion was complemented by a more qualitative requirement for selection, by including only those scientists who are rated by the NRF, on the basis of the quality of their scientific contributions⁴, as at least internationally acclaimed researchers (B)⁵. In line with the secondary analysis of SA Knowledgebase data, which included only academic scientists (see Chapter 3, section 2.2.3.2), only respondents who were affiliated to an academic institution during the time of the interviews

⁴ It needs to be taken into account that this rating system is not without a measure of controversy. In particular, many social scientists feel that the present system of rating was imposed, without adequate consultation, by a natural science-dominated NRF and that it is inappropriate for social science. According to Alexander (2004a:17), this has not only produced a “deficient rating system”, but it has also led to some mistrust between leading researchers and the NRF, causing social scientists to make a conscious decision not to apply for a rating.

⁵ As there were only three A-rated women scientists in the country at the time, B-rated scientists were included as well. Of those respondents interviewed, four of the males and two of the females are A-rated.

were considered for selection. Also, this criterion fulfils the requirement of “current involvement”, as the selected respondents are currently involved in the academic publication issues concerning the study (Spradley 1979, cited in Babbie & Mouton 2001).

In combination, the above criteria produced a list of thirty potential respondents, consisting of a highly select, homogenous group of “superwomen” and “supermen”. Particularly among these “surviving” women, who one may assume are more similar to career-oriented men than to women in general, the effect of family responsibilities may be understated. In general, selecting only the most productive publishing academics will indirectly lead to a demand-based definition of a scientist, as it is highly likely that only those scientists of whom publication of research results is expected and rewarded, are selected (see Chapter 3, section 2.2.2 for a more detailed discussion of the advantages and disadvantages associated with such a demand-based definition of a population of scientists).

It is therefore not surprising that very little variation by age, qualification level, academic rank, professional experience, and type of institution is reflected in the sample (see Appendix D for a detailed profile of the respondents). This second part of the study is limited only to scientists over the age of 40, who have attained a PhD, and occupy permanent positions in the full professorial rank (with both teaching and research duties⁶) at HAUs⁷. All but one of the respondents – a woman - are white⁸. The majority of the respondents (seven women and five men) work in the natural or health sciences – scientific domains that arguably expect and reward the publication of relatively short accredited journal articles more than the social sciences and humanities do. The fact that the all but one of the women respondents work in the natural or health sciences, and have therefore chosen male-dominated disciplines, may have further increased the sampling selectivity referred to above.

⁶ It is important that full-time researchers are excluded from the sample, as they should, theoretically, be able to produce considerably more research output than instructor staff (*cf.* Blackstone & Fulton 1975; also see Chapter 3, section 2.2.2.1).

⁷ Five respondents were associated with the University of Stellenbosch, three with the University of the Witwatersrand, and two with the University of Pretoria. One respondent each hailed from the University of Cape Town, UNISA, the University of Johannesburg, Rhodes University, the University of Kwazulu-Natal, and the Potchefstroom University of Christian Higher Education.

⁸ Considering the effects of double discrimination on African women (see section 3.3.1.2 in Chapter 3), it is remarkable that a black woman fulfilled the sample criteria. However, it is in line with the findings of the analysis of SA Knowledgebase, reported in Chapter 4 (see section 3.3.2.2), that the difference between black women and white women’s publication productivity is much smaller than the gap one finds between black men and white men.

In contrast to prior research on publication productivity that has been flawed by the confounding effects of variables such as discipline, rank, and type of institution (Thoreson *et al.* 1990), selecting the top men and women publishers in the country allows for an approximation of a “matched pair design”: as the male and female groups tend “match” each other in terms of certain variables, these variables are held constant, which allows one to “tease out” more easily the *direct* effect that gender *alone* has on publication productivity.

2.2.1.2 *Duration of the interviews*

Because of their in-depth nature, qualitative interviews tend to be quite extensive or lengthy, usually lasting from one to two-and-a-half or even three-and-a-half hours each. However, given the respondents’ time constraints and the fact that telephonic interviews were conducted, the average interview was limited to approximately 30 minutes, and produced between five and ten transcribed pages, or approximately 4 000 words each. The time limitation required that the focus on publication productivity in particular – as opposed to academic career histories in general – had to be maintained throughout the interviews (see section 2.3 below). In addition, only limited - if indeed any - time was spent during the interview on the collection of background information, as data on birth date (and therefore chronological age) and scientific field or discipline were available in SA Knowledgebase, and the use of the CV in conjunction with the interview allowed for the collection, prior to the interviews, of data on educational qualifications, employment history, and publication record.

2.2.1.3 *Contacting potential respondents, gaining trust and establishing rapport*

To evoke an initial interest in the study, potential respondents were contacted (in order of productivity) via e-mail, and informed about the purpose and objectives of the research and interview (see Appendix A for the formulation of the cover letter). Confidentiality assurances were given, as well as assurances that the information acquired would only be used for the purpose of the author’s doctoral research.

Preserving confidentiality presented a particular challenge in this study, as the entire academic community in South Africa is relatively small (De la Rey 1999) and this select group of top publishers are easily identifiable. Special attention was therefore given to prevent a reader from linking responses to the identities of the particular respondents who provided them. In order to achieve this, the respondents’ names were replaced with pseudonyms⁹, and any other information that may possibly identify them, such research field and place of work, was replaced

⁹ The pseudonyms were chosen to reflect the gender and first language of the respondents.

by more general descriptors. During the first contact, potential respondents were already made aware of the fact that the interviews would be tape-recorded, and were then requested to indicate their willingness to participate in the interviews. They were also given the opportunity to decide on a date and time for the interview (within a time period of two to three weeks after the initial contact in April 2005) that would be most convenient for them.

In general, faculty members dislike and distrust studies of their work habits (Yuker 1984). However, the faculty who were contacted exhibited very little resistance to being interviewed: less than five of the potential respondents declined, citing time-constraints as the primary reason. In general, resistance response is much more likely among academics that have been performing way below average, or faculty at HBIs who have been found to respond very poorly to mail surveys on research-related issues (NRF 2001; Van Staden *et al.* 2001; DACST 1998a)¹⁰. The potential respondents who declined, were replaced by respondents further down the productivity list, until a level of data saturation was obtained that was judged as adequate against the background of pragmatic concerns, such as limited time. Consequently, eight male and eight female interviews were conducted and transcribed in total.

At the commencement of the actual interviews, respondents were again assured of the confidentiality of their responses, the voluntary nature of the study was communicated clearly, and informed consent was gained. As is typical of any research project utilising qualitative interviewing as a data collection method, respondents were also given the option to refuse to answer particular questions, to have the tape recorder turned off at any time he/she so requested (or not used at all), and/or to terminate the interview at any point, if they wished to do so. None of the respondents ever felt the need to do so, and because the interview was conducted telephonically, it is unlikely that the audiotaping was perceived as obtrusive¹¹. In fact, by far the majority were keen to speak freely and analytically about their own work experiences. As a result, some interviews (both male and female) exceeded 45 minutes.

It is very likely that the respondents' willingness to be frank and open was enhanced by the fact that the interviews were personally conducted by the author, who is similar to most of the respondents in terms of race¹², language¹³, and the fact that she is pursuing an academic career at

¹⁰ However, both the 1999 audit of women in research (CSD 1999) and a study of women academics at HBUs in particular (Maúrtin-Cairncross 2003) reported a "good" response rate of more than 30 percent.

¹¹ Some of the respondents expressed some initially nervousness about being recorded, and/or weighed their words carefully at the beginning of the interview. However, approximately five minutes into the interview they become less aware of the fact that their words were being recorded, and their responses become increasingly spontaneous.

¹² The author is white, as are fifteen of the sixteen respondents.

a South African university¹⁴. This limited the number of potential barriers between the researcher and the respondents, although some other differences might have had an effect on the interview dynamics. In particular, the gender difference between the female author and the male respondents¹⁵ and the fact that in terms of academic rank and status the interviewer is in a relatively junior position in relation to the respondents, might have increased the likelihood of social desirability bias of responses (see section 3.5.3.2 below), and/or decreased the interviewer's ability to develop a true insider perspective. As Babbie and Mouton (2001:285) point out, biases may also be brought into the interview situation by the interviewer by virtue – in this case – of her gender and age. However, the interviewer was aware of these potential biases, and tried to avoid them as far as possible by carefully wording questions in order to reduce the perception among respondents of any pressure to provide socially desirable answers. Also, the fact that the author was interviewing “upward” (*cf.* De la Rey 1999:112) in terms of academic rank and status - although daunting at times - allowed her to adopt more easily the role of the “socially acceptable incompetent” (Lofland & Lofland 1995, cited in Babbie & Mouton 2001:290) with regard to many of the issues dealt with in the interviews.

At the end of each interview the interviewee was thanked for his/her time, and for sharing his/her experiences. The respondents were also thanked in an e-mail sent to them a few months later (see Appendix E for the formulation of the follow-up letter), which included a copy of their interview transcription. In order to undertake “member checks” (Babbie & Mouton 2001:275&277), i.e. going back to the respondents to check the raw data, respondents were asked to scan the transcription to confirm whether it actually reflects what they said during the interview. This also provided them with the opportunity to determine if confidentiality had been maintained to a satisfactory extent. Most of the respondents were completely satisfied with the transcription, and only three suggested minor changes be made to the transcription (e.g., inserting or deleting a word or phrase), mainly to enhance the understanding of the meaning of their responses.

¹³ The author is bilingual and the interviews, as well as any other correspondence, were conducted in the first or preferred language of the respondent. Ten of the respondents may be classified as English-speaking, and six as Afrikaans-speaking. Sections of the Afrikaans transcriptions that are quoted in this chapter have been translated into English.

¹⁴ When e-mailing or telephoning the respondents, the author introduced herself by name, and indicated that she is a lecturer and doctoral student in the Department of Sociology and Social Anthropology at Stellenbosch University, who will be using the data for her doctoral research.

¹⁵ Interestingly, though, the interviews with the males were longer and produced 12.5 percent more data, on average, than the interviews with the females did.

2.2.2 CV data

CVs represent a relatively standard and unobtrusive source of tremendously rich and comprehensive longitudinal data about matters central to academic careers, such as the timing, sequence, and duration of jobs, promotion record, and – crucial to this study – publication record. “The CV, unlike other data sources, often recounts the entire career of the scholar in some detail. Thus, it is not simply a list of credentials, but a historical document that evolves over time, capturing changes in interests, jobs, and collaborations” (Dietz *et al.* 2000:420).

However, the CV has not often been employed as a source of data. In South Africa, the author was only able to find one reference to the use of CV to collect data - in this case demographic data on a small sample of women in executive positions in the higher education sector (Moultrie & De la Rey 2003). Dietz *et al.* (2000), who have recently assessed the utility of the CV as a data source for examining the career paths of scientists and engineers, conclude that they seem to hold much promise as a data source.

Considering these advantages, respondents who agreed to participate were requested to provide the interviewer with a copy (preferably electronic¹⁶) of their CV after the initial contact. Although Dietz *et al.* (2000) report a very low response rate ($\pm 30\%$) from e-mail requests for a CV, the highly productive and prominent faculty selected for the interviews all seemed to have an updated electronic copy close at hand. These CVs were then used as a data source in conjunction with the interview, which provided the opportunity for triangulation and for the linking of subjective and objective data. In addition to thus enhancing the credibility of the findings of this study, using the CV as data source reduced the time spent during the interview to obtain and record the education and employment histories, and detailed publication records of respondents. The fact that the author also studied the CVs in detail prior to the interviews provided a point of departure for the probing of certain issues during the interview (see section 2.3 below).

In terms of limitations, it is important to recognise that one can only *assume* that the CV provides complete and accurate information about an academic’s graduate education, academic positions and publication productivity. Because the information is self-reported, it is subject to being portrayed in a favourable light¹⁷ or even completely fabricated¹⁸. No doubt some CVs will

¹⁶ This specific request was aimed at preventing the interviewee from incurring any printing or paper copy costs.

¹⁷ This is the problem of CV “embellishment”. CVs have been found to closely match information from other secondary sources, such as the directories of professional associations. However, these other secondary sources have been shown to undercount the number of published journal articles as compared to CVs (Heinsler & Rosenfeld 1987, cited in Dietz *et al.* 2000).

distort or even downright deceive the reader. However, it is unlikely among this selected group of highly productive academics, and – if it does occur – there is no reason to assume that the measurement error would be related to gender, the primary independent variable of interest. In other words, it is unlikely that men are any more or less likely to misrepresent their career information than women are. Finally, Dietz *et al.* (2000) warn against the enormous work involved in coding the CV for subsequent analysis. However, as the CV was not used as the primary data source, but rather in support of qualitative interviews, data were not coded in detail. Data were analysed with the Statistical Package for the Social Sciences (SPSS).

2.3 CV data and interview themes

The interviews were semi-structured, that is, conducted according to an interview guide, which consisted mostly of open-ended questions (see Appendix B for the interview guide). These were focused on certain themes or broad areas of questioning that are all directly related to publication productivity. The selection of questions was informed by the review of previous empirical and theoretical work on gender differences in publication productivity (see Chapter 2), some of the the intriguing results of the quantitative, secondary analysis of SA Knowledgebase, as well as methodological considerations relating to a study of gender differences in publication productivity (see Chapter 3). Although focus group discussions were considered for the purpose of identifying question themes, the experiences of researchers such as Maürtin-Cairncross (2003) indicate logistical problems and lack of available time slots as factors impeding the use of this data collection technique, particularly among university staff.

It was therefore decided to rather allow respondents to arrange an individual interview in a time that suited their schedules. The fact that during the interview the respondents were in their offices – their “natural setting”, so to speak – provided the further convenience that they were able to continue with their work until the interview was initiated, and to continue with their work when the interview was over (*cf.* Maürtin-Cairncross 2003; Dlukulu 2000). On the level of data analysis, it was also considered preferable to ask questions similar to those included in previous studies of publication productivity (especially qualitative ones) that have been conducted elsewhere, in order to allow the comparison of findings.

¹⁸ Actually, all social surveys, which constitute the vast majority of sociological research, are hampered by the potential inaccuracies of self-reported information, as they are based on responses to survey items asking interviewees to report on their own backgrounds, attitudes and behaviours (Xie & Shauman 1998; Wanner *et al.* 1981).

2.3.1 Measuring publication productivity

One of the central variables in the study, publication productivity, was measured as the number of article equivalents recorded in SA Knowledgebase from 1990 to 2003, but also by a modified measure developed from the CV. This measure aims, in a number of ways, to lessen the potential for gender- and discipline-related biases in commonly used measures of publication productivity (see section 3 of Chapter 3). First, the new measure is a lifetime-measure, in that it includes all the articles published over the complete span of a publication career from the first accredited journal article until - (in most cases)¹⁹ - 2004. By maximising the time period across which publication productivity is measured, short-term fluctuations in publishing are controlled for, and a more stable perspective is achieved (Najman & Hewitt 2003; Phelan 2000; Teodorescu 2000).

Secondly, the CV data allow one to develop a finer measure involving the number of pages²⁰, rather than articles as the unit of analysis. In this way, variations in article length – directly related to discipline and indirectly to gender – is taken into account²¹. Thirdly, the measure is not cumulative, as it does not involve counting total publication output over the complete span of a career²². Instead, an average over all the “actively publishing years” is computed, excluding from the measure those years during which a respondent produced an output of 0 pages. This prevented the lifetime measure from being confounded by years’ of service and/or time and opportunity to publish. In this sense, the measure does not discriminate against women in particular, who tend to be younger in terms of career age, take maternity leave, or are limited in the number of hours they can devote to research and writing when their children are young.

Finally, the number of authors was adjusted for by following the standard practice of dividing the number of pages an article comprises by its number of authors (see section 3.1.4.2 in Chapter 3), producing what the author terms “page equivalents”. Publication productivity was therefore measured as the number of pages, divided by the number of authors involved, that were published in DoE accredited journals during the actively publishing years of a respondent’s career.

¹⁹ Most of the CVs had been updated at least a year before the interviews took place. Publication productivity data were recorded up until the year for which *all published* articles were listed, which meant excluding 2005 for all of the respondents, 2004 for four of the respondents, and 2003 for one respondent, because all or some of the publications were still listed as “submitted”, “under review”, or “in press” in those years.

²⁰ As all CVs were available in electronic format, each respondent’s list of publications could be converted relatively easily into a table, with columns separating the co-authors, journal title, first page, last page and year of publication for each article. The number of pages was calculated by subtracting the first page from the last page of an article.

²¹ See section 3.1.2.2 in Chapter 3 for a more detailed discussion on article length variation.

²² See Chapter 3, section 3.1.5 for a more detailed discussion on issues relating to period of exposure.

In addition to measuring publication productivity, the degree of multiple authorship was also determined for each respondent, whose likelihood to produce jointly authored publications was operationalised as the proportion of his or her accredited journal articles that are multi-authored, and solo-authored. The average number of co-authors was also counted for each respondent. As the issue of collaboration may be of a more subtle nature than what is reflected by rates of co-authorship, reasons for a tendency toward multiple authorship (and therefore, arguably, for research collaboration²³) were determined during the qualitative interviews.

The CV data also allow for a detailed career publication profile, in the form of a line graph, to be compiled for each respondent. These graphs are used to determine if there have been any “dips” or “spurts” in publication productivity during a respondent’s career, and the reasons for such trends were then explored during the interview. It was hoped that such an analysis may shed some light on the results emanating from the secondat analysis of SA Knowledgebase, such as the fact that publication productivity levels off for women at the age of 45, but not for men. Also, those respondents whose publication profile showed that they published during their graduate training were asked to what factors they ascribe such early publications, and what (if any) effect this early start had on their later publication productivity. Consequently, a number of these graphs are integrated in the data analysis below, where relevant.

The CV data also allow one to compare the respondents in terms of a number of other publication-related tendencies, such as publishing academic output other than accredited journal articles, and/or publishing in “internationally²⁴ accredited” (listed in the ISI or IBBS indices), or “locally accredited” (only listed in the additional DoE index of local journals). However, considering the small sample size, and the fact that three of the men, but only one of the women, are working within the social sciences and humanities domain (see Appendix D, p. 489), it is highly possible that any gender patterns in this regard will be confounded by field differences (see Chapter 3, section 3.3.3.2)²⁵, precluding any meaningful gender comparisons to be drawn on the basis of the data.

²³ Although it has become standard practice to use such measures of co-authorship as the main quantitative indicator of research collaboration between individuals, this practice is not without its problems (see section 3.2 in Chapter 3)

²⁴ It needs to be remembered that the concern with “internationality” is typical of the scientific communities in the Third World or on the periphery, such as South Africa, where a practical yardstick of the quality of a publication is whether it is an international (mainstream or foreign) or national (domestic) publication (Goel 2002; Stolte-Heiskanen 1986).

²⁵ Preliminary analyses did indeed show a pronounced tendency for the three men in the social sciences and humanities fields to publish their research findings in formats other than the accredited journal article. In addition, relative to the respondents in the other two domains, a very low percentage of the total article output of two of these men (and none of the articles of the one woman in the social sciences and humanities) was published in ISI- or even IBSS-listed journals (see Appendix D, p. 498-499).

2.3.2 **General views on publication**

Respondents were probed on their views on scientific publication, and in particular on the increasing pressure on South African academics to “publish or perish”. On a more personal level, respondents were probed on what they perceived to be the primary motivator(s) driving their high publication output, and if they have experienced any positive and/or negative effects of maintaining such an output.

2.3.3 **Views on teaching and research**

In order to develop an understanding of respondents’ perspectives on teaching in relation to research and/or publication, they were asked what they thought the relationship between teaching and research should be. On a more practical note, they were asked to report to what extent their research informs their teaching, to compare their teaching load to that of their other colleagues, and to evaluate the extent to which their interests lean towards either research or teaching.

2.3.4 **Factors that have impacted on publication productivity**

Respondents were asked what they would consider the most important personal and/or institutional factors that have contributed to their publication productivity during the course of their career. Conversely, they were also asked if they have encountered any constraints in their career thus far, preventing them from publishing as much as they would have liked to. Similar data were collected from a different angle, by asking respondents what advice they would give to students or young staff members who would also like to reach a high level of publication productivity.

It was important to determine whether interviewees spontaneously refer to certain factors as impacting on their publication productivity, and if they did, these were probed further. At the same time, the possible effect of a number of factors, if not volunteered, was also probed (taking care not to lead the participants into such a discussion, but merely to ensure that all possible factors were considered). First, based on information on the institution where the PhD was obtained, as gleaned from the CV, respondents were asked about the effect (if any) that this might have had on their later publication productivity. Secondly, the CV data were used to determine at which academic institutions the respondents were employed during their careers, and where they are currently employed. Respondents were then asked about the possible impact that these employing institutions might have had on their publication productivity.

Thirdly, the CV data were used to determine the respondents' career or professional age and the number of years they have been in the full professorial rank, as well as to identify any salient or unusual career features, patterns, or trends. Respondents were then asked about the possible effects that their particular career path might have had on their publication productivity. They were also probed on how they make time to publish, considering other academic and family-related roles they have to fulfil. In part, these questions were aimed at shedding more light on the counter-intuitive result of the SA Knowledgebase analysis that the gender gap in publication productivity is most pronounced among full professors and those with a PhD.

As mentioned in section 2.3.1 above, the respondents' tendency to produce jointly or solo-authored papers was determined from the CV. This information was used to introduce a discussion on the fourth issue, i.e., the impact (if any) that research collaboration has had on a respondents' publication productivity. The discussion also extended to the possible impact (if any) that informal contact with colleagues within the respondents' field might have had on their publication productivity. A related issue, the incidence of discrimination - particularly (but not exclusively) of a gendered nature - in the academic workplace was also raised among both male and female respondents. Female respondents were probed further on the possible impact gender discrimination in any form has had on their publication productivity, and if they have perceived any changes over time in the provision of research support, funding opportunities and capacity building programmes for women faculty (which may explain the narrowing of the publication productivity gap between women and men that, according to the analysis of SA Knowledgebase, occurred during the 1990s).

Finally, with regard to marriage and parenthood, the quantitative analysis of SA Knowledgebase raised an intriguing question: why are no women as extremely productive as some men are, including some women who presumably have no families? Therefore, in the qualitative component, respondents were asked to describe their views on combining marriage with a research career, as well as the impact (if any) their own spouse(s)²⁶ has had on their publication productivity. In a similar question, both men and women, irrespective if they have children or not, were then asked to espouse their views with regard to combining parenthood with a research career. To those thirteen male and female respondents with children (two men and one woman are childless), more specific questions were asked about the effects (if any) that parenthood had on their publication productivity. The women were then probed further about

²⁶ All of the respondents had been married at least once. At the time of the interviews, all of the men were married, while one woman was a widow and another was divorced (see Appendix D, page 489).

maternity leave, the stage in their career at which work-family conflicts were most difficult to cope with, as well as any mechanisms that helped them cope in this regard.

3 Data analysis and interpretation

3.1 Section outline

In the following section, the extent of the gender difference in publication productivity among them will first be reported, whereafter data contained in the respondents' CVs are analysed in conjunction with the qualitative data obtained from telephonic interviews, in order to develop a deeper and fuller understanding of the possible origins of the measured gender gap. In many cases, the CV data provide a starting point for the further investigation of particular issues, undertaken by means of a thematical analysis of the qualitative interview data (for a tabulated summary of this and other data, see Appendix D, pp. 489-493). The focus of such analysis is on identifying common issues or themes within the gender groups and differences between the genders regarding their publication careers, experiences and perspectives.

Where appropriate, the literature reviewed in Chapter 2 is used to interpret and make sense of the data, which is therefore placed within the context of existing empirical findings, hypotheses or theories. However, the research process is predominantly inductive in its approach, resulting in the generation of new hypotheses that may make more sense of the observations. Also, rather than reverting to abstract, theoretical constructs, the aim is to couch qualitative descriptions "in the concrete, everyday terminology of the actors themselves" (Babbie & Mouton 2001:272). Thus, in an attempt to "stay true to the meanings of the actors themselves" (*ibid.*) categories and concepts used by the respondents themselves are integrated – primarily in the form of verbatim quotations - into the reporting and analysis of the data.

The themes or issues that emerged from the data define the structure of the remainder of this chapter. The first theme relates to gender differences in terms of career age, and provides a detailed understanding of the factors that contribute to this difference, as well as the differential consequences it has for the male and female respondents' careers. This discussion touches on a number of sub-themes, which are fleshed out in the remainder of the sections.

In the first of these, which relates to parenthood, marriage and publication productivity, the fact that the women respondents tended not to spontaneously mention the effects of motherhood on their publication productivity is investigated. Thereafter, the extent and nature of such effects and personal adaptations that are required to counteract these effects are described. In order to

successfully combine a research career, marriage and/or motherhood, women need to negotiate a supportive environment in the institutions where they work, as well as in their families and marriages. Attention is therefore focused on the way in which the women of different generations do so, as well as on the predominantly positive impact of their husbands on their publication careers.

The issue of the possibility and effects of combining motherhood on a research career is not only viewed from a female perspective, but the male respondents' views in this regard are also investigated. The focus will be on how men view the combining of a research career and motherhood by their female colleagues. Although the men had very little to say about the effects of fatherhood on their own careers, they tended to focus strongly – and quite spontaneously – on the effects of their academic careers on their children. A discussion of these effects is followed by another two themes that form part of the broader subject of marriage, parenthood and academic publication productivity in terms of which the male perspective and experience differs quite noticeably from the females', i.e. co-parenting and spousal support.

As the literature review in Chapter 2 shows, academic publication productivity – and therefore any gender difference in this regard – may also be influenced by a number of institutional factors. The discussion therefore turns to constraints other than family responsibilities on academic women and men's publication productivity. The first of these involves the influence of the broader political and institutional context, after which the focus shifts to the more immediate work environment. A gendered analysis of the encroachment of administrative and managerial duties on the time available to produce research publications is then followed by an investigation of the possible impact of gender discrimination on especially, but not exclusively, women's publication productivity. This analysis is presented from both a female and male perspective, and the genders are further compared in terms of their responses to institutional constraints they have experienced in their careers.

One particular form of gender discrimination often reported in academia is women's exclusion from male-dominated networks. Thus, a part of the data analysis focuses on women and men's interaction and collaboration with their peers and postgraduate students. While joint authorship with postgraduate students may increase a supervisor's publication productivity quite substantially, undergraduate teaching responsibilities are generally argued to have the opposite effect, therefore gender differences in terms of teaching load are investigated next. Males and females are also compared in terms of their prioritizing of, preference for and enjoyment of

undergraduate teaching, and possible reasons for these differences, as they emerge from the interviews, are presented.

In the final section of the data analysis, the focus shifts away from what the respondents have primarily experienced as constraints to their publication productivity, to factors that facilitate this aspect of their academic career. These range from institutionally related facilitators, such as funding, to personal drive and confidence.

3.2 The extent of the gender difference in publication productivity

According to SA Knowledgebase, the sixteen respondents in the sample have produced a total of 776, or an average of just more than 50 article equivalents per respondent for the period 1990 to 2003 as a whole. An analysis by gender of author produces a female to male ratio of 0.37. In other words, the men have produced on average almost three times the number of article equivalents (73) that the women have (27) (see Appendix D, p. 492). Among these 16 authors, the publication productivity gap is therefore much greater than what was found in the group of South African authors at a whole, where the female to male ratio was measured at 0.57

When the modified page equivalent system is employed, the male authors are shown to have been producing an average of 39 page equivalents per active year, compared to the females' 17 such units per active year (see Appendix D, p. 492). The female to male ratio is now almost 0.44, indicating that the modifications that were introduced impact on the size of the gender gap that is found. For example, when inactive years are brought back into the equation, both men and women's page equivalent output drops, but women's drops lower than men's, producing a ratio of 0.36, which is very similar to that produced by the SA Knowledgebase data for this specific sample. This implies that **not** taking into account inactive years disadvantages women in relation to men when the sexes are compared in terms of publication productivity. Ultimately, the way in which one measures publication productivity, and particularly the extent to which one takes into account the time (and therefore opportunity) an author has had to be productive, has an appreciable impact on the size of the gender gap that one finds.

3.3 Career age and publication productivity

In terms of chronological age, the male and female respondents do not differ much. On average, the female respondents are slightly younger (54) than their male counterparts (56). However, among the male respondents the age range extends to a much younger level of 41 years, while the oldest female - at 68 - is also the oldest respondent in the sample. More important in an

analysis of publication productivity, however, is the notion of career age, measured as the number of years since the respondent has obtained his/her doctoral qualification. It is also in relation to this feature of the respondents – one that reflects seniority and/or years of professional experience – that one finds a more pronounced difference between the men and women. While the men in the study had amassed an average of 26 years of professional experience by the time of the interviews, the women, on average, had five years less experience. The women's career ages range from a mere 13 years to 28 years, while those of the men range from 16 to 35 years (see pp. 489 and 491 in Appendix D for a detailed profile of the respondents in terms of chronological and career age). As frequent academic publication is usually only initiated after the completion of a doctoral qualification (*"When I had finalised my dissertation, I could start, as it were"*, a female respondent explains), it is not surprising that women's considerably younger career age would negatively influence their publication productivity.

The combined chronological and career age data provide further, direct evidence that women tend to obtain their doctoral qualifications at a later chronological age than the men do. An analysis of CV data on birth date and year at which doctoral qualification was obtained shows that, on average, the women were awarded their doctoral degree at the age of 34, and that half of the women were older than 33 when their publication careers could actually be considered "ready for take-off". The men, on the other hand, had obtained their doctoral qualifications at the much younger average age of 30, and by the age of 33 all of them had achieved this important milestone in their academic publication careers (see Appendix D, p. 491).

As reported in Chapter 2 (see section 2.3.2.6), the time lag between a bachelor's degree and the PhD has been found to have a negative effect on publication productivity: those who take more than ten years are thirty to forty percent less productive than those who take less than four years. The fact that women generally take longer than men to earn their PhD should therefore contribute to women's lower rates of productivity relative to men's. An important question to answer in this regard is: are women initiating their doctoral work at a later stage in their lives, or do they merely take longer to complete their doctoral degrees? The ideal data to answer this question – the commencement date of a respondent's doctoral studies - are unfortunately only available for a small proportion of the respondents who include this information on their CVs. However, graduation dates for master's and doctoral level qualifications may be gleaned from most respondents' CVs (see Appendix D, p. 491). The time lag between these dates provides one with an indication of whether the women already lag behind the men in their academic training at a stage earlier than their doctorate studies. On average, the women are characterised by a

longer time lag (seven years) between their master's and doctoral degrees than the men are (four years). These findings mirror those of previous studies that have found that women generally take longer than their male counterparts to attain a PhD (Asmar 1999; Probert *et al.* 1998, cited in Chesterman 2002; Xie & Shauman 1998; Toren 1991).

Interestingly, however, is the fact that there is a smaller gender gap of only three years in the average age at which respondents obtained their master's degrees. Moreover, the men and women do not differ at all in terms of the age at which they were awarded their first degrees. These data provide strong evidence that, even among these highly productive individuals, the academic career histories of men and women clearly reflect processes of accumulation of advantage for men and disadvantage for women, as proposed by Cole (1979).

It is important to determine what initially produces the time lag between the master's and doctoral qualifications, and thus sets the process of disadvantage accumulation into motion. The argument that women are less able than men to complete their doctoral research within a shorter time period, owing to the fact that they are innately less able as scientists than men are, is almost impossible to maintain in the face of evidence that the scientifically relevant abilities of women scientists are at least equal to those of men (see Chapter 2, section 2.1.1). In this sample, for example, one also finds that conversion of a master's thesis to a PhD – an indicator of exceptional scientific ability – is equally likely to occur among sexes: one man and one woman had their master's theses “upgraded” in this way. Actually, the women in this study have succeeded in forging highly prestigious careers in mostly male-dominated fields (all but one of the women are located in the natural or health sciences) during a time when South Africa's higher education system was characterised by the marginalisation of women, who were not given the same opportunities as their male counterparts (NRF 2001), and for whom the rules were “tougher” than for men (White 1989:107). Consequently, it may be argued that they are a more highly select group than men in terms of abilities.

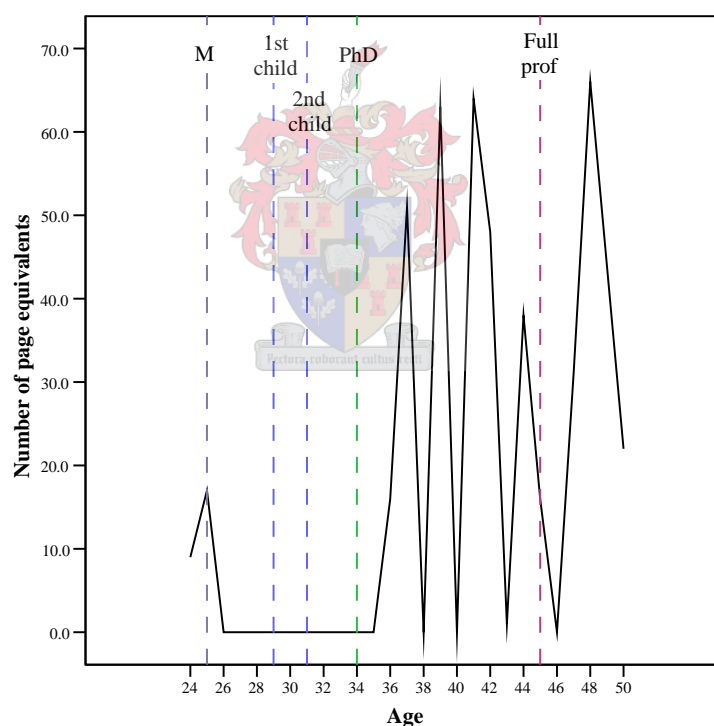
The fact that the age gap between the women and men increases as the women reach their childbearing years, leads one to suspect a tendency among the women to delay the earning of a PhD until having one or two children, as Toren (1991) found to be the case in Israel. In order to further investigate this issue, selected features of the career and life histories of those respondents who experienced the largest gap between their master's and doctoral degrees are analysed in the following section.

3.3.1 “I sort of threw that up”: postponing the PhD

Among most of the women for whom the time lag between attaining their master’s and doctoral qualifications is greater than the average of six years measured for the group of men and women as a whole, the bearing and raising of children indeed played a decisive role in postponing their publication careers. In Linda’s case, at the time her two children were born (approximately two years apart) she was already working on her doctoral dissertation, which she finished when her children were not yet of school-going age. Combining the writing of a dissertation and children’s “baby days” is described by her as “very difficult at times”, and “rather exhausting”. Figure 3 graphically depicts the combined effect of raising young children, working full-time as a lecturer, and working on a doctoral dissertation:

Figure 3

Linda’s career publication history



Based on her own experience, Linda’s advice to the next generation of academic women is to change the chronological order of the life-changing event of childbearing, and the career-changing event of a PhD:

“...the moment that you are finished with your dissertation, and you would like to have children, do it then. You will probably find that it is easier for you to handle, even though your career takes longer to take off”.

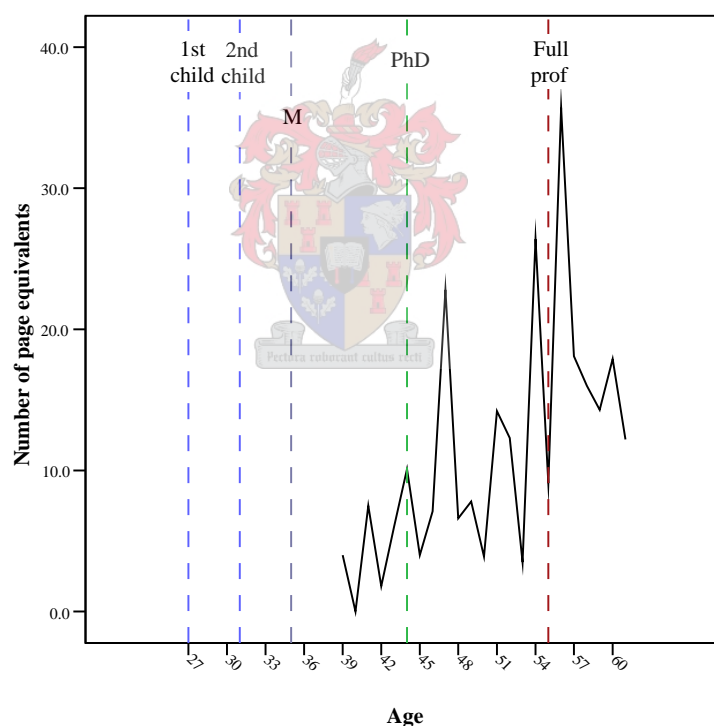
Other female respondents who combined their postgraduate studies with childbearing also warn against the difficulties associated with such a strategy. For example, according to Cecilia,

“...you’ll always feel guilty – whatever you’re doing: if you’re playing with your children, it’s the worst thing when you’re writing a thesis”.

Some women do not only start their publication careers at a later stage than men do, but enter academia only after they have pursued other careers, such as teaching at school level. Elmarie’s career followed such a trajectory, as illustrated in Figure 4. Similar to Linda, Elmarie pursued her postgraduate studies on a part-time basis while her children were still quite young. The difference is that Elmarie had to start from scratch, achieving her master’s degree in her mid-thirties, “...and then a very long road with a PhD”.

Figure 4

Elmarie’s career publication history



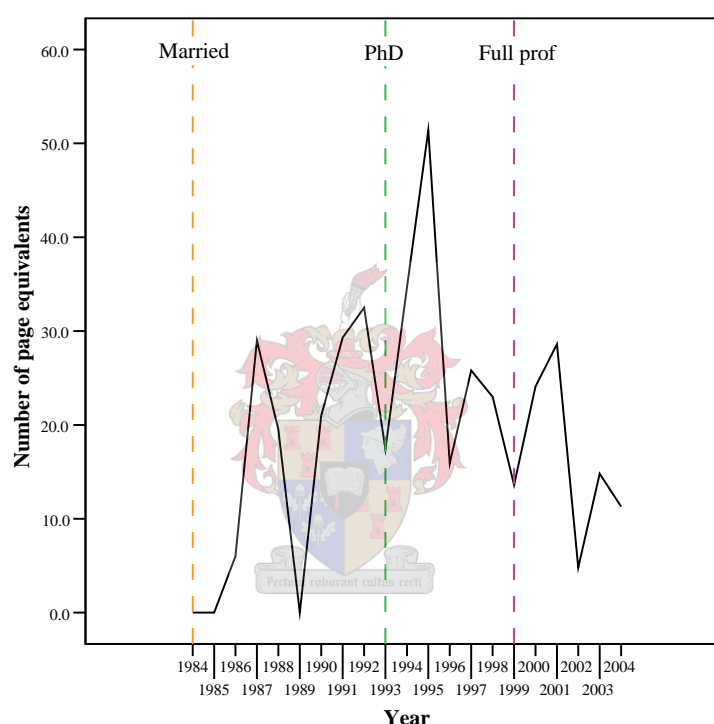
According to her, it was a particularly long road, because she was studying part-time, had two small children, and was teaching full-time. What is interesting to note, however, is the extent to which Elmarie’s choice in relation to her career was not only shaped by motherhood, but in an important sense her academic career was *initiated* by her husband’s career change from private practice to academia. At the time that her husband was in private practice, she was teaching at a

school, but when he changed to a career at a South African university, she began teaching part-time in two academic departments at the same university.

Other research that has followed a life-course approach indicates that the majority of women have “fractured” or discontinuous careers, because they shape their professional lives in relation to the lives of husbands, lovers and children (De la Rey 1999; Probert *et al.* 1998, cited in Chesterman 2002). This effect is probably most clearly visible in Sarah’s career history:

Figure 5

Sarah’s career publication history



Interestingly, she evinces the most substantial gap of thirteen years between obtaining a master’s and a doctoral qualification, but, counter-intuitively, she has no children. According to the respondent herself, that is one of the reasons why she “*managed to publish quite well*”. However, it is also clear from Sarah’s narrative that meeting and marrying her husband directly contributed to her postponement of her PhD:

“...the NRF gave me a bursary to start doctoral research at [a research station], and there I met someone I decided to marry. And so, I sort of threw that up and I went and worked as a sign-writer, a secretary, and did other things...I...wasn’t an academic at all [for three years in the eighties]: I was a secretary and private consultant...Well, I had been considering [a PhD] in [the early eighties], but then when I met my husband, he decided to...go and build boats in [a South African town], having been an officer in charge of a nature reserve, and so I left the nature

reserve to follow him down there, and then helped him in the boatyard with accounts, stuff like that. So, it wasn't really an ideal environment for...I couldn't continue the PhD I wanted to do in [one] province, because I was then living in [a town in another province]”.

Thus, the explanation for the thirteen-year lag between Sarah's master's and doctoral qualifications is directly related to the manner in which women shape their careers in response to marriage. In a sense this illustrates the difference model: although both women and men marry, their responses to marriage differ. Sarah's narrative also illustrates another aspect of the difference model, i.e., the tendency among women to focus on the direct societal impact of their work (see Chapter 2, section 2.1.2.1). After obtaining her MSc, Sarah decided that what she “*really wanted to do was work for society*”, by doing volunteer work for two years. She did, however, “*publish some stuff out of that eventually*”, and as section 3.3.4 below shows, some of the men have also made career decisions that are not necessarily conducive to publication productivity, but that have been motivated by the need to make some kind of positive impact on the world around them.

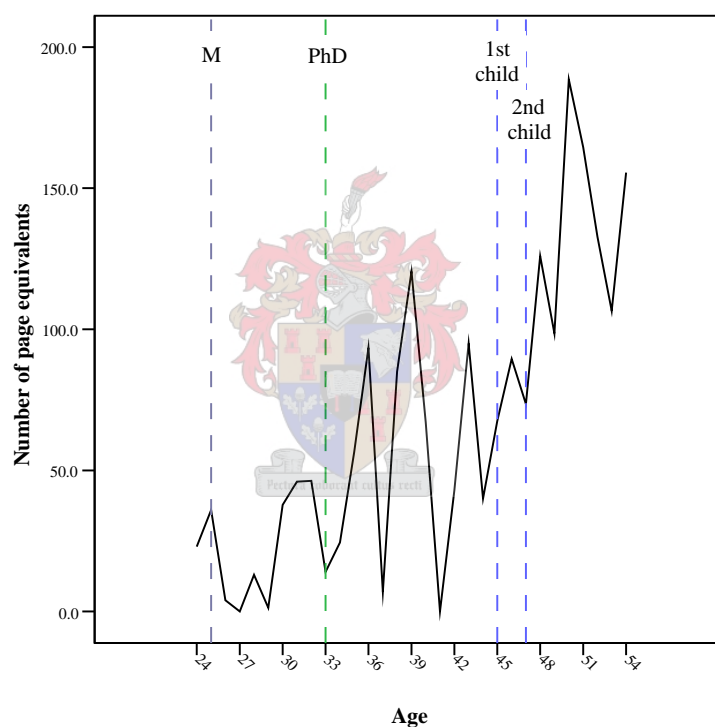
The effect of marriage on the shape of a woman's career is also clearly illustrated by the parallel careers of a married couple who co-author extensively. Their research collaboration required that one of them undergo a shift in research focus, in order to ensure a higher level of compatibility and synergy in their work. The responsibility to make this change befell the woman (Beatrice), probably because at the time she had not yet established herself to the extent that her husband had, as she is younger than him, both chronologically (four years), and professionally (six years). Actually, at that stage she had just finished her PhD. Such a change in research field focus (a factor which will be discussed in more detail later) necessarily limits one's research output for a number of years. According to Beatrice, it always results in “*a bit of a lag...common of people with who, after their PhDs, go change fields*”.

Previous research has shown that the academic careers of men follow a much more orderly, or at least linear, progression, characterised by continuous service, with regular and steady promotion up the organisational hierarchy²⁷ (De la Rey 1999; Lie 1990; Karp 1985). In line with

²⁷ Although not directly related to the issue of publication productivity, the data also show that a gender difference in career structure already emerges when women and men make decisions about what undergraduate degree they would be studying for. Neither Sarah nor Delia, for example, planned to become natural scientists, and both originally registered for a BA. According to Delia, her undergraduate course studies were “*not particularly well planned...It is very much more a more, kind of: 'Well, I'm here; what can I do next?'*” The influence of stereotypical gender roles on the women's decision-making is also clear in both cases. Delia registered for a degree in the social sciences and humanities, because “*that's what women did*”. In Sarah's case in the late sixties, gender-role expectations concerning what degrees are considered ‘appropriate’ for men and women were institutionalised in the

these findings, only one male respondent in the present study, Charles, experienced a lag of eight years between attaining his master's and doctoral qualifications, which is similar in scope to the lag most of the women exhibit. Moreover, the reasons for the lag are clearly unrelated to his family life (his children were born twelve years after he completed his PhD). Rather, Charles attributes the fact that his "*PhD took a long time*" to his combining of postgraduate studies with employment at a South African university and consultancy research work. Although one would expect this situation to stifle Charles's publication output at least initially, he boasts the second highest pre-PhD article count of all the respondents, as illustrated in Figure 6:

Figure 6
Charles's career publication history



Paradoxically, Charles cites his academic employment even prior to attaining a master's qualification as the reason for the high publication productivity that he has maintained since what is relatively a very young chronological and career age. In particular, he emphasises the fact that his employing department supported and encouraged its staff to present papers at conferences, and to publish them:

form of discriminatory university regulations that did not accept women applicants for certain study fields, such as forestry.

“I was working in the department as a junior lecturer when I was doing my master’s, and the department’s policy was always to encourage people to publish. They would encourage you to go to conferences. So it is a very good sort of start in life...It was a generally supportive environment, an encouraging environment to ‘do the academic thing’ – just to go to conferences, present papers and publish”.

As the issue of the pre-PhD publication productivity is of particular importance in the study of gender differences in career publication productivity, the following section is devoted to discussing its causes and effects in the respondents’ careers in more detail.

3.3.2 **Publication productivity during graduate study**

According to the accumulative advantage hypothesis, an early start – as indicated by pre-PhD publications – has a positive effect on later publication productivity (see Chapter 2, section 3.1). It is also an important criterion according to which researchers are appointed, as Thandi explains:

“Who wants you, when you are looking for a job, and you say, ‘OK, I’m waiting for my thesis, I’ll only publish when I’m finished’: you’re just promising things that may not happen”.

It is therefore important to note that the CV data show that the women on average tend to author or co-author less than half of the pre-PhD articles that men do (see Appendix D, p. 491).

According to Delia, she followed *“the more classical way of starting”* an academic career, *“in that you sort of wait”*. This approach to graduate publication has, however, changed since she was a student: her own master’s and doctoral students tend to be publishing much earlier and much more prolifically during their graduate training. This is mainly the result of supervisors placing their students in certain strategic and well-funded research areas (also see section 3.5.5.2 below):

“We put the students in areas where we know we’re working at the sort of edge of what’s known. And what we now find, is that within six to eight months of their starting on their master’s, they’re ready to start publishing...by pulling students in like we do: we fund them, we put them into our research areas, so we can get results very quickly. Most of our PhD students now are getting three to four publications by the time they each graduate”.

3.3.2.1 *“You had to find your own way”*: early academic socialisation

“Doing research so that it actually results in a publication is something that you learn”, states Beatrice, implying that mentors are very important in socialising a scientist into becoming highly productive. As Charles’s experience (quoted above) clearly illustrates, the academic environment into which one is socialised is indeed a very important facilitator of publication productivity during graduate training. In this regard, the qualitative data indicate that the men were exposed to a more publication-enhancing environment that socialised them to value research in their careers than the women were. According to Leon, his early academic environment encouraged early PhD attainment - *“Right from the start, if you step into the faculty, you are encouraged, and actually more or less called upon to start working on your doctoral degree”* – and conveyed a strong message that publication is not *“a luxury that is added afterwards”*, which explains why he published before he attained his doctoral degree.

The women tend to report the opposite, in particular a lack of a culture of research publication at South African universities in their pre-PhD years of academic employment. Linda’s description of the *“atmosphere”* that prevailed during the eighties, when she was working on her doctoral dissertation, stands in stark contrast to Charles and Leon’s experiences. She describes *“an academic establishment that was not very focused on the development of young lecturers – or not as focused on it as much as now”*, characterised – especially in her field, by

“...professors who did not actually attend congresses; or who never encouraged you to do so, or who did not set an example for you in that regard...As a young person, one was not told: ‘It will be good to attend this congress, or that congress’”.

Moreover, Linda is not alone, as Elmarie provides a very similar account of her experiences at the university where she was employed during the seventies (before she attained her PhD in the eighties):

“...there was no publication culture at all...It was not expected of us. I mean, there were no constraints in the sense that you were not allowed to do it, or something like that; it is quite simple: it was not part of the way of thinking”.

One male respondent, Bob, corroborates these women’s observation on the lack of a research culture that characterised South African universities a few decades ago:

“I think that certainly around the 1970s there wasn’t really much research being done in South Africa in universities – at least not in [the] departments that I was in. So, there was really no research culture - very little research culture in the department [where I worked] before the 70s in South Africa. So, I hadn’t really been exposed to a research culture in the 60s”.

However, while Linda expresses regret at not being exposed to, informed about, or introduced to the workings of an academic career, Bob does not mention any negative effects of the prevailing institutional culture on his publication productivity. The reason is that he was more mobile than Linda and Elmarie were during their graduate training. While both these women combined their graduate studies with the raising of young children, Bob is childless. This is one of the reasons why he was able to study for his PhD in the United States, where he was exposed to a more dynamic research culture than what was the case in South Africa:

“I was in a big and a good department – it was one of the leading departments [in my field] in the world, and there was a research culture, which appealed to me enormously, and I kind of feel that I brought it back with me, and contributed...starting it in [my original field] in South Africa, and have contributed to bringing it into [my new field] here”.

These findings indicate that the women and men experienced the same graduate institutions differently. In particular, the women report them to have been less encouraging in terms of early publication productivity than the men do.

In terms of mentorship in particular, however, a number of the women emphasise the important positive influence mentors²⁸ have had on their careers. At the time a research culture was still lacking at the university where she was employed, Elmarie recalls that a male mentor, an “outsider” whom she met at a conference, pointed out the importance of publishing one’s research results, particularly in the international literature, to her – “*“Oh, but you know, one has to publish one’s results”*” - otherwise they “*mean nothing*”. She followed his advice, with the result that she

“...was internationally known because of those publications, long before almost anyone in South Africa knew about [her]”.

In Delia’s case, the fact that her supervisor had been working “*a long time*” in the research area she chose for her PhD meant that he “*knew where the forefronts were, so it was very quick and easy to get to that*”. Cecilia mentions one mentor in particular, who saw her potential and encouraged her to present at a conference – a paper she later published – as well as some other “*nice mentors*” who supported her and recognised her work. Sarah also reports that she “*had outstandingly good mentors*” and supervisors who “*helped [her] a lot*”.

²⁸ Most of these mentors were male, reflecting the findings of South African audits among women in research (NRF 2001; CSD 1999) that most women had men as mentors in their research careers or as their principal supervisors in their postgraduate studies. According to these reports, the finding reflects the greater number of males with higher qualifications, particularly a PhD.

Linda is an exception, as she explicitly refers to her experience of a “*lack of academic guidance – or mentoring, encouragement – that was typical of the eighties*”. Consequently, she does not attribute her career success to the influence of any mentors. “*You had to just do your own thing; you had to find your own way*”, she explains. Linda’s narrative illustrates the argument (discussed in section 2.1.2.3 of Chapter 2) that, because women academics are less likely to be mentored or to benefit from informal and formal networks, they do not know exactly what the (androcentric) expectations of the academic role are. The result for Linda’s career – particularly the first few years thereof - have been very similar to those reported by other senior women academics in South Africa, i.e. a lack of orientation rendered them unaware of their obligation to publish or the relevance of publications to academic credibility (Maürtin-Cairncross 2003).

Compared to the male respondents, however, there does not seem to be a higher prevalence among the women of feeling less mentored, as has been reported by other researchers (*cf.* O’Leary & Mitchell 1990; e.g., Landino and Owen 1988). One gender difference that did emerge from the interviews is that, while a number of the women tend to explicitly mention the positive role mentors played in their publication careers, the men seem to be more hesitant and less spirited in their descriptions of their own mentors. Only one male respondent, Leon, provided a relatively positive account of the way in which his academic socialisation to love research and to publish as much as possible was influenced strongly by role models with whom he worked:

“My love of research comes from two sources. One is: I had good mentors, had good examples...I worked closely with people who gave you the message, loud and clear: ‘Publish; research is part of your work – it’s not a luxury added on afterwards’. And my mentor also publishes a lot – some people would probably say, ‘Too much’. I have already seen his list of publications, and it is a fairly impressive list. So, you get that sort of message very clearly”.

Among the men, friendship, rather than mentorship, is the preferred term, indicating a tendency towards equal-power relationships. “*I don’t know if I could ever call somebody a mentor*”, Sean remarks, “*I had a very close collaboration with K in the UK. And we’re just friends now*”. Similarly, Martin’s response, “*I suppose I had the privilege to have some nice mentors to help me*”, indicates almost an indifference towards the role mentors played in his career. In his narrative, Ted refers to mentors in passing – “*I was fortunate that I was taught by L, who was a genius, but who could explain anything to anyone*” – and describes being mentored in a quite distant, indirect manner by the mostly overseas role models:

“Facilitators were other people overseas...I’ve had lots of heroes overseas. And I had lots of people I respect, and I still do. I look for heroes, great scientists. And I read their work; try to understand how they got around a problem that I might be facing”

Rather than emphasising their own mentor’s contribution, the men showed a much stronger tendency to provide responses describing their own role as mentors. Jacob recalls *“creating opportunities”* for a young colleague, whom he also supervised for his dissertation, through an international research group he is involved in,

“...so that he could, for instance, become a research fellow, and in this way become involved in research projects”.

For Jacob, it is excellent if one can create such possibilities through the *“knowledge...one has acquired over many years”* and one’s contacts abroad, in order to *“reach out, become involved...enrich other people”*, rather than to *“sit tight in [one’s] ivory tower”*. Both Jacques and Ted view mentoring as integral to their *“work”* or *“function”*. According to Jacques, mentoring implies helping a student who *“makes an effort”* to put research results together in a paper, to *“hammer out”* a publication. For Ted, his *“primary job”* is to:

“...facilitate and teach these young kids to be good scientists, and to provide them with the necessary skills, and resources that they need to be good scientists...It’s not to accumulate everything for myself”.

It is important to note that none of the women responded to probes on mentoring in the way these three men did. Rather, they describe their own dependence on colleagues and mentors to a much greater extent than the men do.

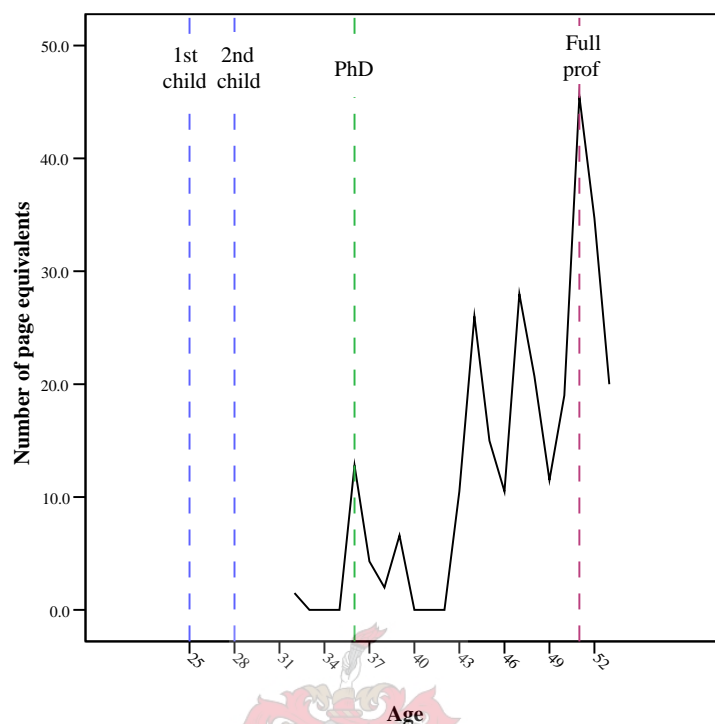
3.3.2.2 *“You’re busy developing lectures”*: early teaching load

In contrast to men such as Charles, Leon and Bob, who report a productive time during graduate training, most of the women refer to studying *“in conjunction with an academic job”* (Beatrice), and particularly teaching full-time, as a constraint on the number of publications they could produce during their graduate training. This is especially true if the training involved travelling abroad, which makes it *“hard to settle down and publish”*, according to Thandi, whose career publication history is graphically represented in the next figure. She explains that when she arrived at an overseas university at the beginning of the 1980s, her children were *“very, very young”* (three and six years of age), and she only left when the eldest was entering teenagehood:

*“I had to look after them and do research for my PhD, and I had to work...teach. I believed then...if I could survive that, nothing, **nothing** is difficult”.*

Figure 7

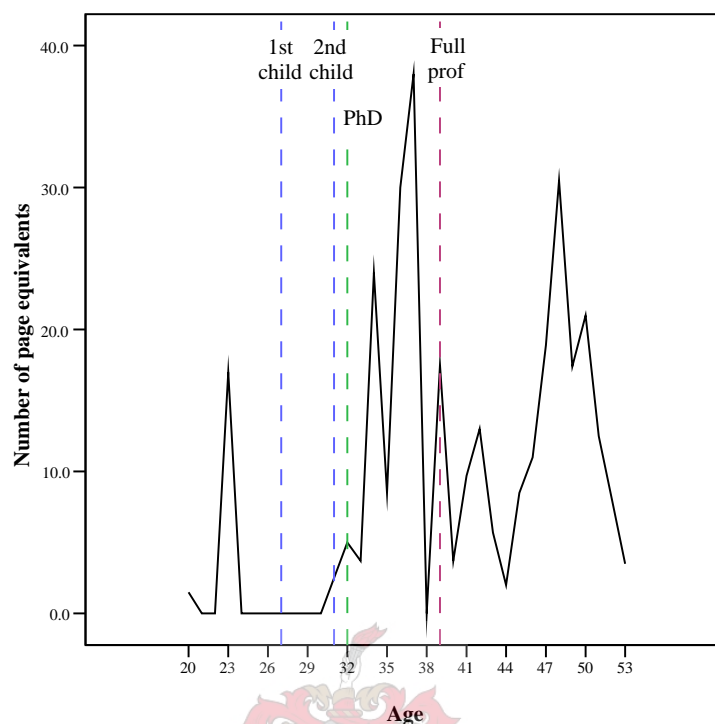
Thandi's career publication history



Other female respondents describe similar experiences. For example, Cecilia refers to the fact that full-time employment “*certainly limits one’s potential to publish, because you’re busy developing lectures, and working flat-out*”. In her career publication history below, one can again see the effect of early teaching load, combined with raising two small children and working towards a PhD, on Cecilia’s publication productivity from the mid-seventies to the mid-eighties:

Figure 8

Cecilia's career publication history



Similarly, Elmarie explains working “*long on the D*” in terms of training other students. “*I was busy the whole time*”, she explains.

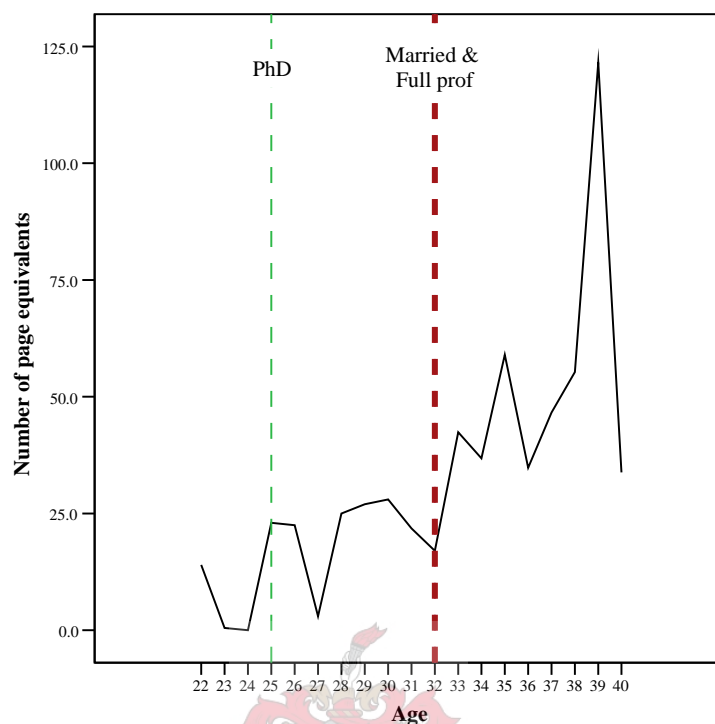
Such experiences are mostly absent among the male respondents. Only one, Sean, feels that publication during PhD training is rare, and almost impossible if it is combined with a junior position characterised by a high teaching load, as was the situation in his case.

“Now, even the best PhD students I have typically are producing two to three papers a year if they are really, really good”.

His lower initial publication output, resulting from his PhD studies and high teaching load is graphically represented as follows:

Figure 9

Sean's career publication history



Even when external factors related to the broader socio-political context threatened to impact on Sean's career, he still managed to pursue an academic career in his chosen field. When in the Apartheid era there were no post-doctoral opportunities for him overseas, because "*nobody wanted you abroad*", he "*just got a job*" at a South African university. During the eighties Sean was also called up for twelve months of national service, which should have had some effect on his career. However, the effect was minimised by some strategic manoeuvring:

"I wasn't gone, because I cheated the system: I went and did basic training, and then I went back. They couldn't use me, because they thought I was a doctor. The medical services couldn't use me. So then I had myself transferred to [a government department]. They couldn't pay my salary, so I got the University to offer to pay my salary. They said fine, but they don't have space. So then I was transferred back to the university. So I did guard duty on week-ends, for a year".

An intriguing finding is that the female respondent who boasts the highest pre-PhD article count of all the respondents – male or female – also interrupted her doctoral studies and in effect deviated from the linear (masculine) norm for academic careers. As with Charles, however, the effect of this discontinuity on Sarah's publication productivity was negligible. In fact, merely two to three years after she got married, Sarah entered what she describes as "*an extremely*

productive time” in terms of publication productivity. Her career publication profile (see Figure 5, p. 256) clearly shows a rise in her journal article publication productivity from the mid- to late eighties. It also shows that the increase was not dependent on her obtaining a doctoral degree, but rather on her marriage. During that time she was running a research station together with her husband, and they were employed full-time to do research. “So,” Sarah explains,

“I had absolutely no academic commitments. And that was really the best time for research, and I think I attribute my high productivity then to being able to do research full-time, and working with someone who was also doing research full-time”.

The issue of spousal collaboration will be dealt with in more detail in sections 3.4.5.2 and 3.4.6.5 below. Suffice it to say at this juncture that a large proportion of Sarah’s work (more than half of her article counts) includes her husband as co-author, and that the other female respondent who collaborates extensively with her husband (Beatrice, already referred to above) also reaped long-term rewards in terms of her publication productivity from this conjugal research collaboration.

3.3.3 **The complex interplay among marriage, children and early academic careers**

The CV data on the respondents’ career ages and publication productivity produce results similar to those already reported in the literature review, i.e. that a number of women to delay the earning of a PhD until having one or two children. For these women, motherhood ultimately causes them to be “slow” or “late” starters, and late achievers, in academia (*cf.* Maürtin-Cairncross 2003; Petersen & Gravett 2000; De la Rey 1999; White 1989). The qualitative data, however, show how previous assumptions about the interplay among marriage, children and academic careers may not hold true. Marriage may indirectly impede publication productivity by foreshortening the academic career, but it may also provide the impetus for pursuing such a career - as the career histories of Elmarie and Sarah indicate - or for developing a more productive research focus, as in Beatrice’s case. Also, the cumulative disadvantage effects of a later career start are not always realised. Male and female academics, such as Charles and Sarah, may publish prolifically before attaining a doctoral qualification. In the case where women have children, cumulative disadvantage effects may be countered by “making up” for low productivity at a later stage - when children “*grow up*” and become “*less dependent*” on their mother, according to Adèle:

“My domestic circumstances are becoming all the more easy, because now it is only my husband and myself. So, my obligations are becoming less and less. So, I find that I actually have more time to my disposal than I had before, which allows me to keep up the pace”.

Linda agrees: *“Even though your career takes off more slowly, you build a kind of foundation which later, when your children are more free, you can build upon much more strongly”*, she explains. Eventually, she argues, one may actually *“catch up”* with one’s male colleagues. In general, Linda experienced an increase in *“space”* as her children grew up, and she mentions in particular that when her children started school, she could start attending conferences. As Toren (1991) has reported in relation to Israeli academic women, women academics’ mobility and opportunities to attend such professional meetings is of utmost importance for furthering an academic career, but it is also that which is limited most by young children.

Although these findings in conjunction with previous research (see Chapter 2, section 2.2.4.2) strongly support the fact that career difficulties related to motherhood are most salient at the stage when children are young, some women respondents counter this assumption. According to Delia, whose children are eleven and three years of age, other factors, such as the personality of a child also come into play:

“It’s actually probably the child: my oldest is much more complicated, much more time-demanding. It was very difficult when he was a baby, and I find it quite difficult now again, with all the carrying and fetching and whatever, to get him to various sports and whatever”.

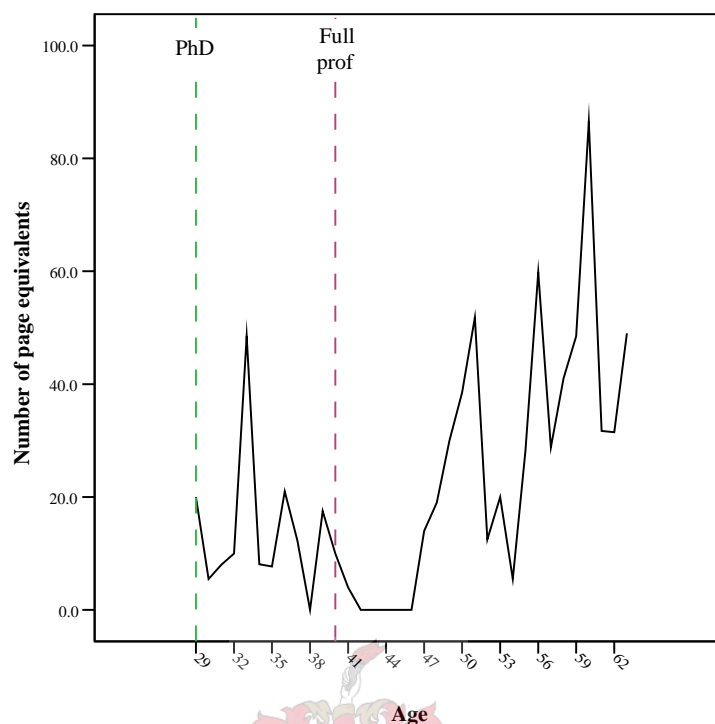
Moreover, Beatrice - whose children are teenagers – is of the opinion that, *“it’s getting progressively worse as the children get older”*.

3.3.4 Male career discontinuity

The discontinuity so common at the initial stages of many of the women’s academic careers is mostly absent among the male narratives – an observation which seems to support the notion that women tend less than men towards orderly, linear career progression, with regular and steady promotion up the organisational hierarchy. However, career discontinuity is not a trait exclusive to female careers. Bob, for example, exhibits a five-year hiatus in his publication record (during his mid-forties), which he ascribes to a *“typical midlife crisis”*:

Figure 10

Bob's career publication history



After reaching his goal, or what he *“always wanted to do as a little kid”*, i.e., becoming a professor at the age of forty in a particular discipline, he started *“really running out of”* research ideas in his early forties, and felt he needed to make a change – which, according to him, *“is absolutely typical of a midlife crisis”*.

Other male respondents reported similar experiences, which – although not strictly representing career discontinuity - are still affecting their publication productivity negatively. Leon acknowledges that he may be experiencing *“writer’s block”*, which has caused his publication outputs to *“have plunged a lot the past two, three years”*. He considered the interview as beneficial, as it provided him with the opportunity to *“talk a bit about [his] career”*. *“Perhaps I can continue it now”*, he says.

Another example of male career discontinuity is provided by Charles, who refers to periodically ‘running out of steam’ with regard to particular research topics:

“I suspect I’ll go for a downturn very soon, because I am running out of a lot of steam. I’ve been doing a lot of work on [a particular topic], and I honestly think I’ve written everything that I could possibly write on that (just about). And I feel that I’m writing the same thing for the umpteenth time now”.

Charles changes his main research focus every few years – in his own words, he “*re-invents*” himself - in an attempt to counter this boredom he experiences: “*Its time to get out and do something different, otherwise you just get bored*”, he explains. Because such changes require retooling for a different subject, and therefore a lot of reading (usually done during a sabbatical), they inevitable result in a temporary downturn in publication productivity.

Thus, fractured or discontinuous career paths are not necessarily limited to the female academics. Also, it is not only women who may make career decisions based on the need to do something useful or to make a difference. Contrary to what the difference theory would lead one to expect, some of the male respondents have also made career decisions that are not necessarily conducive to producing a continuous flow of accredited journal articles, but that satisfy their need to do something useful. For example, Bob explains that the impetus behind his decision to change his research field in his forties was his realisation that:

“...maybe this is an opportunity to do something worthwhile. So, I just chucked up my old ad hominen professorate at [the university where I had been working]...and of course everybody thought I’m totally crazy – and I became a student...at [another university]. I started over – completely over again.... [This new field] just sounded [like] an area which I could get involved in, and do something useful”.

For Leon, the driving force behind writing “*a terrible lot of stuff in newspapers and in the press*” (which necessarily reduced the time he spent on academic publications) is his political “*interest in what is going on in the country*”. The genders do differ, however, in terms of the origins of their career discontinuity. For the men, career “breaks” that decrease their publication productivity seem to be motivated by issues that are more individual, internal or psychological in nature - running out of steam, or out of ideas, or experiencing a midlife crisis or “*writer’s block*” - while the women identify factors external to themselves – particularly marriage and children - as causing career discontinuities. We will now turn to a consideration of the impact of marriage and parenthood on the publication productivity of the men and women interviewed.

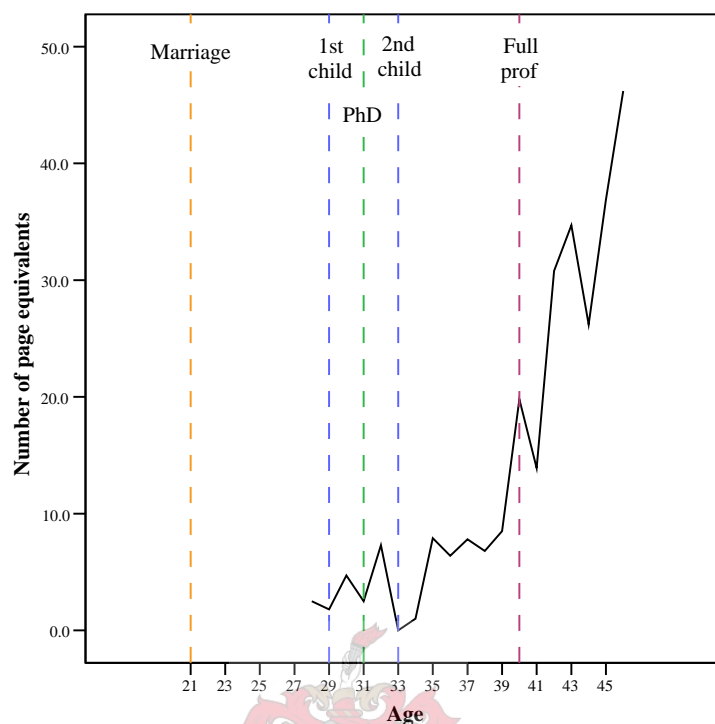
3.4 Marriage, parenthood and publication productivity

3.4.1 **“It is just the way life is”: blind-spotting the effects of parenthood**

The data reported in the previous section clearly indicate that a number of the women publish very little if anything if childbearing coincides with postgraduate studies and lecturing responsibilities at the initial stages of their careers. However, when respondents were asked to identify constraints that they have encountered in their careers thus far that have prevented them from publishing as much as they would have liked to, not a single female (or male, for that matter) mentioned marriage and/or childbearing voluntarily. Raising small children is only mentioned by less than half of the women respondents as reasons for dips in their career publication productivity, and always in conjunction with full-time employment (in most cases academic) and postgraduate studies.

Thus, in line with previous research findings elsewhere, this study presents a contradiction: the women report that the obligations of motherhood are considerable and associated with difficulty, exhaustion and guilt, but motherhood is not spontaneously noted as a factor that has slowed down their rate of publication productivity (*cf.* Maurtin-Cairncross 2003; NRF 2001; May 1999; Toren 1991; Cole & Zuckerman 1987). This tendency toward “blind-spotting” of the motherhood issue is clearly illustrated by Beatrice’s tendency to exclude children from her narrative, although her career graph begs the question: how did this woman cope? The birth of her first child in 1987 was followed by a doctorate graduation in 1989 and two years later, the birth of her second child:

Figure 11
Beatrice's career publication history



When asked why she experienced a drop in publication productivity around 1991, her response included many factors, which indeed had an effect:

“That’s called post-PhD blues, I think...It’s also clear that it coincided with the move [to another university], and the change in disciplines, and all sorts of other things... there’s also establishing yourself as a...establishing a lab”.

However, she never refers to the constraints posed by childbearing and raising toddlers, while completing a PhD and holding on to a full-time research and teaching career. Such “blind-spots” concerning the impact of young children on a publication productivity may be accounted for by the fact that most respondents got married and had children more than a decade or two ago, and that these events are not perceived to be as salient in relation to their careers as other, more recent constraints. Alternatively, there may also be reluctance to voluntarily describe family commitments in terms that imply that children represent some kind of constraint in one’s life (see Chapter 2, section 2.2.4.3). For example, Linda and Elmarie highlighted the fact that they did not perceive motherhood as particularly hampering or difficult, while in the same breath they refer to the constraints it brings:

“It never...bothered me. You might have less time to devote to your work: an hour or two or three per day less than someone else”.

“I cannot actually say that it was difficult – just that one is more tied up”.

A related explanation is associated with the negative stereotyping of academic mothers referred to in section 2.2.4.1, Chapter 2: it may be that the effect of family-related responsibilities on women’s careers is accepted as the norm to such an extent that it may not be considered a distinct or “real” constraint:

“I quite simply accepted - regarding the children and the dissertation - that, only from say [the late 1980s onwards] I could in fact really start building on my career...I never had a terrible kind of grudge about not being able to continue from the start like my male colleagues, for whom a kind of environment has always been created, in which they could function at their best. To me it is simply something that I...it is just how life is...my husband also made sacrifices for us to stay together and have children together. I did not find it inequitable – actually not”.

The same respondent even referred to the indirect positive effects of children – when they become older – because of the routine they impose on parents’ lives. Although children and marriage are not volunteered by respondents as important constraints on their career publication productivity, gender differences in the perceived effect of family-related responsibilities became apparent as questions became more focussed.

3.4.2 **The extent and nature of the effect of motherhood**

In response to direct probes on the effect of children on publication productivity, some women respondents indeed agreed that motherhood had a definite and large impact. Specifically, if the responsibilities associated with parenthood fall predominantly on the woman, it implies a “*huge time drain*”. According to Linda, “*You might have less time to devote to your work: an hour or two or three per day less than someone else*”. Various qualitative research studies conducted among women academics in South Africa also reveal that reproductive roles reportedly often result in a lack of time to publish (Maürtin-Cairncross 2003; Petersen & Gravett 2000; De la Rey 1999; White 1989). According to a female respondent in this study, Beatrice, this is particularly true when children are very young: it is then that “*the biggest conflict comes in...and your time is incredibly stretched*”. Another effect of motherhood on publication productivity that is often mentioned is career fracturing. Linda and Adéle both express concern that childbearing-related career interruptions may lead some women to either permanently cease working, “*so that they don’t continue*”, or to “*fall so behind in one’s field, that it is very, very difficult to recover again*”.

later”. However, this is one effect that neither of these women **themselves** experienced, which is probably one of the most important reasons why they are such productive researchers.

What another female respondent did experience personally is the relatively common limitation (discussed in Chapter 2, section 2.2.1.3) that family demands and the occupational contingencies of a husband place on a woman’s professional mobility. Elmarie turned down at least four high-status positions, including professorships and directorships at overseas universities, for which she was headhunted. Her narrative clearly illustrates that the lack of such mobility was brought about specifically by norms prescribing that only males may exercise the power to make work-related decisions that might relocate the family as a whole:

“In my career I got rather attractive offers...I think that in two of them I said I can’t come, because my husband is an academic, and they said I mustn’t worry: they will make room for him on the staff. But with all four I had to say ‘no’, because of my family...If I had been a more – I think – assertive, [a] feminist woman, I would maybe have told the family...I think what one does, is one lists the pros en die cons, and you decide, OK. And then my generation - you must remember, I am now 62 – my generation did not really grow up [with the idea] that a married woman can be so assertive. Although I grew up in a family with a very strong mother - and she’s a highly intelligent woman - but in spite of that, there was one master in the house, wasn’t there? I think one just grew up like that”.

Again, we find strong evidence that women shape their careers around those of their partners, but not *vice versa*. The consequent lack of mobility is not necessarily only felt at the peak of women’s careers. It may also explain why the CV data show that, at least in this small sample, the men show a greater tendency to have obtained their PhD from an overseas institution²⁹. In Australia, Sheehan and Welch (1996:87) also found that women are far less likely than men to have attained an overseas PhD, because female academics are less encouraged, or less able to travel abroad for extended periods to study for a PhD, which can be explained in part by the greater likelihood that they are hindered by domestic role, and/or child rearing.

As already mentioned in section 3.3.2.1 above, studying for a PhD overseas, particularly during the sixties and seventies when South African universities were isolated from the much more research-driven American and European universities, led to exposure to a research culture, with positive consequences for future publication productivity. Scientists from scientifically developing countries such as South Africa, often study in scientifically advance countries

²⁹ As indicated in Appendix D, page 488, three of the men, as opposed to only one of the women, had attained their PhD at an overseas university.

(Wagner *et al.* 2001) for other reasons as well, such as those described by Martin. He went to an overseas university, because:

“...there was nobody in South Africa that really had the knowledge in the field that I wanted to work in...Everybody said, ‘You need to get overseas. You need to meet people that work in this field and understand it’. That was the driving factor. And that, of course, was fabulous...there’s no way I could be doing what I’m doing now, without having had that experience”.

3.4.3 **“It was a lot of sacrifice, but it was worthwhile”:** ameliorating the effects of motherhood

None of the seven female respondents with children ever discontinued their careers for more than a month in order to raise their children. It is therefore important to identify factors that have allowed these women to take care of a family while carrying on with full-time employment. When responses in this regard were analysed, two aspects repeatedly emerged: “circumstances” (or “context”), and “personality”:

“I don’t think it’s everybody’s cup of tea. I think there are certain personality characteristics and certain times and contexts which make it possible to be the successful academic woman. [It] sounds callous, discriminatory, and everything, but some people can manage and some people can’t” [Cecilia].

“I think it depends a lot on your specific circumstances, on your personality...If you have the kind of personality, and the kind of circumstances that will stabilise well after that interruption, then it is actually easy for you to then continue” [Linda].

3.4.3.1 *Circumstances*

In terms of circumstances, practical considerations are important, such as living close to campus, and/or a school. In Elmarie’s case, her “*children could walk to school and to the university*”, while she and her husband both walked to work. Consequently, family life was not disrupted by the fact that Elmarie worked, as the family members “*could always all come home at lunchtime and sit around a table and have a nice chat*”. Moving closer to campus, as Linda did when her children started school, also simplifies the logistics involved in juggling work and children: “*One gets to work sooner, one can drop off one’s child faster. So, it helps a lot – it’s a sort of smaller, logistically less complicated environment*”, she explains. Probably the most supportive environment that could be provided is a day care centre or even a school on campus. Most South African academics are not yet privileged to have such facilities on their campuses (see section 2.2.4.4 in Chapter 2), but they were available to Thandi when she was studying overseas as a single parent with two relatively young children under her care. The on-campus childcare

facilities greatly contributed to her ability to cope with her situation. “*Actually,*” Thandi acknowledges, “*That is why I chose that university (in addition to other things). So, they can take the children from seven in the morning to seven in the evening*”.

Children themselves may contribute to a productivity-enhancing stability of one’s social life, or what Cole refers to as “routinisation of work patterns” (1979:66). As already mentioned in section 3.4.1 above, for Linda this is an important consideration:

“The sort of routine that accompanies family life is maybe a positive thing for work...If you have a sort of stable routine and things go well, then it is actually a sort of environment that impacts positively. Children lead a routinised life. They attend school, they have things to do...That sort of routine then has an effect on you...a sort of civil routine, which then also impacts positively on your work”.

Access to paid help in the home was volunteered by more than half of the respondents as a crucial part of the support structure they needed to combine family responsibilities with an academic career. In most cases the paid help was extensive, including general managing of the household and cooking (“*That is why we could always go home at mealtimes*”, explains Elmarie). In one case, paid help was only called upon when the children were very young, and then only for half a day at a time. Similarly, Beatrice - who never had paid help - felt that, although a nanny would have been “*really nice*”, it is only a temporary solution until the children are about five or six, because “*then they don’t want the nanny any more*”.

Still, all indications are that in South Africa affordable help is much easier to come by than in other, especially developed countries (see Chapter 2, section 2.2.4.4). This point is acknowledged by Delia, who notes that, “*In South Africa, we are lucky that we do have home help and maids...and one relies on that tremendously to keep sort of things going*”. This difference between South Africa and developed countries is also reflected in the fact that Thandi, when studying in such a country overseas, had no option but to rely on unpaid help from friends to look after her children while she attended conferences: “*I’d leave them with friends. I would get a friend – one of the students – to stay with them, or something like that. So, I owe a lot of friends*”. But even in South Africa, supportive friends - particularly those with their own children - play an important facilitative role, according to Delia: “*Just having a circle of friends...as far as the kids are concerned – that you can, sort of, farm them out when necessary, and take them to people’s kids when necessary*”.

In most cases, extended family members were not in close enough proximity to the female respondents to play an extensive supporting role, or potential support was limited by other

factors. For example, in Linda's case her mother is also employed full-time, although "*she was always sort of available, if there were problems, or if there was a crisis*". In Beatrice's case, however, the support of a mother-in-law is indeed described as "*incredible*": she remembers various times when she was "*able to dump the kids*" with her mother-in-law, in order to "*go off to various conferences and stuff*".

3.4.3.2 Personality

In terms of the second necessary requirement for coping with dual roles, "personality", the importance of discipline and energy are highlighted, particularly when multi-tasking is required. According to Cecilia, women who want to combine a successful career and a family need to make decisions about "*phasing and planning in a way that men maybe don't have [to]*". However, the ability to multi-task is not necessarily a "personality characteristic" inherent to a particular gender. Rather, they represent what Cole and Zuckerman refer to as "personal adaptations" required to enhance efficiency (1991:170), as a number of the women respondents indirectly acknowledge that these were skills they had to learn: "*One does learn to arrange one's time to the best of one's ability*", mentions Adèle; develop the ability to "*juggle several balls in the air...and be able how to compromise, otherwise you'll drive yourself crazy*", is Cecilia's advice to the large number of women postgraduate students she supervises, while Delia offers practical suggestions on how to combine motherhood and research:

"You do learn to have to do research while waiting at swimming lessons, or at MacDonalds, or wherever. Fetching and carrying: you tend to do some of the research while you're driving around."

The women simply work harder when they have children, therefore discipline and energy is paramount when motherhood requires working "*whenever one can*", and particularly in the evenings, as some female respondents³⁰ explicitly mentioned. "*But it is not very easy*", acknowledges Adèle, while Elmarie describes her days and nights as follows:

"Most of my experimental work, for instance - when I was younger - I did in the evenings. I taught in the morning, in the afternoon I was at home with the children; I did not miss a cricket or a rugby or a ballet thing. And then bathed the children and put them to bed, went back to the laboratory, and my husband looked after them further and sat at home marking...it was a lot of sacrifice, but it was worthwhile".

³⁰ The fact that both these respondents work within the experimental, laboratory sciences is significant, as it may be argued that it is easier and safer for women to conduct laboratory research at night than, for instance, conducting a survey after hours.

On a less practical and more ideological level, women need to make a choice to succeed in both career and family if they want to combine these two spheres of their lives successfully, according to Cecilia:

*“I am not overly understanding and empathetic and forgiving when people come to me and say, ‘Oh, I can’t do this, because my husband says I can’t make the curtains’, or ‘I’ve got three children’, or these kinds of things. They look at me and say, ‘Well, you can do it, I know, but I can’t do it, because I can’t do all these things’. That’s rubbish. There are women throughout the world who’ve managed to do that...I honestly think that women **can**, but they can also choose not to. They mustn’t **whine**. Make your choices!”*

Compromises carry their own cost in terms of guilt. Beatrice expressed the hope that when she gets around to retirement age, she would be able to do all the things she would like to do “without guilt”, while another suggested that I should interview her teenage children, “and they’ll tell you about the fact that they never see their mother”. Even women who initiate their research careers and start publishing when their children are of school-going age, such as Thandi, describe pervasive feelings of guilt and self-doubt. These are directly associated with the perception that, as a “working mother” one has not quite fulfilled the requirements set by the strong traditional ideology of motherhood that still pervades large sections of South African society:

“As a mother, you always feel you could have done better. I just feel [sigh]...oh, I don’t know...you always...I always feel like, ‘Have I done the best I could as a mother. Have I put my children second?’ It’s a motherly thing. You never really feel satisfied that you’ve done the best...I would just feel that: maybe did I not neglect them while I was doing research?”

It is therefore not surprising that some of the women respondents emphasise the need to **accept** – not necessarily the ideology, but what Beatrice refers to as the “reality of the mommy divide”, i.e., the fact that compromise is inevitable, and that one aspect of one’s life – either family or work – will be adversely affected. According to Cecilia, one has to accept or come to terms with the fact that “you’ll always live in a guilty mode, and you’ll always be fragmented...you’ll always feel guilty...whatever you’re doing, you always feel that the other should be attended to”. This is not as easy as it sounds, and it creates a level of role strain that, according to her, not all women can “handle” or “stand”.

Delia agrees with Cecilia that women who need to balance motherhood and a career have to “live with” the effects of selectively reducing some of their work responsibilities:

“You’re in a stage in your career where people are asking you to do various things, and your answer is, ‘No, I’m going to MacDonaldis, now; or swimming lessons’. You have to live with it...I do pull out of lots of things that people say I should be part of, and the answer is, because if I’m doing that, then I’m not doing something else I should be doing, and some is spending time with kids - which is again an adverse influence, but it’s tough: you can’t do everything”.

Consciously decreasing the amount of work responsibility is practically inevitable when children are very young. More important, however, is the fact that mothers of young children, such as Beatrice, decrease certain aspects of their academic role, while maintaining others. In this regard the women tend to take time out from research, not from teaching. Beatrice explains the rationale behind this decision: when time is *“incredibly stretched”*, it becomes

*“...almost difficult **not** to say, “Well, OK fine: I’m going to do something that doesn’t necessarily require the midnight hours...and get into something that is actually more routine, and you can actually manage it between 8 to 5...The teaching is way more amenable to that, because research just isn’t. Research is happening all sorts of strange times. Research means many more travel. Research just means more insanity, actually”.*

Attending conferences, especially those outside one’s own country, has been shown to be one of the most significant correlates of article productivity in ten countries (Teodorescu 2000). However, it requires Beatrice to *“fill up the fridge with pages of instructions – you know, ‘Remember, get x to here’”*. Adèle focuses on the intellectually demanding aspect of research: *“Research is demanding, and one had to keep one’s wits together. And it is not always compatible with a family and with small children and everything it is fraught with”*. The fact that the responsibilities of small children impacts not on the careers of these women as a whole, but rather on their role as researchers, is also supported by the fact that none of women ever ceased working for longer than a month because of children. The work they did continued to be involved in, however, predominantly involved the more structured, routine job of lecturing.

Compromises that affect women’s work performance are not necessarily accepted by male colleagues. *“I don’t think my male colleagues would feel probably the same way”* about her spending some time with her children instead of at work, Delia concedes. Neither do husbands necessarily accept compromises that they perceive may impact on their children. For Adèle, for example, concerns about her children’s welfare while she was at work were particularly salient, because her husband did not approve of her working – even in a part-time position - while the children were young. Thus, in order to create an environment that allows for a higher level of compatibility between work and family, women need to negotiate a supportive environment in

the institutions where they work - particularly among their male colleagues – as well as in their marriages and families.

3.4.4 “We had an agreement”: negotiating institutional support

With regard to negotiating institutional support, generational differences among women of different chronological ages emerge clearly from the career narratives. Until the late 1970s, tertiary institutions provided no paid maternity leave for staff (Walker 1997), thus when Adèle (chronologically the oldest respondent) had her children in the late sixties and early seventies, it makes sense that she never even considered maternity leave to be an option:

“If I think back, I do not think I ever asked for [maternity leave]...I cannot remember that I ever asked for it. But, on the other hand, if it had been an option, then I think I would have asked for it. So, I think at that stage maybe it just wasn’t an option”.

Even in the late seventies and early eighties, a month’s maternity leave seems to have been the norm. Cecilia recalls that the lack of sufficient maternity leave at that stage meant that she had to bring her babies to work, where she also breastfed them. Linda mentions that, in general, negotiating institutional support was much more difficult two to three decades ago than it is now:

“At that stage you did not dare, for example, to mention your femininity; to say, ‘Look, I can’t do this, or I can’t do that, because I have children, or I have obligations’. It was an absolute no-no. You couldn’t say that; where I think now it is easier, and where now I even hear my male colleagues...lay claims about childcare; [male colleagues] who, at a stage would have, for example, looked at me askance if I had said, ‘I have to go pick up my child; I have to now do this, or that’. You never mentioned it...it was definitely a no-no; it was a taboo”.

While Linda experienced a work environment in which women had to adopt to a male order that practically ignored the female life cycle, the younger Delia experiences a work environment that adopts more to her needs as a working mother (although this is also a function of technological advances which removes the need for mothers to be office-bound):

“One of the big plusses [at the university where I work], is there’s a lot of flexibility. And then, if you do want to work – not that I get much chance these days – but if you do need to work away from the office, you can work away from the office, which helps. One needs flexibility to juggle all these things. And, it’s really, I suppose, allowances and flexibility, and the degree of trust the institution has in you to do your work, even if you’re not sitting at your desk. I’ve got a laptop, I’ve got a cell phone, and I’m getting back to working – my youngest is now three – so, we are going to end up back working at MacDonalds and Lifestyles – anywhere where there’s a jungle gym, and places where I can sit and have coffee - so he feels he has an outing, and I can get work done”.

Only one female respondent, Elmarie, refers to the fact that decades ago she consciously managed to negotiate a work environment that allowed her to be involved in her children's lives as much as possible:

“We had an agreement, for example – me with the head of the department at the time: the day consists of three parts: a morning, afternoon and evening. I work two of the parts...I taught classes in the morning; in the afternoon I was at home with the children - I did not miss a cricket or a rugby or a ballet thing. And then bathed the children and put them to bed, went back to the laboratory”.

Institutional support is not only a function of how successfully women manage to negotiate juggling space with superiors - such as heads of a departments – but colleagues may offer support as well, especially in a tightly knitted research group, as in Delia's case:

“Luckily, because we are working in a group: if I pull out a little bit, the rest of the group can push in, you know, and help a bit. And so, there is always that advantage when working in a group: that we do tend to cover for each other when times are rough”.

3.4.5 **“My husband says I have to do the curtains”:** negotiating support from partners

Women do not only have to negotiate with an employer for space to juggle their work and family responsibilities, but negotiating a supportive environment with their partners is crucial as well. Cecilia considers *“how to take permission to ask for a negotiating space in their relationships”* as a “strategic skill”, and developing it among her female students one of her central responsibilities as their supervisor:

*“Honestly, sixty percent of my time with female academics particularly, is showing them how they can say...they're **right** to do their own thing...One woman said to me, 'I can't do my thesis, because my husband says I have to...make the curtains in the sitting room'. This is on a master's level. That's bullshit”.*

3.4.5.1 *“It is a partnership”:* the supportive husband then and now

With regard to the respondents' own marital relationships, Adèle acknowledged that her husband did not approve of her working when their children were small, because *“He was of the old-fashioned sort”*. As such, her experience a few decades ago mirrors that of some women academics at South African HBUs who still face male partners' resistance to their success outside the home (Maürtin-Cairncross 2003). However, similar to several of the South African women professors studies by De la Rey (1999), who emphasised the role of the supportive husband and partner in the achievement of success, most of the women in this study count

themselves lucky to have married husbands who encouraged them, and provided them with the “*space*” and stability they needed to combine an academic career with raising children. Some husbands, such as Linda’s, are even reported to have made sacrifices in order to create an environment that eased her role strain:

“He made it very easy for me – when [our children] were now five, six years old – to start becoming productive then. And I think it has to do with if you are sort of in a relationship where you get some space...if you have stable circumstances, then you can function well; then you can work well”.

In Linda and her husband’s case, their decision to move closer to the campus where she works simplified for her the logistics associated with combining a career and children, but required of her husband to make the “*sacrifice*”, in her words, of commuting to the city where they used to live, “*which meant longer hours for him*”. Consequently, Linda felt it was only fair for her to take care of the children for the greatest part of her day. However, when she had to travel away from home, she felt she had the freedom to do so, because her partner was willing to “*stand in for her when she was away*”. In that regard, she considers herself lucky, and from that stage onward, according to her narrative and CV, her publication productive increased markedly. In her case, marriage seems to represent a “*personal asset*” that enhances publication, as discussed Chapter 2 (see section 2.2.3.1).

The importance of being able to rely on a partner who can hold the fort, so to speak, is illustrated in cases where such a partner is absent either temporarily, or permanently. For example, Thandi’s husband stayed in South Africa when she took her children with her to continue her postgraduate studies overseas - a time she experienced as “*alone*” and “*very hard*”. Cecilia’s husband’s work frequently took him away from home when her children were young and she was writing up her dissertation – a time she remembers as being “*very, very difficult*”. A third female respondent who mentioned her husband’s lengthy absence from home as a result of pursuing his own postgraduate studies overseas, did not experience her being alone with the children as difficult *per se*, but only that it was “*more complicated than usual*”.

Even the divorcée – the only one among the respondents - emphasizes that her husband was “*very supportive*” of her, and “*that was great*”. However, she warns, “*Not everybody’s husband is like that*”. A number of narratives indeed reflect that women needed to consciously negotiate what they consider to be equitable domestic arrangements. “*Look, he’s not perfect*”, Beatrice accedes, but:

*“I think we’ve both compromised and we’ve divided things in ways that are comfortable to both of us...It’s happened to a greater or lesser extent like this: on a number of occasions [my husband] had a really, really heavy day, and arrives home sometimes quite late – 7:30, 8 o’clock – like he’s not had any food...really all he wants to do is come home, sit down and eat. And he’ll walk into chaos! It doesn’t always happen that way: sometimes you **do** get food on the table. And sometimes he said to me, ‘Food would be nice’. So, rather than being...we accommodate each other. So, it is not expected that I have food on the table”.*

Generational differences are apparent when one compares the situation of women such as Beatrice, where the gender division of household labour is less traditional, to that of women who were socialised earlier, such as Elmarie. Although she also successfully negotiated a domestic environment characterised by co-parenting, she considers her situation as exceptional:

“I don’t think I’m quite the norm there...he and I looked after the children fifty-fifty; we had an agreement from the start...the day consists of three parts: a morning, afternoon and evening. I work two of the parts. My husband works two of the parts. That means: in the afternoons I was at home for the children, and in the evenings he was at home...It is a partnership, but it was a lot of sacrifice”.

The male respondents also refer to the fact that gender roles in the domestic sphere have changed from what they themselves perceived as being the norm when they were young parents. For example, according to Leon, the younger women today have husbands that are *“better than he was”*.

3.4.5.2 *“The particular marriage makes the difference”*: selective mating and intimate academic partnerships

The tendency towards co-parenting partnerships is not only influenced by prevailing social norms, but also by the extent to which an academic’s marriage represents “selective mating”, i.e. when both spouses are academics, and particularly if they co-operate on the research front. In Sarah’s words, *“The particular marriage makes the difference”*. Beatrice describes the advantages associated with spouses working in the same academic field “filling in for each other” both at home and at work, as follows:

“There’s no question in either of our minds that we couldn’t do what we do if weren’t working in the same field together. And it works both ways: I can fill in for [my husband] and he can fill in for me, and if there’s a family crisis, he understands that...I’m kind of in the middle of it. And occasionally he helps out with a family crisis and I have to go and do the stuff. So, that I think is really very powerful. Look, it’s not always possible, but it certainly makes a huge difference for me, because you’ve got the support”.

As various other authors have suggested (*cf.* Xie and Shauman 1998; Sonnert & Holton 1996), a highly educated, professional spouse, such as Brenda's husband, provides "high human capital" in the form of intellectual stimulation, encouragement and emotional support that enhances publication productivity. At the same time, research collaboration among marital couples increases the intimacy and therefore the strength of a marriage, as Brenda explains:

"Successful marriages...succeed, if there is something that couples identify that they do together...if there isn't something that they do together, then everything collapses. And I suppose what [my husband] and I do together is our work. But that then means we're not trying to find something out of work to do together; then we can work these incredibly ridiculous hours at work".

Such "intimate academic partnerships" (Creamer 1999) create a high probability that the women's husband would be more understanding and therefore supportive of her research career, even if she does not have children, as in Sarah's case. She feels strongly that if spouses work in a similar field, *"and they work well together – that's going to increase the publication output of both the man and the woman"*. On the other hand, non-selective mating, according to her,

"...could well have a very negative effect on publication output, because: what publishing means is not doing something in the social sense. It's a trade-off. And so, if the partner doesn't understand that, then I can't see it working."

As Sarah explains, intimate academic partnerships also have definite positive effects on the publication productivity of both partners in such relationships. Indeed, evidence from the United States shows that those woman scientists who are married to scientists (not necessarily in the same discipline) publish, on average, 40 percent more than women married to men in other occupations (Cole & Zuckerman 1987). Although the small sample in the present study precludes any such generalisations, the frequent occurrence of "selective mating" found among the highly productive academic authors selected for this study (it is exhibited by six of the sixteen respondents) may provide a further indication that co-authorship with a marital partner (exhibited in different degrees³¹ by five of the six selectively mated respondents) enhances publication productivity. Sarah's narrative provides further qualitative evidence that this is indeed the case:

"Oh no, once I was married, that's when my research productivity really started, because I married another [scientist in the same field]; we nearly always work together. [It works] very well indeed...we enjoy doing sort of interactive projects".

³¹ The incidence of co-authorship varies from two accredited journal articles to 137 (see Appendix D, p. 489).

Even in cases such as Adèle's, where the research collaboration between conjugal partners is limited (*"We did one or two things together, but then he again followed other interests and other paths"*), points of contact between their research interests allow the husband to provide intellectual support:

"He never worked very much in the same direction as I did, but he had the necessary background. So I can, for instance, go and discuss something with him, and then he can always make a meaningful contribution".

It is interesting to observe, however, that among the couples who do publish almost all of their work together, the women's publication productivity is half that of her husband: *"My husband has twice as many publications as I have"*, Sarah mentions during the interview, and the CV data indicate that Martin publishes on average twice as many page equivalents per active year than his wife Beatrice does. Also, intense research collaboration with a marriage partner – although seemingly always advantageous for men – may be dangerous if initiated too early in a woman's career. If the woman does not first establish herself as an independent researcher in her own right, there is a real danger that the research community will consider her to be a "side-kick" of her husband. This explains the apprehension with which Beatrice approached her decision to enter into an intimate academic partnership:

"From my own personal standpoint, I was determined I was not actually going to work with my husband until I've established myself. And once I got my PhD, I decided 'Well, OK, I've vaguely established myself', so, working with him was marginally OK".

3.4.6 **"My wife chose not to work - that is my bias": the male perspective on combining motherhood and a research career**

Some women respondents explicitly identified a definite gender difference in terms of the impact family life has on the careers of women and men, because of different gender-role expectations at home. According to Linda,

"It is indeed difficult – more difficult for a woman than for a man...For my male colleagues...a kind of environment has always been created, in which they could function at their best".

Similarly, Cecilia expresses awareness of the fact that her male colleagues do not have to compromise between work and family:

“I think their expectation is that they live for work, and they go home at the end of the day, and that’s when they are focused on the family. But most women will leave for work, and while their working, they’re worried about the water bill, or little Johnny at school”.

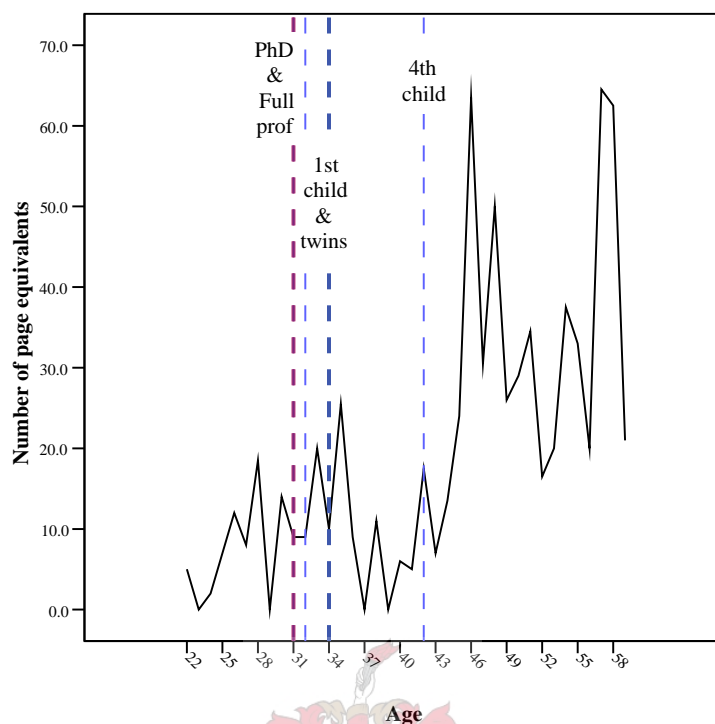
Is this also the case among the male respondents in the study? The validity of these women’s statements is indeed supported by the fact that all seven female respondents who have children have husbands who work full-time, while among the six men who have children³², the wives of only two work in full-time, paid employment, and one of these – Charles’s wife - worked from home when the children were still young. Because traditional gender-role divisions have been maintained in their private lives, the men’s domestic circumstances have arguably been much more favourable in terms of enhancing publication productivity, than those of the women have been. This salient gender difference is reflected in the career publication histories of the men and women. For example, Charles’s publication productivity increased by more than 100 percent during the few years directly after the birth of his second child (see Figure 6, p. 258). Also during the three to four years after the birth of his fourth child, another male, Jacob, experienced the first of two exceptional “spurts” in his publication productivity:



³² Although it needs to be taken into account that two of the male respondents do not have children, and therefore child-related impacts on their careers are highly improbable, one of the female respondents is childless as well. Even she maintains that she has *“always thought that having kids made it quite difficult to publish”*. It is probably also no coincidence that the male respondents who publish most prolifically are childless. Rather, it is most probably a factor that has contributed to their publication output and general career success.

Figure 12

Jacob's career publication history

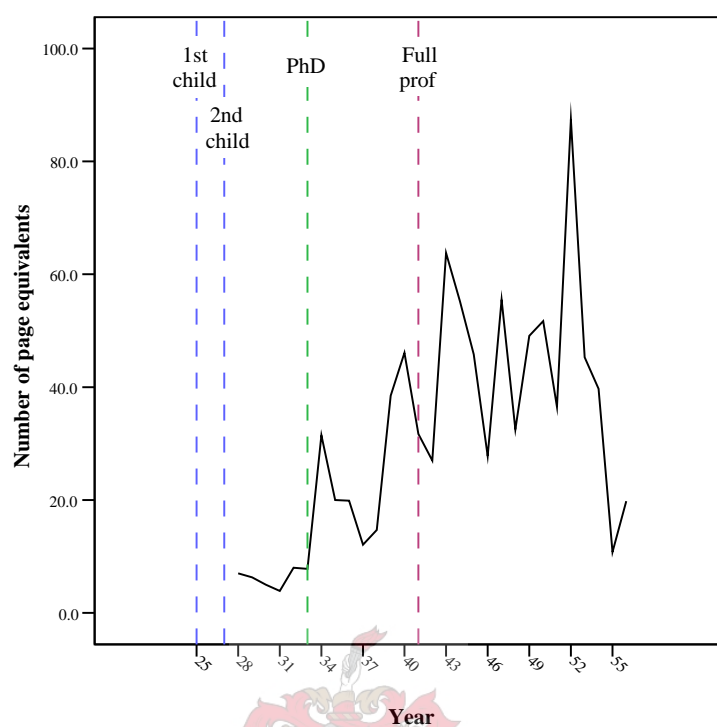


On the other hand, of those seven women with children, three completely ceased publication for anything from one to eight years around the birth of their children, while two only started publishing four to eight years after their children were born (see Figures 4 and 6).

Even when men such as Ted only start publishing after the birth of their children, they do so much sooner – in Ted's case one year after the birth of his second child:

Figure 13

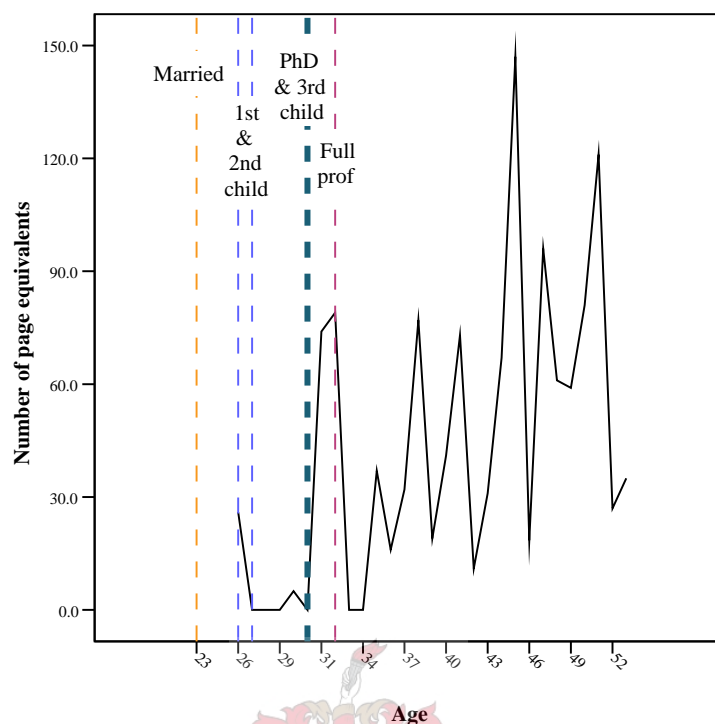
Ted's career publication history



There are men, such as Leon, whose graphs tend to “flatline” around the time their children were born. He did, however, manage to attain his doctoral qualification in the year his third child was born, and shows a huge post-doctoral increase in his publication productivity merely one year after the birth of that child:

Figure 14

Leon's career publication history



In addition to the CV data, Leon, Jacques and Ted (in that order in the quotes below) clearly acknowledge the manner in which their wives have supported them:

“At the stage when the children were small, my wife stayed at home. I went about building a career. She supported me of course, in the sense that she created opportunity for me...What happens with many women who may have liked to have done research work, who are then pushed into the traditional role of the woman and mother – those type of limitations I didn’t experience”.

“If it wasn’t for my wife, then I would also not have managed so well, because I worked sixteen hours every day – six days, seven days of the week”.

“My wife just is a brilliant woman. She raised [our children], and made up for any failures on my part. What I mean, I don’t know if she made up for them, but she covered for me if I was traveling, and so on... If I didn’t have such a selfless wife, there’s no way I would have achieved what I did...I’ve been incredibly selfish, and I think you need to make that point”.

It is therefore not surprising that, in contrast to the women, the men in the study did not volunteer **any** deleterious effects of parenthood on their own careers. In fact, the men’s initial reaction to questions relating to the effects of parenthood on their careers, and the difficulties and uncertainty they expressed when providing responses to such questions, reflected the fact that they perceive parenthood to be quite irrelevant to their own career experiences. For example, Ted

explains, *“It’s incredibly difficult. You see, my wife chose not to work. That is my bias”*, while Leon is undecided: *“I do not think I would have done better if I did not have children. Maybe I would have. I don’t know”*. This pattern clearly supports Linda’s claim (quoted above) that her male colleagues’ wives create for their husbands an environment free of these responsibilities, in which they can function at their best.

3.4.6.1 *“She’s done it all”*: superwomen narratives

Because of the difficulties that the men experienced in relating parenthood to their own careers, they were probed on the views they had in general on combining the raising of children with a research career, even if it did not relate to their own careers. Care was taken to pose the question in a gender-neutral manner (i.e., *“What are your views with regard to combining parenthood with a research career?”*), and it is interesting to note that most responded by focusing on the effects of family on the careers of other **women** they know. Other qualitative research among academics, such as Asmar’s (1999), also found that men who mentioned the issues of family and children mostly do so in reference to the family commitments affecting the women that they work with. It seems therefore that parenthood, and especially its compatibility with a career, is conceptualised by the men solely as a *“women’s issue”*. In this study, for example, Sean (who is married but childless) refers to two female colleagues who are married and have children. The first is described as *“fantastic”*:

“She’s productive, she’s the chair of a department, she’s had her kids – they’re hugely successful children – and everything’s fine. She’s a great person. I say to all my female students: ‘If you think it’s tough, and you can’t have babies and all the rest - a husband - then talk to [her]. She’s done it all’”.

The other is reported to have two children, and to have just had her appendix removed. Although she *“can’t do too much in the day”*, because of the operation, and has to *“crawl around on the ground”* looking after her children, because she cannot pick them up, she still finds the time to comment, via e-mail, on a paper written by a PhD student she is co-supervising with Sean. In a similar vein, Jacob mentions female colleagues who *“in spite of the children, also perform almost just like the men*, particularly senior women professors, *“who have children and publish very well”*, while Leon comments that he has not noticed that his women colleagues’ motherhood *“held them back with regard to publications”*. According to Bob, *“the most productive women”* researchers that he knows *“have been married”*, particularly one colleague who is *“married and a very prolific publisher”*.

These “superwomen narratives”, as well as general comments such as *“I think it’s incredibly difficult”*, show male appreciation, among fathers and childless males alike, for the difficulties inherent in combining a research career with motherhood. In this regard, Sean relates his experiences while living with a family on his sabbatical overseas. The mother, a head of an academic department and mother of two small boys, coped with her dual burden of academic responsibilities and motherhood by strictly compartmentalising her days and nights in work and family time:

“She would get up early in the morning, and she would prepare the kids for school, and then she would go to work...then she’d come back from work at six. Then she would spend from six to eight-thirty with [her two sons]. Uninterrupted. That’s their time. And then she’d work from eight-thirty ‘till midnight”.

As mentioned in section 3.4.3.2 above, discipline and energy are needed to maintain such a grueling time-schedule. According to the men, such challenges instill in women certain abilities that men lack and that are sought-after in the workplace. According to Sean, married women’s *“organisational skills are better, and they could probably teach the guys something about that”*. He attributes this to the fact that their circumstances – combining two roles – require them to be *“supremely well-organised”*.

However, references to superwomen in science also reflects the perception that, with the exception of these few women, combining motherhood with children impact negatively on either the children, the careers of the women, or both. While three women respondents expressed some concern about the possible impact of their work on their children and experienced some guilt in this regard, the male respondents express much stronger concerns in this regard. It is therefore not surprising that most of the men prefer that mothers, including their own wives, do not work full-time (or, in the case of Jacques, do not allow their wives to work). A male respondent, Ted, whose wife, in his words, *“chose not to work”* is of the opinion that:

“...there’s a lot of benefit to the children to do that. So, I’m not going to preach anything, but I think the children do suffer a bit. That would be my concern...a lot of women...eventually realise, ‘My God, it wasn’t really worth it - what we’ve done; we’ve lost the intimacy of our families, which is actually really what everything’s about”.

The concern another respondent, Jacques, harbours about the welfare of the infants born to members of his female-only staff is the reason why he insists on and facilitates a six months’ paid maternity leave for these women:

*“I immediately give them six months off. The university will not pay them, but I pay them – the little bit of money that I pay them in **any** case...I give them six months off, I do not want to see them...they are usually very highly motivated, and they want to come back as soon as possible, but I chase them away for six months, so that they can pay attention to that baby, so that something does not happen to him or her”.*

3.4.6.2 *“They could have still done more”*: the effects of children on their mothers’ academic careers

Although men do not consider it “impossible” for women to combine parenthood with a research career, as reflected in the superwomen narratives, according to most of the men it is inevitable that the woman’s career will be less productive. Respondents mostly raise the issue in general - such as Leon’s opinion that, if women did not have the role of motherhood to fulfil, “*they could have still done more*” in terms of research productivity, and Sean’s view that, “*Of course there are dips in your career [when you] go and have kids*”, especially “*for the first little while*”. More specific is Ted’s comment that women who are mothers “*can’t be as focused*”, because they have to “*multi-task*”:

“When I’m writing, my wife’s cooking – that’s as simple as that: she’s doing something else...if you are the selfless wife...you can’t produce like I have”.

It is particular maternity leave that is seen to have “*a bit of a negative impact*” on the new mothers, “*because it causes them to lag behind the men*”. As the findings thus far have indicated, the process of cumulative disadvantage among women is usually put into motion when childbearing is combined with a PhD and teaching, which leads to a PhD being protracted over a longer period than is the case among the men. In a highly competitive research environment, where the PhD is essential for promotion, the accumulation of disadvantage for women in such a situation leads to frustration, according to Jacob:

“It causes them to take longer to finish a dissertation. I know of one colleague who took ten years, but in those ten years she raised three kids. It makes it more difficult...leads to frustrations and so on, because colleagues who, one could almost say, stand at the back of the queue start overtaking them, and then it causes a bit of frustration...I still think that it is something that holds people back a bit”.

Some women do not even attempt to study further, according to Martin, “*because the work environment doesn’t allow them to be able to deal with children and their studies*”. Consequently, they publish less than males with higher qualifications. And even when women are in the majority as postgraduate students, as is the case in Ted’s department, their stretched

career paths mean that they rarely rise to management level (although he adds that this situation is changing rapidly).

The male narratives seem to reflect – albeit indirectly - the view that women who make the decision to have children, should accept the career consequences that will inevitably flow from their decision. The women respondents also emphasised the need to accept that compromise is inevitable, and that one aspect – either family or work – will be adversely affected. However, a gender difference, though subtle, does emerge, in that those women who do make the choice in favour of having children – a choice that is conceptualised by men as driven primarily by personal motivations - are necessarily making a choice against a career. Consequently, some men argue that women who choose to become mothers should not expect their colleagues or employers to invest as much in those women’s research careers as in the careers of researchers who do not have to deal with the constraints of motherhood. According to Jacques, for instance, it is not his “*fault if a woman has babies*”, therefore women in that situation

“...should not then come and moan that they do not have the time. You must just decide what your functions are in life; it is not an excuse. You should not always look for an excuse. But, women who are trained by me will not look for an excuse. They have been taught how to act in such situations. But then you often get, ‘O well, I am a woman, and I am this and I am that’. Now, if you are the weaker sex, do not be the stronger sex in terms of some things. Make peace with your life, and carry on”.

In terms of support systems, the men mention a number of factors that may allow a woman to cope better when combining motherhood with a research career. Paid domestic help was referred to. As with the women respondents, there is awareness of the fact that affordable help is more difficult to come by in developed countries than in South Africa. Referring to the family in the UK where he stayed during his sabbatical, Sean explains that, “*They had kind of a nanny who could look after the kids in the afternoon, because she and her husband were quite wealthy*”. In terms of institutional support structures, practices that reflect a cognisance of women’s heavier burden in terms of family responsibilities are advocated. Sean is of the opinion that universities as employers should “*set realistic expectations*” for such women with a dual role. Jacob agrees that “*one should also be practical and pragmatic*”, and he applauds the Alexander von Humboldt Foundation’s extension of its cut-off point for grants to women by two years for every child:

“The cut-off point is forty, and if you’ve had three children then they say 46 is as good as 40. They take into account that one did not have the chances to work full steam during that time...I think it’s good, it’s right. One should also be practical and pragmatic. One should say, ‘Right, here is a situation that renders women, if they have children, unable to do it, and therefore one should be more accommodating’. And I think that’s right”.

Of all the possible support systems mentioned, though, the role an academic woman’s male spouse may play to help her cope does not feature in the male respondents’ narratives. Only one indirect reference was made by a male respondent with regard to spousal support: *“It all depends on who you’re married to...doesn’t it?”* Sean asks rhetorically. This again highlights the fact that one of the most salient differences between the male and female respondents originates from the traditional gender division of labour, as it has completely exempted almost all the male respondents from fulfilling domestic responsibilities throughout their academic careers.

3.4.6.3 *“I wasn’t always there when I should have been there”: the effects of fathers’ academic careers on their children*

The male respondents’ narratives do not reveal any constraining effects of their own role as a parent on their careers. Two respondents, Leon and Jacob stated outright that fatherhood did not *“have a negative impact”* on their working capacity or output. In addition, most of the men prefer that their own wives not work full-time (or, in the case of Jacques, do not allow their wives to work). Consequently, the male respondents’ parental involvement has been much more limited than that of the female respondents. Moreover, the male respondents who publish most prolifically are childless, and one may argue that the complete absence of childrearing responsibilities in their lives is most probably a factor that has contributed to their publication output and general career success.

In the male respondents’ lives, work clearly takes central stage. Only rarely is the fatherhood role allowed to supersede the work role – when children are born, for example, or when a wife places demands on her husband for what she perceives to be her or her children’s sake. Even then, though, the work role is not sidelined completely. For example, Leon remembers that when his youngest daughter was being born, and he took his wife to hospital, he *“brought a book – a writing pad – and a pen along (it was still just before the time of computers)”* and while he sat waiting in the maternity ward, he worked on an article. Jacob reports that his wife *“has been angry”* with him, when on his sabbatical at home:

“I almost don’t come out of that study; she has to pull me out of there for meals...My wife supported me a lot through the years. All she demands is that, if I am on study leave I should at least come down every now and then to work in the garden, and pay attention to the children, and so forth - because I am rather inclined to want to only keep on working and working and working”.

However, the selfsame prioritising of work over family causes feelings of anxiety and guilt similar to those expressed by the female respondents. Thus, when the men were asked about the effect of children on their careers, their responses tended to focus on the reverse, i.e. the (mostly negative) effect their careers might have had on their children. Although Leon feels that he has not “*completely neglected*” his children, he acknowledges that there were times when he did, particularly when he was working on his doctoral degree and had to carry an exceptionally heavy teaching load:

“In the morning I went – during the holidays – to the office at six o’clock, and I came back two o’clock at night. And my one little daughter, my second-eldest daughter, gave me a look one day when by chance she bumped into me at home, and then said, ‘Oh, Dad, are you still there?’”

In contrast to the female respondents, who experience guilt and a fragmented life-world at the time that they are raising their children, most of the males express these feelings in the form of regret later in their lives, or what Ted refers to as at his “*advanced age*”. He acknowledges that something he did not understand in the past, and is only now beginning to understand, is that the “*intimacy of our families...is...really what everything’s about*”:

“It’s the intimacy of relationships which are important. It’s not the prestige, and the material wealth, and so on. I’ve met so many people now in their sixties - people who were outwardly considered to be very successful - who now realise that they should’ve done it differently”.

Martin reports trying to spend any spare time he has with his children, but at the same time he is acutely aware that he and his wife – also a highly successful academic – may not be “*very good parents*”, because they spend their time “*doing a lot of other [work-related] things*”. Nevertheless, he feels the effects of this on their teenage children have not been too severe. Aside from the children making the occasional accusatory remark - “*You guys are always working, you’re never here; you only talk about work*” - he judges his children and their relationship with him and his wife as being “*quite nice...I think they quite like us, and we like them*”. Similar to Martin, Jacob and Ted express a sentiment of relief that the children were not affected too negatively by the frequent absence of their father. Although Jacob’s wife “*sometimes blamed [him] a bit that [he] did not pay more attention to them...luckily things all*

worked out very well after all". And although Ted feels that *"maybe I should have spent more time with my family. I think probably that was an error"*, in the same breath he expresses the opinion that his children have *"come through pretty well"*.

In fact, Ted and two other fathers rationalise that adverse effects of their absence were countered by various benefits the children experience as a result of their fathers' career success. According to Ted, his daughter's initial career development in particular has benefited from his status or high profile. Jacques's career has provided his children with the opportunity to travel overseas a few times with him, with the result that *"they adapted very well to life; they gained a lot of experience, and saw more than most children. Two of them have doctoral degrees"*. Leon is of the opinion that by neglecting his wife and daughters, he has actually empowered them all to become *"headstrong feminists, which is probably a good thing"*.

3.4.6.4 *"I do it when I can": co-parenting from a male perspective*

Considering the results thus far, it is not surprising that only one male respondent, Martin, referred to sharing at least some of the parenting responsibilities with his wife, and then only *"when he can"*:

"Somebody has to get somebody at the gym, and somebody has to help a little bit with the homework. And I do it when I can, you know".

This is most probably because he is one of the two male respondents whose wives work full time, and the only one whose wife did not interrupt her working career when she had children. His wife's academic career involves a fair amount of travelling, which at times shifts a greater share of the domestic responsibilities on him:

"Tomorrow she's going to...a meeting in [a town in another province], so I'm doing some carrying around and some things...I think that we're actually quite good at both participating in the family building".

These factors, combined with the fact that he was in his late 30s when he started his family, goes some way toward explaining why he is the only respondent who referred to the sometimes exhausting nature of parenthood (although he does not relate this to his career in any way):

"There were times when I'd say, 'Hell, it's a little bit much for us'. You can't say to your children, 'I'm tired now, give me a break. You know, I'm old, you must understand that'. And they'll say 'No, you're not old: you're old when we say you're old'. But they do keep you young".

Instances of concrete support offered by male partners, or references to any form of co-parenting are rare - not only in the male narratives, but also in the men's superwomen narratives, which suggest that superwomen succeed by their own volition – because they are “fantastic”, “great people”, who are “supremely well-organised” and “highly motivated”. To be fair, the women also emphasise their own energy and discipline and central to their ability to combine motherhood with a research career, but they mention their partner's role to a much greater extent than the men mention themselves or other husbands in a supporting role. This further supports the interpretation that there exists a male-specific view that combining parenthood with a career is not an issue that concerns men *per se*.

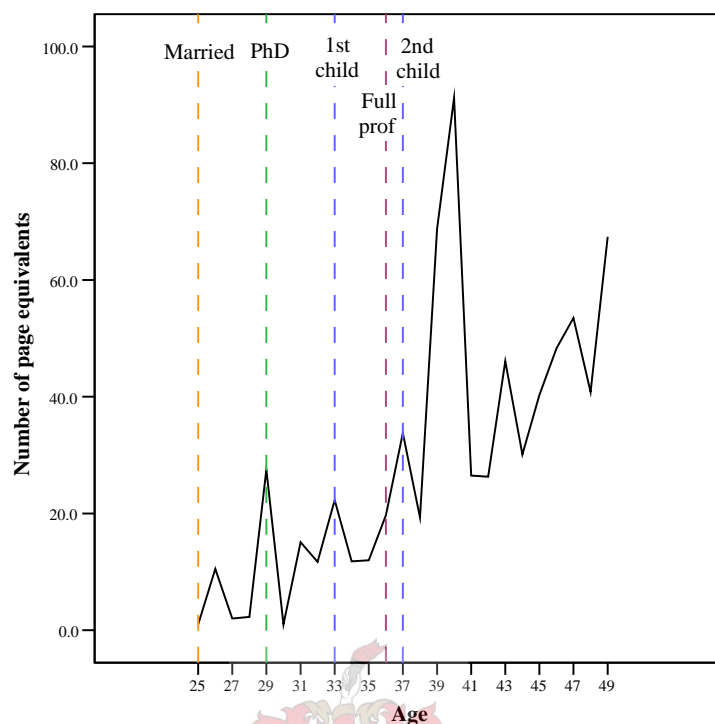
In part, this view is justified by the fact that men need to focus on their own careers – careers that usually take precedent over the careers of their wives: “*Her husband is a medical doctor: he also cannot really help a lot at home, and then it has quite an impact*”, explains Jacob, who sympathises with a female colleague's situation. And from a male perspective, the ideal of co-parenting is very difficult to put into practice, because of the biological “realities” associated childcare. Martin remembers that, when he and his wife first started with a family:

“...we had discussed equal time, equal roles, that kind of stuff. And it's all very nice, but once the baby is there, this baby does not want to drink milk from me, I can tell you. For those first few years they are incredibly emotionally attached to the mother - as much as the father plays around there”.

Consequently, Martin's wife carried the greatest burden in terms of raising their children, with the result that her own academic career has had to take “*a back chair to some extent*”. This is supported by the CV data, which indicate that he publishes on average twice as many page equivalents per active year than his wife does (see section 3.4.5.2 above), as well as by his career publication history. As Figure 11 above (see p. 272) shows, Beatrice increased her output slightly in the two years after the birth of her second child (most probably as research conducted and written up before the birth of her child was eventually published), but for the next few years (in the first half of the nineties, when both her children were not yet of schoolgoing age) she only managed to maintain her publication productivity at just under ten page equivalents per year. The moment her second child had reached schoolgoing age, however, she started increasing her publication productivity, and is now producing five times the volume she did then. Figure 15 below shows that Martin experienced a slight decrease in the year after his second child was born, but that this was followed by an extremely productive period during the first half of the nineties. Actually, at one stage during his children's pre-school days he was producing nine times as much as his wife did.

Figure 15

Martin's career publication history



Also interesting is the fact that Beatrice publishes a much greater proportion of her articles with her husband, than he does with her. Martin and Beatrice's collaboration therefore illustrates what Cameron's (1978) research has already found, i.e. that men have a greater number of different collaborators than women do. Martin sketches the differential effect that children have had on their individual careers as follows:

"...for sure [my wife] has not been able to travel as I've had, she's not been as integrated as I have. I mean, where is she now [18:30]? I'm in my office...typically I'm here until seven o'clock...There is no question at all that she has taken a side-step. There's no question. I mean, look: I spend eighty hours a week doing science and my job, and she maybe does sixty. And that's not because she would not wish to do what I'm doing, because our work and our hobby – it's all integrated. She is taking the bulk of the load of managing our home affairs with the children. And that's just the way it is...there are realities...I mean, there is a reality of what children do".

3.4.6.5 *“There’s full understanding for what you’re doing”*: the supporting role of the male respondents’ wives

In addition to providing their husbands with the opportunity to focus on their publication productivity, the male respondents’ wives are reported to have had other positive effects on their careers as well. Three male respondents co-author with their wives in different degrees, and all three describe their wives support in terms of the intellectual input they provide as specialists in their own, although related, fields. According to Charles, his wife *“keeps him on [his] toes”*, particularly since she *“is now back in the research environment”*. Sean considers it *“very advantageous”* from a research perspective that his wife (a previous student of his) is a specialist in a related field, because he does not *“have to worry about...complicated issues”* related to her field. This is also the reason, according to Sean, why he and his wife collaborate. Finally, Mike, who collaborates most extensively of all of these respondents with his wife, ascribes much of the increase in the *“depth of the science”* that he does to his research collaboration with his wife:

“She has a different area of expertise...and she’s been able to bring [her field] into my [field]. So, there’s no way that I could be publishing and doing what I do if that collaboration hadn’t started”.

Women also highlighted this “meeting of minds” as a factor highly conducive to their careers. In fact, Charles’s wife co-authored with him at a time when she was having their first child. Although at the time she had given up her outside work, their co-operative research relationship allowed her to continue working from home. However, the women in academic partnerships differ from the men in that they focus less on the academic advantages associated with such co-operation, and more on the fact that it practically ensures a supportive, understanding spouse. Only Sean emphasises this additional advantage of conjugal co-operation: *“that there’s full understanding for what you’re doing”*. Had his wife been a non-academic, she would, according to him, *“go nuts”*. The fact that she is not only an academic, but is working in the same field that he is, she is *“much more understanding. And often she’s got to do the same. So, you know, we’re quite happy”*.

Another gender difference in terms of intimate academic partnerships relates to the reportedly gender discriminatory way in which the broader research community tends to consider the contributions of the wife to a co-authored outputs as less important than those of her husband. This belief – clearly unfounded in the light of the men’s narratives quoted above - leads to a social construction that the women in the partnership are riding on the coattails of their husband’s career success. As discussed in section 3.4.5.2 above, Beatrice’s decision to postpone

her collaboration with her husband was a conscious attempt to counter the potential detrimental effects of such perceptions on her career. From her husband's perspective, her refusal to collaborate with him until she had established herself, or at least until she had attained her PhD, was motivated by the fact that, "*she just thought that my shadow was too big, and she would get hidden*".

Unfortunately, it seems that in the case of this particular intimate academic partnership, Beatrice has become hidden, particularly as she shares her husband's surname³³ – a decision he now regrets:

"The biggest mistake we ever made was for [my wife] to take my name. Oh, for sure. This was a big mistake. Once you've done it, you can't get out of it...I think it's done [her] harm, I think it's caused confusion in our scientific lives, and I wish she had her own name. And I think she wishes she had her own name".

Beatrice's career has suffered at the hands of the peer-review system on which her NRF rating, and therefore her research funding, is based. Her husband explains, "*I remember one NRF rating of hers: they said, you know, '[Martin] did this; the brains behind it'...I remember one of those NRF reviews; people being quite critical*". The unfairness of such gender discriminatory perceptions did not escape his attention:

"Ironically, a lot - more than half - of the brains were her brains...I think she has been discriminated against quite strongly, because of our collaboration. What do you do about that?...The irony is, so much of the depth is her input³⁴...if you go into the Web of Knowledge and look: she is more cited than I am. She has a higher international profile than I do".

Finally, a rather unique case of spousal support is found in the form of Bob's wife, who supported him financially as well as emotionally when he was studying for a new field of study that he decided to pursue in his forties. It is clear from his narrative that his wife's support was critical to his subsequent career success:

³³ Women are also disadvantaged in other ways by changing their surnames. As was discussed in section 2.3 in Chapter 3, such surname changes are usually not tracked in large bibliometric databases, which leads to the creation of duplicate authors, who are each linked to a portion of the articles produced by one women scientist. The fact that this duplication is only a possibility for women, introduces a gender-related bias of unknown extent.

³⁴ This quote also illustrates that different gender styles may exist in terms of how publications are produced. Compared to men, women such as Beatrice may be focussing on fewer, more important papers, producing output that has greater "depth" (cf. Sonnert & Holton 1995; Long 1992). By implication, a measure of research performance based simply on counting numbers of articles, and that therefore does not take into account these different gender styles, may very well be systematically biased against women.

“My wife was earning a salary then, and she was very understanding, and we could only do it because she was earning a reasonably good salary, and she was very understanding...I probably couldn’t have done what I did, if she hadn’t been as understanding”.

The above case is, however, an exception among the majority of narratives concerning the effect of family responsibilities on careers, which clearly show that, while women need to negotiate for juggling space, men experience enabling circumstances created by wives who are at home full-time to take care of the domestic sphere. It is almost impossible that this salient gender difference would not translate into lower publication productivity among women. However, other gender differences might also have an impact, and therefore need to be investigated before drawing any conclusions in this regard.

3.5 Workplace-related constraints

3.5.1 **Institutional research culture and policies**

The extent to which an institution maintains a strong research culture that emphasises publication productivity, or its degree of research orientation (Rodgers & Maranto 1989), is of crucial importance to academics’ publication productivity. An entrenched publication culture means that universities expect their faculty to engage in research and that more rigorous publication requirements exist for advances in rank and salary at these institutions (Allison and Long 1990). The respondents in this study, most of whom have been employed at South African universities for at least three decades, report a general lack of such an entrenched publication culture before the 1990s. Although this seems to have been a feature of most South African universities, and although women were not “institutionally ghettoized” (Davis & Astin 1990) in this regard, the data analysed in section 3.3.2.1 indicate that, because of women’s more limited geographic mobility, it had more of an impact on at least the initial stages of the their careers, than it had in the case of the men.

The lack of a strong academic publication culture is partly associated with what Linda refers to as “*the political circumstances of the eighties*” in South Africa that prevented scientists in this country from exposure to the international research community with its culture of “publish or perish”. In this regard, the male respondents much readily report a negative effect on their publication productivity. Jacques, for one, mentions the exclusion of South African scientists from international conferences during the 1970s:

“I was often not allowed to go to conferences...We could not go to conferences; we could – we had the money – but they refused to register us. And the point is: it actually has a negative influence”.

The broader political context also excluded male academics from other research-related opportunities abroad. For example, Sean experienced exclusion during the 1980s in terms of overseas post-doc opportunities:

“...in the Apartheid days there were no post-docs. Nobody wanted you abroad. In the eighties, when I applied for a job, there were no post-doc opportunities. I just got a job”.

Sean also mentions current institutional policies at the university where he is employed, for example the favouring of Afrikaans as teaching medium, which constrains publication productivity in general, by limiting the number of students an institution can attract and train for an *“international, English science market”*. Some of the women mention limited access to funding for students, laboratory staff and equipment *“to do the science”* (as Beatrice puts it), as constraints. According to Delia, to raise funding, particularly for students’ research projects *“takes huge amounts of time and it’s very difficult”*. Similarly, Charles voices dissatisfaction with the fact that the university where he is employed *“shuffles off”* a lot of the money that academics earn *“to pay for administration”*, while Leon, reports having been discouraged from publishing by an NRF-rating that he considers unfair.

3.5.2 **“The dreadful admin load” associated with a high academic rank**

Even if access to research funding is secured, the administrative burden of managing it may be time constraining. Beatrice, for example, feels that reporting on the spending of funding takes more time that is justified by the accountability such reporting is supposed to ensure:

“While I understand the reason for that, I think sometimes they should just fire the accountants...there’s going to be some money that’s going to go to waste and maybe there is even going to be some fraud, but in actual fact...your average research scientist is so passionate for what he or she does, they’re not going to misspend the money”.

A concern with administrative red tape associated with research funding is also found among the male respondents, such as Charles, who reports that at the university where he works:

“...there is a massive growth of administration...in terms of people shuffling paper, and harassing us on a daily basis with forms we are filling in for trying to access our own research grants”.

The time available for publication may be further limited by other administrative duties, or what Sarah referred to as “*the dreadful admin load*” associated with senior academic positions, such as the head of a department. With regard to academic rank, the CV data show that the women do not only experience a greater time lapse between attaining their master’s and doctoral qualifications, but that they also become professors on average nine years later (at the age of 46) than the men do (at the age of 37) (see Appendix D, p. 491). This implies that, in terms of another indicator of seniority and professional experience, years in the full professorial rank, the women are much “younger” or “inexperienced” than the men. On average, the men have held the full professorship rank, with all the advantages it implies for publication productivity (see Chapter 2, section 2.3.2.1) for 19 years, while the women have only been full professors for an average of eight years.

However, the qualitative data show that an academic environment, and in particular a professorial rank, are not necessarily pre-requisites for a career characterised by publication productivity. Actually, in some cases the effect of these variables may be negative, especially for women who are appointed as heads of their departments. According to Linda, who held such a position for three years, time management “*is one of the most difficult things to accomplish, especially when you are a chairperson...it does not matter how you plan your time – it just tends to grow sort of like an amoeba*”. Linda blames the management of the university where she is employed for not taking into account that departmental chairpersons have multiple roles to fulfill: because they are “*managers and lecturers and researchers*”, they do not “*have 24 hours of the day to manage*”. “*You have to devote a certain period of the day to it, and then you also have to teach...and you have to do research*”, she explains. She also criticizes the university for being “*over-bureaucratized*” and “*completely over-administered*”, which inevitably results in a large amount of paperwork.

Cecilia directly links her position as a chair of a department – one she held for ten years – to her productivity in terms of research articles. She reports finding it “*very, very difficult*” to maintain an optimally productive publication record when having to deal with a high administrative load. If she were “*allowed just to do research*”, she argues, she would “*probably produce five or six articles a year*”. Cecilia’s narrative also implies that the institutional system that rewards those academics who are most efficient with higher academic ranks, has the unintended consequence of overburdening those same academics with administrative duties. The problem is exacerbated by the fact that academics are not necessarily “*trained*” for many of

these duties, such as dealing with budgets, and that – at the university where she works – they lack “*an infrastructure*” that supports them.

Some of the male respondents express a need to minimise work responsibilities that encroach on their research time, but these are mostly gate-keeping responsibilities³⁵. For example, Jacques expresses a need to scale down on the refereeing he does for 35 international journals, while Leon admits to have made a mistake by agreeing to be an editor of a journal: “*I should not really have done it. One of the younger colleagues should rather have done it*”. A third male respondent, Jacob, did resign as editor of an academic journal – a position he held for more than a decade. He describes this as a time during which one

“...very seldom had spare time during which one was not in one way or another busy with the journal. It’s quite extensive work...then, after a while I decided I can’t...it’s just simply becoming too much. Then I decided I may as well resign the editorship. I am still involved in journals’ governing bodies, and so on, but I am now – well, thank God! – not involved to such an extent in editorial work”.

Although editorial work is at least as time-constraining as a chairpersonship, the latter does not offer the publication-related advantages that a gatekeeping position does. It is therefore not surprising that some women do not find themselves in such a position voluntarily. Elmarie, for instance, was “*blackmailed to sort of let go of my research to get into a management position*”, as the dean of her faculty told her that she “*can forget about promotion*” unless she became the head of a department “*and establish a research culture and manage them*”. She has now been appointed as a director of a research focus area, which she describes as “*an even worse management position*”. The effect of this position, which includes organizing a large international congress, on her publication productivity is obvious: “*I am not so terribly hands-on with writing, with experimental work. I’m more in management than in hands-on research*”, she acknowledges.

Other women have consciously chosen to eschew positions associated with management and administration. After less than three years as full professor and head of a department, Sarah has consciously limited her academic role to that of part-time lecturer and supervisor of postgraduate students at a number of South African universities, in order to focus more on her research. She identified “*the dreadful admin load at the university when you’re back in a so-called academic job*” as the only constraint on her publication productivity that she has experienced throughout

³⁵ This does not imply, however, that the women fulfil gatekeeping responsibilities to a lesser extent than men do. According to the CV data, the women have on average held only a slightly smaller number (3) of editorships than the men have (4) during the course of their careers (see Appendix D, page 492).

her career. According to her, it “*has enormous costs for research and research productivity. You can neither get into the field, nor do you have the time to write the papers*”. Linda has not made herself available to be again elected as chairperson, and two other female respondents, Thandi and Delia, mention limiting or even completely avoiding involvement in committee work in order to free up some time for research and publication. Such coping strategies - or what Cole and Zuckerman refer to as “personal adaptations” (170) - may, however, have unintended, negative effects, as Acker (1994:67, cited in Walker 1997) has noted with regard to academic women in the UK. These women, “while keeping up with family, teaching and research, have less time and energy for committee work and image-enhancing activities”, which may lead to their exclusion from both formal and informal networks. Delia is quite aware of this dilemma, but feels she has no other option: “*I know it advances your career and does all the rest, but you work at the balancing of what you’re doing now and what you’re not doing*”.

Although Linda mentions that, “*all the chairpersons complain*” about the high administration load at the university where she is employed, the men in this study rarely refer to the negative effects of holding senior management positions in academia. Only Jacob explicitly links his publication productivity to his extensive involvement a number of years ago in university administration, for example serving as a faculty dean and on the senate and council. The reduction of the extent of his involvement due to “*affirmative action*”, is something about which he was

“*...terribly glad, because then I could again, so to speak almost, spend ninety percent of my time on research and writing, publishing...I may be publishing a bit more now, because I am not involved in the administrative stuff any more...In the sense that one simply did not have the time to work to such an extent*”.

However, according to him, the effect on his publication productivity was relatively small:

“*If you look at my list of publications, then you will see that, even throughout those times I still always published...One of my advantages when I wasn’t dean any more and came back to the department, was exactly the fact that I maintained research and publication while I was in the administration – maybe to a lesser extent than now, but always maintained*”.

Although there is very little evidence of the exploitation of women academics’ time in the labour intensive execution of administrative tasks, the women’s more intense awareness of their administrative load should be interpreted within the South African context, where – as Maürtin-Cairncross (2003) and De la Rey (1999) point out - a dearth of women in senior academic positions coincides with a trend to increasingly view the dominance of white males as

illegitimate. Consequently, there is a growing demand on women in senior positions to participate in committees, and to generally take on greater responsibilities in terms of management and administration.

3.5.3 **Discrimination in the academic work environment**

In the previous sections, the academic working environment is presented as challenging in terms of time and resource constraints. Because of its male-dominated nature, one would expect women to experience these constraints even more severely. Thus, in the following section, data are analysed in order to develop a better understanding of gender discrimination as experienced particularly, but not exclusively, by the female respondents.

3.5.3.1 *“I’m not really a feminist”: women’s experiences of gender discrimination*

It is often argued that qualitative research may provide more direct evidence of gender discrimination in academia, in the form of women’s self-reports of their experiences in the workplace, than quantitative research would (see Chapter 2, section 2.3.4.3). It was therefore surprising to find that half of the female respondents reported that they had not really experienced any noticeable form of gender discrimination during decades of working in predominantly male environments. Only one female respondent reported discrimination against her as a student in the late sixties, when she was not allowed to register for a degree in what was considered a male domain: *“There was a sort of apartheid where women weren’t even allowed to register for degrees in [certain fields]”*, she explains. Also, while only a single female respondent felt that gender discrimination is *“something that you live with on a daily basis”*, responses such as the following are much more common:

“I have truly never experienced problems...I’ve never had reason to feel aggrieved that I’ve been discriminated against because I’m a woman...as for networks and collaboration with other people...no, I can’t say that gender played any role whatsoever” [Adèle].

“I did not experience it specifically as gender discriminatory...In my case I think it was not so much the gender in the department” [Linda].

“I could really, in my professional life - it’s like: opportunities to go to conferences, to publish - ...do anything I wanted” [Sarah].

The findings seem to mirror those of studies in South Africa and elsewhere (see section 2.3.4.3, Chapter 2), in which the majority of women rejected gender discrimination as a factor that has impacted on their personal academic careers.

Some of the women in this study account for the lack of gender discrimination in their work experience on the grounds of disciplinary variations in tendencies toward gender equality. Cecilia feels that she has “*flourished*” in the humanities environment in which she has been functioning, because she has not “*had some of those battles to fight that other female scientists have had to in other contexts*”, particularly the medical sciences. As such, her observation agrees with Stack’s (2002) argument that in humanities disciplines (he specifically mentions sociology and anthropology), one would anticipate greater integration of women into academic research networks, because these disciplines are characterised by a lower degree of gender inequality. The proportion of women in a field of specialisation may also have a role to play, as Beatrice notes:

“I consider myself very lucky that I’m in one of the few science departments in the country, where there are actually more female members of faculty than male. So, the women rule, and keep the men under good control”.

Gender discrimination falls away in fields such as Beatrice’s, because they have exceeded what Sonnert and Holton (1995) term a critical mass of fifteen percent. Also, in fields characterised by large numbers of women, gender discrimination is more visible, therefore sanctions for discrimination are frequent, which lowers levels of discrimination (Cole 1979).

Other women acknowledge that it might not be the case that gender discrimination has been absent from their career lives, but that they are simply not attuned to it: “*Maybe I’m just not that way inclined: I’m not really a feminist, and I’ve never thought in such terms*”, says Adèle, while Beatrice explains that, “*a lot of the gender stuff tends to just kind of pass me by, because I ignore it, just because...maybe I’m not focused on it*”. As Maürtin-Cairncross (2003) has proposed, this tendency may result from “*deeply embedded socialisation of patriarchal systems, which women accept unchallenging*”, or may simply be the result of the subtlety of “*androcentric barriers*” (78).

Indeed, if gender discrimination is reported by the female respondents, it is usually described as quite subtle (“*it’s never been horribly blatant*”, recounts Beatrice), or as something “*other women*” - but not they themselves “*personally*” or “*specifically*” - experienced, as Sarah and Linda do. Linda, for example, reports that some of her female colleagues in the same department indeed experienced gender discrimination: “*There are men of my age who did encourage the young men, while she wasn’t encouraged*”, she explains.

One example of a more subtle form of gender discrimination is the tendency among superiors to view a woman's career as less important than her husband's, due to the social construction of the male as breadwinner. Consequently, women such as Beatrice may be passed over for promotion in a highly competitive, under-resourced work environment:

"...in the sense of, well: I'm married. Do I really need a promotion? I've got a husband. Do I really need that extra money that comes with promotion? Do I need that little extra push?"

It is also important to bear in mind that respondents were not provided with a "standard" definition of what gender discrimination entails, which resulted in respondents not defining some gender-biased behaviour as discriminatory *per se*. For example, the majority of interview responses show that the women experience at least some form of gender **exclusion** in their work environments. Delia, for example, describes the peer review system as "*geared much more for the way men work and think*" (also see section 3.7.2 below), and therefore as "*fairly hostile*". The peer review system therefore exhibits a "closer fit" to the "working styles of men", as Mairtin-Cairncross (2003:162) has noted with regard to other aspects of the academic career as well.

Data collected in South Africa and elsewhere show that, not only does gender discrimination operate on a very subtle level, but it does so primarily in the domain of informal social interaction (see Chapter 2, section 2.3.4.3). This study again shows that the outsider status of women in academia becomes apparent in the social aspects of work interactions between genders. In this regard, Beatrice refers specifically to the topics of conversation characteristic of male-dominated group that exclude female interests:

*"I think if you are the only female in a group of males you will always feel, to an extent, excluded. And part of that is association with the...the **topic** of conversation. OK, you get exceptions, and I must agree my husband's an exception, but most South African males are excited about cricket and rugby - I'm afraid to say! And I know some of my female students are also excited about cricket and rugby, but it doesn't excite me, and I can't participate in a conversation that has that as a central theme."*

Although instances of gender discrimination are cited rarely by the women, exclusion and isolation of women is much more common, especially among those pioneers who were the first women to work in high-level positions and/or in certain fields. Sarah describes her experience as the only woman head of department in a science faculty as follows:

“I felt that people made no effort whatsoever to integrate me. And I didn’t like the atmosphere whatsoever. And at that time...the Senate had very few women in it. It’s changed amazingly in the last five years – both concerning the racial and gender profile. But in 1999 it hadn’t changed that much. And I didn’t like that”.

In Elmarie’s case, her isolation as the only woman in a male-dominated department was intensified by the fact that her research focus was considered “feminine” – something the men “*did not like much*”. Thandi’s mostly male colleagues’ prejudices were compounded by the fact that she was not only a pioneer as a woman scientist, but as a black woman scientist as well:

“I was probably the first female working in the department; the first person who is not white, working in the department. There was something like, ‘Are you going to make it?’ It was made very clear to me that, ‘you may not actually make it; we are not taking a chance; you are not really accepted fully’...I feel that I’ve gone through what I call ‘academic loneliness’...I have found...you really just have no one to talk to. There is nobody when you are excited, when things are not going right...there’s nobody!”

Academic isolation is not, however, limited to women academics only, although in the case of the women in this study, it flows from their female status. In the case of the men, other factors are at play. For example, Bob also experienced academic isolation, but in his case it was the result of working in a very unique, specialised field. The similarities between his narrative and Thandi’s are striking, though:

“I was on my own, no one really to talk to; no one interested in things I was doing. And eventually, by forty-two, my ideas were running out; I didn’t have enough self-motivation without anyone to interact with”.

Neither is racial discrimination only experienced by black academics. Three white academic respondents, Cecilia and two male respondents (see section 3.5.3.2 below) voluntarily mentioned their own experiences of what they perceive to be racial discrimination against them. Cecilia refers to a “*race glass ceiling*” that is “*being enacted every day*” in terms of “*promotions and employment criteria*”. She herself has experienced it personally:

“I tried for a chair at another university...in this country - recently, with my CV, and the person who got it, had three publications”

Not only does she describe the race glass ceiling as “*horrible... really, really awful*”, but it has led to her cynicism about the future of academic careers in South Africa: “*It’s almost like: why bother?*”

3.5.3.2 “One is not always sensitive to this stuff”: discrimination from a male perspective

When probed more directly about the issue of gender discrimination, a number of the men acknowledged being aware of other male colleagues discriminating against women, both in their role as postgraduate student supervisors, and as managers appointing staff. Actually, the male narratives exhibit a greater awareness of instances of gender discrimination than the female narratives do. According to Sean, “*there’s blatant discrimination*”, and he refers specifically to “*certain professors*” who,

“...if given the choice between a woman and a man, would choose the man, just because they feel uncomfortable”.

As Mattis and Allyn (1999) propose, male scientists often experience awkwardness and discomfort in relating to women scientists as peers, because they have traditionally had little contact with women in an academic setting.

Leon, for whom gender discrimination refers to women being “*treated differently than men are*”, pronounces that he could cite “*many instances of discrimination against women*” in the faculty where he works. Some of his colleagues tend to accord female graduate students what Perumal (2003:76) has referred to as “*second-class academic citizenship status*”:

“Some of my colleagues treat women...in a condescending way, that you are now actually doing a favour for a sort of second-class person by being her supervisor, and then give her a few swipes in the process”.

Males such as Leon tend to highlight the fact that gender discrimination is still a reality “*in this day and age*”, implying that it was probably more common or at least more overt in the past. Martin agrees with women such as Beatrice that gender discrimination in academia is often “*subconscious; a very, very hard thing to put a finger on*”, while Leon expresses a concern similar to that found among the women, that he is simply not attuned to such subtle gender discrimination: “*You may get a woman who tells you I discriminated terribly against her at some time or another [laughs]. One is not always sensitive to this stuff*”. For other male respondents such as Bob, their work-environment has for the greater part of their careers been so male-dominated or “*male-oriented*”, the “*male-female issue*” has not been one that they have “*really thought much about*”.

Pretorius *et al.* (2002:28) argue that the more recognisable “*direct*” type of discrimination, e.g., if men and women have the same qualifications, “*experience*”, publications, and so on, but women are appointed in lower positions and receive lower salaries, is seldom reported (see

Chapter 2, section 2.3.4.3). However, the male respondents do report recent instances of direct gender discrimination. According to Sean, gender discrimination in terms of salary and appointments is “*rife*”, while Martin asks rhetorically:

“Well, why isn’t there a woman rector of our university? And, well, maybe there wasn’t a good woman candidate, but maybe there was, you know”.

The opposite is also reported by male respondents who provide evidence that, at least in the faculty where they are employed, gender discrimination is a non-issue. To support such an argument, Jacob recalls a conversation with his female dean. She attained a professorship fairly early in her career, and identified their faculty as:

*“...truly one of **the** places and institutions where she has never experienced discrimination against a woman, or that one does not take note of the fact that the person is a woman or a man. You look at the merits of the application, and on that basis a person is appointed and promoted. Never has gender played a role. It has really been my experience at our faculty”.*

Leon also reports that his experience has been much more positive, particularly in terms of mentoring young women. He relates the following vignette to support his argument:

*“Then I got an examiner who, on the topic that she wrote, is one of the top experts in the world...He then developed an interest in her work, and at one stage when he was here, sat with her for a long time and helped her to get the stuff right – not only for the purpose of the acceptance of the dissertation, but if she were to publish further, et cetera, et cetera. Now, those type of things happen – **that** is more my experience”.*

Social desirability bias might have played a role in the male respondents’ narratives relating to their own work relationships with women. None admitted to ever have discriminated in any way against women themselves. Rather, male respondents such as Jacques and Martin who head research institutes, pride themselves on their non-discriminatory practices. For Jacques, this essentially implies expecting the same level of performance from his male and female staff, because “*a woman should never apologise for being a woman – that’s the biggest mistake a woman scientist can make*”, and treating both genders equally, otherwise “*you have trouble*”.

In a similar vein, Jacob contends that, at least in his faculty, academic success is not a gender-related issue, but rather a function of a purely individual preference to do research and to publish. He then proceeds to explain how there is very little difference between himself and a female colleague “*who was an academic from the start*”:

“[She] finished her dissertation early, published a lot, goes overseas quite a lot (like me), is involved in a lot of stuff. So, if I compare myself to her, then we are both on the same level: we have the same disposition, we like to do research and to publish”.

For Martin, who does not “*like discrimination of any type*”, non-discrimination extends beyond gender related issues at his cosmopolitan research institute, where diversity in terms of a number of social characteristics is not only tolerated, but celebrated:

“If you come into this institute...there are thirty languages spoken here. There are Moslems and Jews and Christians and black and white and gay and straight...that’s something we pushed very, very hard, because this must be a place for everybody”.

In general, the male respondents had more to say about their female students, than about colleagues of the opposite sex. Quite a number of the men compared women students quite favourably in relation to their male counterparts. In Leon’s experience, they are less sensitive to criticism than men are, who have “*reacted most overly sensitive*” to his criticism, “*walked away to other supervisors, and just never came back*”. He concludes that “*women are rather tough*” and they do not experience problems with being “*challenged*” or “*treated sternly*”. Sean’s experiences with women students have also been positive, and he describes them as a little less “*flighty*”, more conscientious and more reliable than male students, who have “*all sorts of outside interests*”. Bob states that he tends to prefer female master’s students to their male counterparts: “*In my case...there would certainly not be any factors that would...prevent me from, or would discourage me from keep taking females. I suspect that it’s the very reverse*”.

However, some respondents - both male and female – also describe women students as less driven to further their studies or to perform as well as male students are. In Cecilia’s experience, “*socially structured motivation*” (Cole 1979:85) is a reality in her field, as it is very often women that “*just go and enjoy life and don’t come back to academia. I weep when I see the waste of potential*”, she says. And although Sean emphasises women’s conscientiousness and reliability, his experience has been that “*usually the guys outperform the women*”, particularly in terms of ambition, or what he terms “*hunger*”:

“When you get somebody who’s hungry - who has the lean and hungry look, who knows where they want to go...It’s a boy thing...guys just seem to be so single-minded”.

Bob has noticed the trend of decreasing female representation as one moves higher up the degree ladder. Although the undergraduate student body in his field is “*ninety percent female*”, it drops to “*about fifty percent female*” at the master’s degree level, while currently his four male doctorates are all males. Females, in his experience, have “*gone as far as master’s degrees, and*

then given up". Moreover, the "few women postgrad students" he has had, "have not been the best" of his students: "My best postgraduate students, actually, have been males", is his candid response. Similar to Sean, Bob associates women students' research with "the more mundane work" - they "tended to do what I've suggested they should do, and no more, and have not progressed beyond master's degrees" - while his male students exhibit the kind of "entrepreneurial spunk" Sonnert and Holton (1996:67) referred to, as they do "exciting cutting-edge" research, and go off "in new directions".

Bob seems to support the "sacred spark" hypothesis (Stephan & Levin 1992:29) discussed as part of the difference model in Chapter 2. However, in his and Sean's own attempts to explain the gender differences they experience, they tend to be critical of a focus on inherent gender differences, and prefer to rather dwell on the possible effects of socialised gender-role expectations: "I don't know how much that is because society expects them to be so, and it can change", Sean suggests, and later he states, "Often society has encouraged men and women to grow up in different ways, and in consequence, when you get into a business situation or academic situation, there are big differences". Similarly, Bob is not convinced that his above-mentioned experiences can be attributed to the fact that he works in what has been traditionally perceived as a male domain:

"...if you believe the usual prejudice that three-dimensionality is a kind of male thing; if there is any truth in that - and also prejudices that women aren't as good at maths - if you believe any of that, then it might fit with my experience".

To his mind, the fact that he is a male supervisor might explain why "the best students [he's] had, have been male", implying that his approach is more compatible with the male than female disposition, or maybe that he tends to avoid what Cole (1979:134) has termed, "uneasy interactions" between male professors and female students³⁶. Factors that fall outside the difference model also feature in male attempts at explaining gender differences among their students. For example, Martin is also of the opinion that women sometimes do not study further, primarily because of institutional reasons: their "work environment doesn't allow them to be able to deal with children and their studies". Thus, the males do not strongly commit themselves to a position that women students are biologically inferior to male students, or biologically less capable than men to do research. A number of males – especially those in the biological sciences

³⁶ According to Cole (1979: 134), "the assumption by scientists' role partners that a close sponsorship relationship with a female student must also involve a sexual relationship may deter many scientists from subjecting themselves to rumour, insinuation, and innuendo". This assumption is not necessarily unfounded: two of the male respondents in this study married one of their former postgraduate students.

- do, however, emphasise the importance of recognising that women and men are inherently different. According to Sean,

"...people are stupid if they think that the difference in the chromosomes we have, is not going to make any difference to the way people function - men versus women. Again, I speak distributions. There's plenty of overlap, but certainly the means are different".

Martin draws parallels between human and antelope behaviour:

"You go to Kruger Park and watch the bakkies, and you learn a lot about people. The males are always rucking and fighting with each other, and spend a lot of energy on ego stuff...Biologically there's a reason for it".

Jacques feels strongly about the fact that women should celebrate or at least accept the unchangeable fact that they differ inherently from men:

"These days, many women make the mistake: they complain because they are women, instead of saying 'thank you' for being different. That is where the first problem comes in...Then you often get, 'Oh well, I am a woman, and I am this and I am that'. Now, if you are the weaker sex, do not be the stronger sex in terms of some things. Make peace with your life and carry on".

Only physical strength differences between males and females are mentioned, and then only as an issue in a natural science laboratory setting. Jacques explains how he deals "ethically" with this gender difference in the scientific workplace, by insisting on a gendered division of labour, which is partly based on the traditional obligation on males to assist women in physically demanding tasks:

"I don't allow anyone to misuse the women...suppose the distilled water is finished, and that bottle weighs a few hundred kilos. If I find that the women are carrying that thing, all hell will break loose, because then...the men in that environment are in trouble. They should've done it. They should've offered as well...there are certain ethical things in my laboratory that are just done so, and not in another way. That's it. And consequently...the women here, I reckon, are very satisfied".

Do men themselves experience any types of discrimination in the academic workplace? Some men express - in less than positive terms - their awareness of a feminisation of the academic labour force in South Africa. According to Charles, his whole department has changed in terms of its gender profile, with the result that white males in this department are "surrounded by women", and "a dying breed, of course". Jacob is equally aware of the fact that, in his faculty, "there are more and more female professors than men". While two thirds of the faculty are women, men only form one third, leading him to conclude, as Charles did, that men are "now

actually a threatened species". These are, however, the only references men make in relation to themselves experiencing gender-related issues at work. One may therefore argue that gender discrimination is primarily encountered by women academics rather than by their male counterparts. However, this does not mean that the male respondents are impervious to what they perceive to be other forms of discrimination against them.

One form of such discrimination is linked to the traditional distinction among South African universities according to language-medium (*cf.* Cooper & Subotzky 2001; Reynhardt 1982), and – by implication – cultural identity. A minority cultural identity – as an Afrikaner at an English university, or *vice versa* – is mentioned by some male respondents as an important aspect of their working lives: “*I am an Afrikaner*”, states Jacques, “*with the result that I have been discriminated against here. That’s just how it goes*”. Bob describes the feelings of trepidation he experienced when he left his English-medium *Alma Mater* for an Afrikaans-medium university. The latter was “*a kind of foreign thing down the road, which really had nothing to do with*” the English-medium university he had always been associated with. Moreover,

“...it was embarrassing to go there – and I’m being quite honest...I didn’t go there by choice...my ideal was to go back to [the English-medium university], but that never took place”.

Subtle forms of racial discrimination against white academics were also perceived as an issue by Jacques and Ted. Jacques considers it inequitable that “*the new black people now get thousands of rands more*” than he does in terms of research funding, especially considering the large number of postgraduate students he trains. For Ted, the fact that he is a “*white male*” has also had an impact, although on the more subtle level of collegiality: “*Had I been black*”, he argues, “*I would have been far more acceptable in South Africa than I am to many different people*”. Similarly, the institute that he heads has been “*actively discriminated against, because it’s seen to be white elitist, which it isn’t*”.

Even ageism is alluded to by Jacques, the oldest of the male respondents, because he had already reached retirement age at the time of the interviews, he argues that the university that employs him

“...tries to get rid of me every now and again. But they would be very stupid, you know. They should actually keep us guys here, even if it’s only for a small salary – which is currently my case: I don’t get a professor’s salary”.

Another source of discrimination, mentioned by Ted and Jacques, arises from one’s minority status as a highly successful researcher. Ted recalls that the university where he is employed

does not “*take any notice at all*” when he wins an award, and he accounts for this as follows: “*if you are successful, then you threaten other people. And even in high positions you stay threatening*”. According to Jacques, colleagues who are threatened by excellent performance, “*always try to run you down as publishing rubbish. You see, that’s just how it goes*”. He terms this the “*crayfish syndrome: the crayfish that climbs out of the warm water you have to pull down*”.

These two men have, in general, experienced severe institutional barriers, although not necessarily related to discrimination *per se*. Ted experienced a dismissive institutional attitude toward the work conducted by the research institute he directs:

“When we started, we were called “mickey mouse” - one of them, the vice-chancellor of the university, said that. My salary was actually cut in 1984, because we were not teaching [students] in their clinical years, so therefore we weren’t quite...it’s not right for doctors not to teach [students] in their clinical years! Those who teach in the pre-clinical years are clearly inadequate and unimportant. And to be teaching a mickey-mouse topic like [my field]. I mean – please – where is a person’s self-respect?”

According to Jacques, his working environment has also been extremely hostile throughout his career: “*everybody just rolls stones in my way*”, he complains. Particularly his South African colleagues are described as being vindictive and disparaging.

3.5.4 Gender differences in responses to institutional constraints

Almost all of the men who report a highly unsupportive institutional environment – characterised by harassing or greedy administrators, demeaning vice-chancellors, and exploitative or vindictive colleagues - respond to these barriers by strengthening their resolve to prove themselves, regardless. Ted and Jacques therefore both feel that their hostile institutional environment had an unintended positive outcome: “*I just love that*”, Ted explains, “*Because I say I’m going to disprove them in the long term*”. He actually did, by “out-sciencing” and “out-publishing” “*these rather self-important impostors*”. According to Jacques, his colleagues “*actually did [him] many favours*” by increasing his determination to prove them wrong:

“If you roll a stone in my way, I will either break him to pieces, or I’ll roll him out of the way. And the more you make me angry, the more determined I become to drop that stone somewhere on your head”.

In an equally combatant mood, Charles details what his response would be if the university where he works ceases to reward its researchers for publishing journal articles:

“If the trend were to reach a point where they’d say, ‘Well, we’re actually not going to give you anything back for this whole thing’, I think probably at that point we would punish them by switching into publishing in books, chapters, for which you get nothing, or publishing a book, which you could get a lot of personal kudos from - and the university gets nothing from.”

Ted and Jacques have also reacted to what they perceive as discrimination against them or the research institutes they head by adopting a defensive strategy of “going it alone”: *“I merely brushed it away, and went my own way. And now I am still doing my own thing – so”*, explains Jacques, while Ted experienced his exclusion from mainstream academia at his university as quite liberating:

“We got everything without any real help...I never needed these people, because I knew that the only way that I would ever succeed in doing what I wanted to do, would be to do it myself, because I knew that the committees are not going to help you unless you are yourself a member of that mediocrity. Universities are run by committees, and committees produce donkeys, not racehorses”.

Thus, in response to institutional constraints, these men voice a high level of assertiveness and self-determination to succeed in the face of adversity. In many of the female narratives, however, quite a different response emerges. When discussing responses to work-related constraints, one of the most common female responses is rather to rely on emotional support and on managers who are actually prepared to believe in them – a need not voiced by any of the male respondents. Without *“somebody that is talking to you like a human being...somebody to keep encouraging you, saying, ‘OK, it’s all right’”*, Thandi feels she would not have been able to deal with what she experienced as a highly prejudiced environment. Her feelings in this regard are exceptionally strong: a lack of such support would have *“killed her”*, and without it *“you can die”*, while supportive colleagues overseas increased her publication productivity immensely. With regard to support on a more managerial level, Beatrice recalls a head of a department who *“believed enough”* in her to invest departmental funds in a piece of research equipment she was *“desperate for”*.

Support is not, however, necessarily forthcoming from other female colleagues in academia, and criticism of the assumption that women managers, women mentors or an all-female environment are necessarily beneficial for women’s cause, is expressed in the female narratives. Cecilia cautions that, *“one should not always assume that females in high places necessarily support the development of other females”*, while Beatrice thinks that *“an all-female environment is almost as bad as an all-male environment”*. In Beatrice’s experience, *“both sexes*

bring different strengths”, and *“positive tension comes out of having a balance”*, while in Cecilia’s, “queen-bees” sometimes reign:

“...some of my best mentors have been male. And sometimes females in high places are either jealous, or something, or whatever. I’ve encountered some of them on my way, and I have not enjoyed those interactions”.

Among the generation of women who initiated their academic careers during the 1970s and 1980s, the challenge-avoidance behaviour that Asmar (1999:257) proposes as a reason for their lower publication productivity in relation to men is voiced in a number of the narratives. Elmarie explains that she *“just kept quite and did [her] job”*. Traditional gender-role socialisation seems to lie at the root of her response: the reason why she *“did not get a terribly feminist fight going on campus”*, is to be found in the way her generation was not socialised to believe that *“a married woman can be so assertive”*.

Instead of the assertiveness and self-determination to succeed in the face of adversity so common among the men, working hard is conceptualised by Linda as something she would *“do in any case, whether they want to help me, or not”*, because she enjoys her subject. Cecilia advocates working exceptionally hard in order to counter prejudice:

“One of our female deans, whom I really like, she says, ‘Women just have to be like Avis people with the little badge: We try harder’. There’s no question about it. You have to...do the work, and you have to be seen to be doing the work”.

Cecilia’s comment is very similar to what (White 1989) has shown the perception to be among South African academic women, i.e., that *“the rules are tougher for women”* (107). Elsewhere (e.g., Blazquez 1996) research shows that, to be taken seriously as a potential scientist, women have to demonstrate a greater knowledge and research ability than their male counterparts. Thus, whereas men are considered competent scientists until proven otherwise, their female counterparts have to demonstrate their competency fully before it is generally accepted. For Delia, avoidance of an unsupportive or *“hostile”* environment is her preferred response:

“I do prefer working in groups; I do prefer a more supportive environment. You know, if something’s hostile, rather than me saying, ‘Well, let me change it’, it’s like, ‘Well, let me go somewhere else’”.

Although there is evidence that most of the women adopt a kind of *“challenge-avoidance behaviour”*, there are a few exceptions. For example, Sarah reports harnessing negative emotions that result from institutional barriers, such as anger irritation, as a motivational drive. Casting

doubt on women's suitability, commitment and ability – or the “handicap rule” - may also provide the impetus to publish, as Thandi explains:

“There was something like, ‘Are you going to make it?’ It was made very clear to me that, ‘you may not actually make it; we are not taking a chance; you are not really accepted fully’... When you put it like that, you actually make me work, because it was a challenge to me”.

Another woman, Elmarie, responded in a way that is very similar to Ted's strategy described above, i.e. to work independently from an unsupportive institution by seeking outside financial support. Elmarie - who was told that if she did not do her research at a different department, the university would not support it – felt compelled by this to “*jump out very early and get outside funds*”. *And that actually caused me to work very independently, especially at the beginning: completely alone*”, she recalls. In general, however, an analysis of gender differences in responses to constraints in the workplace shows that socialisation processes lead many women to counteract those constraints by working harder and seeking out more supportive work environments. Therefore they (and many women students) are perceived to be less assertive, less apt to pursue their goals aggressively, and less combative and self-promoting in the pursuit of career success, when compared to men scientists.

3.5.5 Collegial interaction and collaboration

3.5.5.1 Getting to “critical mass”: collaborating and interacting with peers

Although the women tend to report instances of intellectual and social isolation in the workplace more readily than the men do, this does not seem to make it harder for women to find admission to a network of collaborators, as Cole (1981) and Sonnert and Holton (1996) have proposed. According to the CV data (see Appendix D, p. 492), the women are on average much more likely than the men to publish in collaboration with others: whereas the average man publishes more than a third (40%) of his journal articles alone, less than a fifth of the average women's journal article publications are solo-authored. While four men have published more than half of their journal articles alone, only one woman in the study did so. The women also tend to publish in slightly larger groups of three to four collaborators than the men, who on average publish in teams consisting of two to three collaborators. The evidence is therefore in line with the findings from previous research that women's lower publication productivity cannot be explained on the basis of their lack of access to collaboration.

Despite the fact that cross-disciplinary differences in publication patterns may confound the findings, it is important to analyse the interview data on collaboration and interaction with colleagues (see section 2.3.3.3 in Chapter 2). These data show that the men tend to refer more explicitly to making contact, interacting and collaborating with colleagues in their narratives than the women do. Martin declares that his research team has “*collaborations now with people everywhere*”, while Jacques even states that “*there’s no one at this university who publishes as much with other people, and who collaborates with as many overseas people*” as he does.

When describing the advantages of collegial interaction and/or collaboration, a number of the men tend to focus first and foremost on how it facilitates new research ideas. According to Bob, “*bumping into someone*” at a conference or talk, particularly someone who is working “*on something totally different*”, may lead to “*a key idea*” that makes “*a big difference*”. Consequently, Bob strongly suggests maximising exposure to potential sites of the collegial interaction, such as conferences and visits to other institutions:

“One must talk to people and write and communicate, because every now and again a key idea comes along out of that - which wouldn’t have come otherwise - and makes a huge difference”.

Martin agrees that “*getting strong collaborative links...brings a huge amount of interaction and new ideas*”, and ultimately new publications as well. For Sean, the advantage is that each collaborator brings his or her own strengths to a research project, which makes it more interesting. The productivity-enhancing effect of collaboration seems to be particularly useful for men who experience constraints on the time they have available to publish. For example, when Jacob was a dean he “*did not get the chance and have the time*” to write and translate a book on his own, and he therefore relied on the help of two colleagues who undertook the English translation, as well as helping him with the publication in general. Sean concurs that,

“Ultimately there is probably only so many things you can do in a day...So the collaborations just increase the amount of stuff you can get to”.

Sean considers having research collaborators as so “*hugely important*” that, from a very early stage onwards he strongly encourages research collaboration among his students, with the aim to increase their productivity. “*They can do more if they work together*”, he explains. An awareness of the importance of research collaboration is not only found among the male respondents. In fact, Delia’s approach is very similar to that of Sean’s, in that her postgraduate students are “*put into groups*”, as this, she has found,

“...helps their performance...they seem to progress much more quickly, and feel much more comfortable, and make their contribution much more quickly”.

The women also tend to connect collegial collaboration positively to their research and publication productivity. Elmarie’s awareness of the fact that *“you can publish a lot more if you [publish] with co-authors”* leads her to *“teach people not to be selfish”*, but to collaborate. For Beatrice:

“If you’re working in a research group, and you can get to critical mass, it’s amazing what you can do”.

Also, the division and specialisation of labour that collaboration is usually associated with may increase not only the quantity, but the quality of a publication, because – according to Thandi - one has *“many people who can contribute different ideas”*.

Although a number of women also refer to the advantages of collaborations in terms of the generation of ideas, they tend to focus much more on the opportunity to counsel with another academic in the same field that collegial interaction provides, than the men do. *“I do prefer working in groups; I do prefer a more supportive environment”*, is Delia’s adamant response. Thandi’s describes her colleagues overseas as *“really wonderful”*, and it is a source of comfort to her - as well as a facilitator of her publication productivity- that she knows she has *“friends over[seas]”* whom she can ask for advice, e.g.: *“This is not working, now what can I do?”*, particularly since the advent of e-mail – *“thank goodness for it”*, she exclaims.

For Adèle it is beneficial that, in the faculty where she works, *“if you should run into trouble, then there are usually numerous people whom you can consult”*. Such an academic milieu, she argues, *“has endless advantages”* to *“working in an isolated institute, with very little outside contact”*. Even when research collaboration is uncommon, such as in Linda’s field, she reports that asking colleagues *“to read what you have written”* and to comment on it is common practice.

The fact that women and not men emphasise the support and advice that they gain from collegial networking is in line with Kyvik and Teigen’s (1996) findings that women seem to be more dependent upon collaboration with colleagues than men are. This finding is also in line with the observation made in section 3.3.2.1 above, that women emphasise support and assistance from mentors more than men do. There seems to be some support, therefore, for the arguments of Fox (1983) and Reskin (1978b) that collegial interaction may be especially important for the publication productivity of women faculty who experience additional family

responsibilities and heavy administrative loads, as it mediates role overload (see section 2.3.3.1 in Chapter 2 for more detail on the reasoning behind such a hypothesis). Collegial support may also be more important for women who, as Maürtin-Cairncross (2003:176) points out, experience research and publication as solitary activities, conducted in a hostile environment that is far removed from their “natural state of being”. As Delia states, *“there are more natural modes of working that would probably happen as more women would get into research”*.

The men differ further from the women in that their narratives reflect a higher level of integration with their peers, particularly editors, than the women do. For example, one male respondent, Jacob, describes the particular advantages of informal access to the gatekeepers in one’s field in terms of the timely publication of one’s papers as follows:

“You will sometimes also ring the editor of a journal and tell him, ‘I have this thing that I want to publish. How are things there on your side?’ Because with us, I suppose, the average waiting-time is approximately a year. And sometimes you have something that you would like to publish quickly, because it involves a fairly topical issue. Then you go to the editors and you say, ‘Let’s see who can publish it the fastest’”.

In addition, more than once during his interview Sean refers to “favours” he has done for other male colleagues, in the form of, for example, research reports or papers in local journals as *“a favour to the editors of a special edition”*. References to such informal arrangements with editors do not feature among women’s narratives. This may indicate that, as the exclusion hypothesis suggests, women are not as integrated in the male-dominated informal academic networks as the men are. Only Delia mentions that the research team she forms part of ends up:

“...publishing in the same few journals, because we know there we’d get a good response to our work...Because the editor now knows us, and basically we get acceptance from him”.

Collaboration is generally perceived as positive by both genders, although some negative sentiments were expressed by a small number of women and men. In particular, they report that collaboration may actually decrease efficiency and therefore productivity. Thandi’s experience has been that she *“can actually produce a lot more very quickly”* when she is working on her own (with her students), as collaborations *“need nursing (not to offend anybody)”*. Linda questions the effectiveness of teamwork in the humanities, as in this domain *“it may cause the research to become slower, or more clumsy”*. Bob, although operating in a natural science domain, expresses a similar sentiment, as he finds that he is increasingly publishing on his own, as solo-authorship is much easier and takes less time than joint authorship. He explains that this

is because two or three co-authors who have expertise in overlapping fields tend to disagree on issues, while *“if you’re doing it on your own, then you’ve got only yourself to deal with”*.

3.5.5.2 Supervisor-student collaboration

One of the most important sources of joint publications is publishing with one’s postgraduate students. On their CVs, the men list an average of 25 masters and 26 doctoral students who have been or still are under their full or partial supervision. Although the women have supervised a smaller number - only 19 master’s students and 21 doctoral students (see Appendix D, p. 493) – the difference is probably not large enough to produce a significant gender gap in terms of frequency of joint authorship with a student. Indeed, in the interviews female and male respondents were equally likely to highlight the fact that a large proportion of their joint publications were the result of co-authoring articles with students. However, it seems to be the women who are especially cognizant of the positive effect that collaboration with their students has had on their publication productivity. For example, Thandi – a natural scientist - ascribes her relatively high percentage of solo-authored publications (just under thirteen percent of all her journal article publications) partly to a lack of students with whom to publish at the initial stages of her career: *“I was on my own before I had students...I worked on my own, published on my own, without students”*, she explains. It is also mainly the women who allude to the important role postgraduate students play in working on their supervisors’ projects (see below).

In terms of advantages of joint authorship that accrue to the students, the women are again the ones that emphasise the mentoring function - in particular with regard to scientific publication - to a greater extent than the men do. According to Elmarie, the reason why postgraduate students are co-authors is to teach them to publish –not only to *“get into the culture”* of publishing, but to *“discover that it’s not at all that difficult to publish”*. Thandi remembers that she trained by publishing during her postgraduate training; therefore she is *“doing exactly the same to my students”*, in order that they also be assessed or *“examined”* in this way. Beatrice also feels very strongly about the fact that her *“postgrad students must publish”*. According to her, learning how to publish is part and parcel of the tertiary education of postgraduate students, and teaching them that is their supervisor’s *“job”*: *“Part of running a research programme that mentors postgrad students means that they need to learn how to publish”*, she argues. Only one male respondent makes a similar point, i.e. that *“part of your function as a supervisor is to teach students how to write – to learn how to write scientifically”*. He therefore demands that students who he reckons *“have produced good results”*, write up those results.

When students and supervisors publish together, the potential for unfair allocation of credit is always a concern. Interestingly, it is mostly the male respondents who express a strong sensitivity for this issue. Although it was not raised or probed in any way by the interviewer, a number of the male respondents volunteered strong views that, in cases of joint authorship with students, the credit should mainly accrue to the students. *“It’s not to accumulate everything for myself”*, states Ted, while Charles describes the existence of an unfair system *“in some other departments”* at the university where he is employed:

“...where students are almost sort of ‘signed up’ with an agreement that whatever they write, the supervisor’s name and the school’s name is automatically put on it. Then you have seventeen authors and the poor student’s name is stuck at the end, and most of the authors contributed absolutely nothing”.

He is adamant that the department with which he is affiliated does not agree with such practices. In order to ensure fairness in this regard, the student is mostly first author of jointly authored publications, even if his or her supervisor’s contribution has been substantial, as Sean describes:

“Irrespective of whether they do it properly or not, and I have to redo it, the students are always the first authors of papers that come out of their thesis (unless there’s been a real shift in the words). Sometimes I have taken the work and said, ‘Well, you’re not going to get very far writing about this’, and then rewritten the whole thing, and they’re still the authors”.

As with peer collaboration, disciplinary differences emerge clearly with regard to the issue of supervisors co-authoring journal article publications with their students. Co-authorship with students is particularly noticeable in the natural, engineering, and medical sciences, while in most social science disciplines it is the exception, not the rule, and in the humanities it does not feature as a practice at all. These disciplinary differences stem from the fact that in the natural, engineering and medical sciences, postgraduate students tend to get integrated into their supervisors’ existing projects - projects that their supervisor has usually been working on for some time and/or has received funding for.

Similarly, and in line with other findings in South Africa (*cf.* DACST 1998b) and elsewhere (*cf.* Kyvik & Teigen 1996; Kyvik 1990, 1989), the interview and CV data show that those working in the experimental, laboratory sciences collaborate in teams most readily, while joint authorship is uncommon among scholars in the social sciences and very rare in the humanities. Joint publications represent on average of approximately 85 percent of the article publications of respondents in the natural, engineering, medical and health sciences. On the other hand, for those

respondents in the social sciences and humanities, the figure is reversed, with an average of 80 percent of their publications made up of solo-authored journal articles.

The data further show that, within a field, the tendency to collaborate with others seems also to be driven by other concerns not related to gender in any obvious way, for example, a need for multidisciplinary research, or institutional funding mechanisms that reward either individualistic or collaborative research behaviour. Thus, although some gender differences have been highlighted with regards to research collaboration with peers and students, the findings should be interpreted with caution, as gender differences with regard to the preference to co-author are difficult to disentangle from disciplinary norms that exist in this regard (also see sections 3.1.4.1 and 3.3.3.2 in Chapter 3).

3.6 Undergraduate teaching responsibilities

A grouping of explanations that form part of the difference model concerns the hypothesis that part of the lower productivity of women scientists in relation to their male counterparts may be due to women faculty's preference for teaching rather than for research (see Chapter 2, section 2.1.2.3). A few respondents themselves hold the view that women publish less than men partly, because they spend more time on teaching, and all of them support the difference model argument that women actively choose the role of teacher because they have been socialised, as Maürtin-Cairncross (2003) argues, to be more person-oriented, nurturing and care-giving. In Delia's mind, for example, women are "*very concerned with students*" and "*find it harder to turn them away*". Similarly, Elmarie provides evidence - in the form of her own experiences as a research director - for women's tendency to accord an extremely high priority to "*be a good lecturer*":

"Very often I will see that the women tell me, [that] the driving force in their life, the thing that is important to them: they want to be a good lecturer...I see it much more among women than among men, that it is terribly important to them to be a good lecturer".

According to the one male, Martin, who expressed an opinion in this regard, women "*seem to choose*" teaching above research, as it "*fits in their lifestyles*". For him, this represents a very salient difference between the genders, and his rhetorical question - "*What kind of men would only teach because they're not good researchers?*" - illustrates the "feminine" and therefore lower status accorded to teaching in relation to research. In order to further investigate if the women are actually more involved in their teaching – voluntarily or not - than their male

counterparts are, the responses men and women provided in relation to their teaching aspects (particularly undergraduate instruction) of their academic careers are compared.

3.6.1 Gender differences in undergraduate teaching load

In terms of teaching load, some of the female respondents report having been at the receiving end of some or other form of unfair allocation of teaching duties. However, gender is not mentioned directly as the basis of the discrimination, and there is no mention of what Perumal (2003:78) has termed the “gross exploitation of women academics’ time in the labour intensive execution of teaching”. In Cecilia’s case, it is being adept at teaching (which may be related to gender) that “*means sometimes that you get exploited*” by having to teach large classes. Sarah makes a similar point: in her experience, “*Anybody who does the job well is likely to be asked to teach a course again and again*”. In Linda’s case, age is reported to have played a role in the allocation of teaching duties. She refers to a “*tendency*” among her and her colleagues – both male and female – when they were younger to “*allow themselves to be intimidated into doing more teaching*”. According to the women, this is not an uncommon occurrence, as both Delia and Thandi refer to the fact that younger members of staff tend to be overloaded in terms of undergraduate teaching.

On the other hand, only one of the male respondents, Leon, feels that his teaching load has always been “*a bit heavier*” than that of his colleagues. Now that he has “*less to do with the first years*”, however, his teaching load is much lighter. Moreover, a number of female respondents mention that they are currently teaching large undergraduate classes, while no men do so. Thandi mentions that she teaches, among others, a first year course – “*a big class; it is a lot of work*”, due to the fact that it is a service course. Beatrice also mentions teaching “*masses...hugely large classes*”. Comments such as “*my undergraduate teaching load is very heavy*” [Thandi], and “*I have always carried a fairly heavy teaching load*” [Linda] are also much more common among the women than the men.

It is therefore not surprising that balancing the teaching and research aspects of an academic job is an issue in the majority of women respondents’ careers. “*Definitely...undergrad lectures and the interaction with undergrads kind of overwhelm you*”, states Beatrice. According to Cecilia, “*large classes, and assignments and exams and everything...really interfere with good research time*”. When asked about her teaching responsibilities, Delia admits that, “*There is all that conflict, because of the time involved – there’s just never enough time for everything one needs doing*”. These women voice what research in South Africa has repeatedly shown, i.e. that

women academics experience a lack of time for research, which they strongly attribute to their teaching commitments (*cf.* Maürtin-Cairncross 2003; Van Staden *et al.* 2001; Thomson 1994; Bethlehem 1991, cited in Budlender 1994).

The data analysis has already shown (see section 3.3.2.2 above) that a number of women account for dips in their career publication output in terms of teaching responsibilities, especially those associated with working full-time as lecturer at the start of their careers, much more readily than the men do. In line with this finding, the women report that striking a happy medium between teaching and research is especially difficult at the initial stages of one's academic career, when more time is required to prepare lectures. *"At the beginning of an academic career, that certainly limits one's potential to publish, because you're busy developing lectures, and working flat-out"*, recalls Cecilia. *"If you have been teaching for twenty years already"*, admits Linda, *"then you know short-cuts; you have a certain experience, and you have certain material"*. However, most women still find it challenging to balance these two aspects of their work. Linda explains that:

"It is something that you struggle with until the day you retire and thereafter: how much time should you spend on what...It takes a while before you eventually get that balance right. You actually never get it right - you're busy with it the whole time".

Sarah does not consider it possible to do both teaching and research *"equally well, unless you're an exceptional person"*. As she does not consider herself to be such a person, she limits herself to *"either do one or the other"*. However, there is some diversity among the women on this issue, with both Adéle and Elmarie reporting that in their case teaching obligations have never impeded or prevented them from doing research³⁷. According to Adéle, she *"could manage everything quite comfortably"*. This makes sense, as she admits that teaching *"has always been only a very small part of [her] activities"*, and that she does *"not have many teaching obligations"*.

In order to keep teaching from interfering too much in one's research, Beatrice mentions that, *"One of the tricks is to manage one's undergraduate teaching load in such a manner that it doesn't overwhelm [you], but that you can get that positive aspect out of it"*. Strategies for managing a heavy teaching load also include making use of postdoctoral researchers, as mentioned in passing by Thandi, or postgraduate students, as Delia admits:

³⁷ These comments should be understood in relation to the high qualification, rank and research status that the respondents in general share, as it seems to be particularly those women academics in South Africa who are the least qualified (those with bachelors degrees), who feel that they are given more teaching responsibilities than men are (CSD 1999).

“I luckily can rely on postgraduates, and I tend to twist their arm, even if it’s not been allocated to me to help with the marking, because I’m supervising them, I tend to twist their arm and tell them: if they need help from me, they can start with the marking...the department doesn’t give me any more postgraduates helping with tutoring... So, I tend to have to call in favours from them”.

Some males do express the view that teaching responsibilities limit one’s opportunity to publish as much as one would like to. Bob concedes that, *“The lecturing, of course, takes time; it takes time away from one’s research”*, and Leon reports that, although he works long hours, *“preparing for classes”* still keeps him from doing his *“creative work”*, or writing.

However, in contrast to the women, most of the male respondents refer to undergraduate teaching loads as a commitment that belongs to the past, and/or report a much stronger postgraduate than undergraduate focus. Martin mentions having had *“a full teaching load”* until the late 1990s, when his *“position changed from having...a formal undergraduate teaching responsibility to postgraduate students”*. This change in position refers to his appointment as director of a research institute, which is *“not a teaching position, because you can’t do everything”*. This is a position that Sean also holds, which probably explains why he has not *“taught first-years for years, for a long time”*. Although he did so at the previous university where he was employed as lecturer, he has not *“done those huge service courses for ages”*.

Similar to Martin and Sean, Ted’s position as a director of a research institute also freed him from the obligations of undergraduate teaching, as postgraduate training is the *“main focus”* of the institute. He therefore also acknowledges that he *“didn’t do very much undergraduate teaching ever”*, and he considers it *“very fortunate”* that he *“went straight into postgraduate teaching”*. A postgraduate focus is not, however, only limited to those men who direct research institutions: Charles, an *ad hominen* professor, also concedes that he does not *“do all that much undergraduate...If you count me on individual lectures, I’m down”*. Rather, he has a *“strong postgraduate teaching load at the moment”*, including three coursework programmes at master’s level (one of his *“major commitments”*) and *“a lot of supervision”*.

Even Leon, who reports teaching responsibilities as currently constraining his publication productivity, recalls a time early on in his career when he was *“in the last throes”* of his doctoral dissertation, when he had to teach 29 classes a week. Although the circumstances that gave rise to this teaching load were rather exceptional³⁸, in that time teaching fourteen or fifteen classes a week was commonplace, and even considered *“a fairly light load”*. However, now he has

³⁸ Leon had to take on the duties of his departmental chair (at that stage they were only a two-person department), who was forced to resign for political reasons.

“relatively few students” compared to what he used to teach, and he is not teaching first years any more – at least, he says, he has *“let that go now”*. With reference to his heavy teaching load in the past, he admits that he *“would not be able to do it again”*. Jacques recalls a similar teaching load early in his career when he was working on his masters, *“I had to teach twenty-four lectures a week, and four practicals per week”*, he recalls, *“And all that I did in four days, because I kept Fridays open to do my MSc”*. However, he prefers not to be involved in any undergraduate teaching, as the quality of students, in his opinion, *“is getting worse at all the universities”*. Consequently, his attention is focused exclusively on supervising a large number of postgraduate students. According to Jacques, his postgraduate supervision load of approximately thirty-five students has also decreased somewhat in the past two years, *“but it’s still quite a lot”*. Although these men are similar to the women in that they emphasise a heavy teaching load at the start of their careers, they do not explicitly link these teaching responsibilities to dips in their career publication output.

Another gender difference relates to the fact that, while by far the majority of the men currently focus almost exclusively on postgraduate training, women such as Linda mention that postgraduate teaching competes for time with undergraduate teaching. Although the approach in their department is to divide the undergraduate teaching load *“as equally as possible [so] that the one does not do more than the other”*,

*“...the problem is just that some of us – myself and two or three others – have a lot of postgraduate work, and to get **that** balanced with the undergraduate, that is a bit of a problem. You work out all the lectures up until honours, so that it is equitable, but then people forget you still have all the...I examine a lot. There are again sort of three [dissertations] lying here now, and it’s a hell of a lot of work”*.

Those men who do teach undergraduate modules are not involved in teaching the large service modules referred to above by Thandi, Beatrice and Cecilia. Rather, the modules the men teach tend to be quite limited in terms of student numbers or scope, and the load may be further lightened by sharing it with other colleagues. Sean, who reports teaching a second-year module, concedes that:

“...even so, I’ve got very little teaching in that any more. It’s split half-half with another staff member...The course is an elective, so it is typically about 22 students that I am involved with...I haven’t done those huge service courses for ages”.

Sean actually dislikes and therefore avoids teaching large classes, because in his experience a large class of 200 students provides very little opportunity for class discussion, as the students *“can’t hear each other”*, and the lecturer ends up *“controlling the class”*. Martin, who as a

director of a research institute is not formally responsible for teaching any courses, does present the odd invited lecture; Leon reports “*at least presenting a small part*” to first-year students and Bob considers himself “*quite lucky*” in that he “*never really had a high teaching load*”. In fact, throughout his career his lecturing load “*generally, by other standards, would have been considered low*”, and it is now “*also considered low*”. These findings suggest a gendered division of labour in academia, which may account in part for the women’s lower publication productivity. However, similar to the findings of a South African research audit (NRF 2001), none of the women report being unfairly discriminated against in terms of teaching responsibilities.

3.6.2 **“My priority is actually research - absolutely”: gendered preference for teaching**

It is quite obvious from the narratives reported thus far that the women tend to be involved in undergraduate teaching, particularly to large classes, to a much greater extent than the men are. This finding supports those of numerous studies elsewhere (see section 2.1.2.3), but the underlying reason for this gender difference is still unclear. Some have argued that women may be less aware than men of their obligation to publish or of the relevance of publications to academic credibility, possibly because of a lack of mentoring in this regard (Maúrtin-Cairncross 2003; Sonnert 1999). However, this is not borne out by the interviews. For example, Linda (who repeatedly emphasizes the lack of mentoring she received) has seen “*time and again*” that “*research is definitely the thing that carries the most weight with promotion and appointment*”, and she feels strongly that opportunities to do research should be provided equally to all academics, by ensuring a fair division between research and teaching.

A small number of women respondents explicitly admit to preferring teaching to research, but only during certain stages in their careers, and not necessarily because of a lesser motivation for or lack of interest in research. Beatrice felt that, after her children were born when her time was “*incredibly stretched*”, the more routine nature of teaching made it far more preferable to research. Unlike research, teaching does not “*happen at strange times*”, nor does it “*necessarily require the midnight hours*”: one “*can actually manage it between 8 to 5*”. Neither does it require travelling. Another woman, Elmarie, never actually minded being the “*skivvy*” at the beginning of her academic career: if a colleague did not want to teach a certain module, she would. Actually, rather than hampering her publication productivity, this “*preference*” for teaching provided her with a strong theoretical groundwork for her research career:

*“I taught **all** the facets of [my field] on **all** undergraduate levels...In the process, I absolutely made my basic [field] totally part of my life. I understood it terribly well, because I had to explain it to the cleverest to the stupidest students in the faculty. And that foundation I laid for myself through teaching, later in my life...on an international level...I always asked myself: ‘What is it that I bring to the table that I’ – if I may use the word – ‘progressed so fast in that field?’ Then maybe it was that I had a foundation of understanding, which many of the other people who are in the field, did not have. So, my teaching...helped my career a lot”.*

Apart from these exceptions, most of the women do not explicitly voice a long-term preference³⁹ for teaching rather than for research, but a number of female respondents do seem to accord an equally high – or even higher – priority to their teaching responsibilities, than to her research-related activities. According to Beatrice, teaching – both in the form of undergraduate teaching and postgraduate mentoring - is her primary academic responsibility:

“The first thing is that, we are in a university, and our primary responsibility then is to mentor young people, so you have to do your teaching responsibilities, which is important in the undergrad”.

Another woman who takes the teaching aspect of her job very seriously, Thandi, prioritising teaching during certain times of the academic year, when she does not focus on her publications at all:

“Right now, I’m teaching. My priority is to get up in the morning and think about all my lectures, all my photocopies. We tend to teach in blocks, then stop. The time I’m teaching, teaching is a priority. All the papers must be set aside”.

The tendency for women to accord higher importance to their teaching responsibilities than the men do implies that they spend a greater proportion of their time and energy on teaching than the men do. This is further illustrated by the fact that some female respondents refer to developing novel approaches to teaching. For instance, Thandi uses NRF funding to involve her third years in laboratory work, in order to get them excited about research, while Delia teaches advanced courses for “*high-level undergraduates*”, which show them “*where the limits of knowledge are*”. These women clearly display a greater devotion to the intellectual and social development of students than their male counterparts do, while other women, such as Cecilia and Elmarie, emphasise their self-efficacy in terms of teaching. In her interview, Cecilia mentioned that she prides herself on being a “*very, very good teacher*”, and in her CV she describes teaching as

³⁹ It needs to be borne in mind that priorities tend to change over time, such as for Sarah who, after a number of years of intense teaching, is now “*edging back towards research*”.

“one of the most rewarding components” of her job. In a similar vein, Elmarie recalls that “*the students liked my classes a lot, and I also received the first year-teaching award*”.

Although none of the women represent teaching as the area of academic work that is more enjoyable than research and publication, they do express a seemingly inherent enjoyment of teaching, while the men are silent in this regard⁴⁰. Elmarie admits that, “*I liked my teaching terribly much*”, while Linda does not mind a heavy teaching load, because she likes teaching. Another woman, Beatrice, perceives the second years she teaches as “*such a sweet bunch*”. She particularly enjoys the fact that,

“...*they're always so incredibly enthusiastic; those people are just so excited. You've got to enjoy them. I mean, yes, they're completely off-the-wall and unrealistic sometimes, but that's actually very nice*”.

Such sentiments expressing the high value attached to interaction associated with teaching are uncommon among the men, and although the men do seem to enjoy teaching, they evidently do not do so at the same level as the women. Martin simply states that he loves teaching, because he loves people. Student feedback seems to play an important role in men's level of enjoyment, which might indicate that among the men a need for outside acceptance is a prerequisite for the teaching experienced to be perceived positively. For example, Leon refers to a period during which he had a heavy teaching load as a “*very good time*” in his life, because the students thought the subject he taught was their “*best subject, their nicest subject*”. Jacob, who is employed at a non-residential university, admits that, the bit of contact he has with students, he “*quite enjoys*”. The times he taught at two other South African universities he enjoyed “*very much*”, and – according to the feedback - so did his students. His enjoyment of teaching is not, however, expressed as strongly as the women do: “*So, I cannot say that I do not enjoy the task of lecturing and teaching*”, is his rather tentative conclusion, and he is quick to add, “*My priority is actually research - absolutely*”.

⁴⁰ Negative perceptions and experiences of undergraduate teaching are relatively rare; they are sometimes implied in the women's narratives. According to Beatrice, first year students might be “*even more horrifying in some respects*”, particularly because of their lack of motivation, than second years. Level of motivation is also important to Cecilia, who acknowledges that she enjoys postgraduate teaching more than undergraduate teaching, because in the case of the former, “*you've got a group of people who you know are motivated and you know are very sort of on the same page. Undergraduate teaching is not always easy*”. Similarly, according to Thandi, if you provide undergraduate students with class notes, “*they just say, 'OK, we are going to photocopy this, come exam time, we'll vomit it into the paper'*”.

3.6.3 “I give them a mother’s touch”: nurturing students and young colleagues

The findings reported thus far seem to indicate that, at least in this small sample, the women perceive teaching to be a more enjoyable and important aspect of their academic role than the men do. Although it is possible that the findings reflect differences among the respondents in terms of career age and/or field that are unrelated to gender, it is interesting to note that it is also with regard to their teaching function that the women exhibit stronger feelings of self-efficacy than the men do. Is this because women have been socialised to be more person-oriented, nurturing and care-giving, as the difference model proposes? In some of the female narratives there is indeed a strong nurturing subtext, which is completely absent in the male narratives. Not only are undergraduate students referred to by Beatrice as “sweet” and as “our future”, but some women’s approaches to their undergraduate teaching are quite obviously influenced by their gender roles as nurturers. According to Delia, being a woman means that:

“If someone has a problem, you feel probably more obliged to help, I think, on average...not: ‘It’s my job to deliver the lecture, and when I’m finished, I walk out’. We try to make the teaching part a lot more friendly for the students. That does adversely influence publications in the end”.

Thandi actually uses the terms “nurture” and “mother’s touch” in her description of her approach to undergraduate teaching:

“The undergraduates: we must nurture them to get them into postgraduate...I even insist on starting first years when they arrive – the very first time. I don’t allow anybody to touch them. I give them a mother’s touch”.

Even with her postgraduate students, Thandi’s nurturing approach is evident. Her own publication productivity is no longer as important to her as the fact that her “students must publish. So I’m pushing for their sake now, because I want them to get good jobs”. Thus, gender socialised tendencies towards the nurturing of undergraduate and postgraduate students may increase the teaching load of women and decrease their publication productivity. Moreover, a nurturing approach may be extended towards junior colleagues as well, which may further increase one’s teaching load, as Delia explains:

“What I often try and do, is try and protect the younger members of staff. And so you taking stuff off them, it ends up on you...I think often because you [as a woman] also try and protect other people”.

The women’s nurturing approach towards their students and/or younger colleagues is also reflected in their concern for the needs of students, in particular with regard to future career employment opportunities. For example, Cecilia feels “sorry for young academics” these days,

because of the “*hidden ceilings*” that she herself has experienced in the previous few years in relation to gender, but especially in relation to race. Consequently, for the past few years she has tended more and more to providing her postgraduate students with “*the strategic know-how how to get out*” of the country. Adèle is “*enormously worried*” about the lack of job opportunities, particularly research posts in academia, for her postgraduate students – master’s, PhDs and even “*honours students who come and ask you, ‘What will I do with this degree?’*” This problem is worsened by the “*enormous movement that is underway to get some of the disadvantaged and the black people to do postgraduate studies*”, which does not take into account the fact that at present there are very few job opportunities for such students. Her greatest concern is “*what is to become of them?*”

It is important to note that no respondents were prompted on the issue of job opportunities for young researchers, and that only one man makes mention of future concerns raised by these women. Although Jacques feels that, in terms of workload and salary “*these days it is easier to be an academic than in the olden days*”, he describes it as a pity that his research unit has “*too little money to pay both the women and the men a decent salary*”. A related concern that he voices is similar to that which Cecilia reports above, in that it relates to the current focus on gender and race equality in academic science. In particular, he feels that research funds are allocated inefficiently according to racial criteria:

“Nowadays in the country it is of course a mess, because it depends if you are white or black, or man or woman – a lot of nonsense...The new black people are now getting thousands of rands more than I get for research, and look how many students I have. But they are pumping money into it. That money is all going down the drain – nothing will come of it. They are wasting money, actually”.

When the male respondents express negativity about the future of academia, the feminisation of their fields due to “*affirmative action*” is an issue that is raised much more frequently than the employment opportunities of their students (see section 3.5.3.2 above).

3.6.4 **“Good teaching is an integral part of good research”: pragmatic reasons for the importance of undergraduate teaching**

Although the narratives illustrate a much greater tendency among the women than among the men to exhibit a socialized focus on the role of nurturer and therefore devoted teacher, some of the women’s narratives do not fit this model, as they actually prefer a lower teaching load. Adèle, one of the very few of female respondents who have a low teaching load, prefers this state of affairs: “*My circumstances at work are actually very nice, because I do not have many*

teaching obligations...so I find that I actually have more time at my disposal than I had before, which allows me to keep up the pace to a certain extent". Indeed, there are some indications that the opposite - a preference for research, rather than for teaching - prevails among the women, as they consciously employ strategies in order to lower their teaching load. For example, Cecilia found that her NRF rating has enabled her to say, *"Hey, I don't want to do too much teaching, because I've got an A-rating and I want to do my research"*. A male, Sean, followed a similar strategy, i.e., by working incredibly hard he earned himself recognition as a top researcher, which allowed him to lower his teaching load:

"I knew that, from the beginning, I would never jump out of the 'one paper, 5000 lectures box', unless I worked – nights, on the week-ends".

The qualitative data also provide a more detailed understanding of various other reasons – reasons that have very little to do with socialised preferences – that might account for women's tendency to take the teaching aspect of their academic work as seriously as they do. Some women emphasise the fact that teaching and research *"work together"* – as Linda puts it - in the sense that they are two equally important, complementary aspects of academic work. According to Cecilia and Linda, for instance, one cannot *"be a good researcher"* unless one is able to teach from one's research. Research is also seen to do *"an incredibly lot for your teaching"*, according to Linda. Thandi agrees. In her case research provides her with the hands-on experience she considers to be a crucial part of the knowledge she conveys to her second-year students:

"I give them notes, and I explain to them why: I say, 'My personal experience is there. You won't find it in books'. So, being involved in research, you can bring personal experience into the lectures, which make them interesting. But, if you just deal with the textbooks, and just do ordinary teaching without doing research, you don't have that personal experience".

Consequently, these women are critical of the view that teaching should be separated from research in the sense that some academics do research in "research posts", while others focus on teaching. According to Linda, this view *"that those people who are good researchers should be allowed to only do research – to do more research – and those who prefer to teach, should teach"* is espoused particularly by the *"big researchers"*. Linda's concern relates to equity issues, i.e. that such an approach tends to marginalise the latter (particularly young lecturers who mainly teach) in terms of promotion. Thandi agrees that the practice of using the most junior people to teach undergraduates:

“...means that senior people are busy pushing themselves, and it means that the junior people will then never get the publications that are needed. It can become selfish, because people are improving themselves”.

Another concern expressed by Thandi as well as by Beatrice, relates to the negative impact this practice may have on the quality of teaching the future generation of postgraduate students receive on undergraduate level:

“...those people are young, they really need experience, they need you to be relaxed when you’re talking to them, and to make them love the subject”.

The women’s decision to emphasise teaching is therefore also rooted in a long-term strategy to increase their postgraduate student body and in turn, their publication productivity⁴¹. According to Beatrice, for example, although there is a tendency to view first- or second-year students as “negative”, it is important to remember, “*they are your PhD and master’s students to be*”:

“...and if you’re not prepared to engage with them, why should they be prepared to engage with you down the line?...I feel very, very definite about the fact that the average academic must lecture undergrads... they are our future. I mean, in ten years’ time they’re going to be PhD students, so, you need to interact with them. You must”.

In a very similar vein, Thandi believes that “*you cannot have a good postgraduate and publishing record, without having a good basis in undergraduate*”, as most of the PhD students in her department “*come from undergraduate*”. According to her, it is a matter of “*principles*” that undergraduate modules must be taught by the most senior staff members in the department she heads. Although this implies a heavier undergraduate teaching load for her and her senior colleagues, she argues that it is justified, as they:

“...have to work hard in the undergraduate, in order to finally have the postgraduate, because the postgraduates are the ones that make us who we are”.

Cecilia also makes the point that teaching and research complement each other: “*good teaching is an integral part of good research*”, in the sense that, by making undergraduate students enthusiastic about her field, she can recruit doctoral students from those undergraduates “*who rise to the top*”.

The men subscribe as strongly as the women to the view that undergraduate teaching fulfils an important function in relation to future postgraduate students and research. Bob explains, “*By lecturing, you can pick up potential postgraduate students*”. In fact, all of the postgraduate

⁴¹ For a closer inspection of the relationship between the number of postgraduate students and a supervisor’s publication productivity, see section 3.5.5.2.

students he has recruited are people he has “*spotted in second year*” class he teaches. At this early stage he already “*singled them out, and got them involved*”. Sean, although a director of a research centre and averse to teaching large undergraduate classes, has not completely distanced himself from teaching undergraduate students, because it provides him with an indication of the nature of postgraduate students he could be expecting to supervise in the future:

“...if you don’t teach them, you don’t know what’s going on; you don’t know what they are thinking; you don’t know what the quality is later on. So, you have to stay and see what the problems are with the undergraduates, and what the success is”.

Another male respondent, Jacques, is adamant that one has to teach well if one wants to “*attract good students*”. Jacques agrees with Cecilia, that arousing the undergraduate students’ enthusiasm is crucial:

“If you treat the undergraduate students nicely, teach them, arouse their enthusiasm – really get it going – then: then all the good students come to work with you. You don’t have to struggle with them: they will come”.

In addition to reproducing the next generation of postgraduate students, undergraduate teaching may have other positive effects on one’s personal research career. Beatrice feels that teaching enthusiastic and excited undergrad students has a “*renewing*” effect, by reminding one of one’s own passion for research. For Leon, his teaching and research are “*inseparable*”, because his teaching stimulates the formulation of new research questions on which he publishes papers: “*questions that originated in the course of my lecturing work – even certain things that students asked me, and that I thought about*”. Undergraduate teaching is therefore considered by both males and females alike as a means to attain research- and publication-related objectives.

There are, however, slight differences between the male and female respondents’ approaches to linking undergraduate teaching and postgraduate supervision. The women tend to focus on interacting or engaging with undergraduate students in order to ensure that some of them would be sufficiently interested, enthusiastic, or trained to continue with their postgraduate studies. While the women thus seem to place the students’ needs first, the men use their role as undergraduate lecturer more strategically to their own advantage as a way in which they, as future supervisors, can become acquainted with, attract or even hand-pick potential postgraduate students. These gender differences tend to echo the finding that the women in the study evince a greater tendency than the men to add a nurturing dimension to their teaching responsibilities, and, as a result, to spend more time and energy on this aspect of their academic role. The men

such as Sean, on the other hand, have “*learnt to be more strategic about what [he] was doing, so that increased the amount of time [he] devoted to research*”.

3.7 Facilitators of career publication productivity

The data have shown how women experience a spurt in their publication productivity mainly after their children have grown up, while trends in men’s lifetime productivity is not related to their children at all. In addition to this gender difference, the sexes also emphasise different facilitating and motivational aspects that have given rise to short and long-term increases of their career productivity.

3.7.1 **“Sometimes these things just happen”**: good funding versus good fortune

Directly or indirectly, access to research funding is perceived as a central facilitator of the majority of respondents’ publication productivity. Recent increases in Charles’s output are ascribed to “*getting some decent research grants for one of the first times in [his] life*”. Not only is the funding adequate, but the fact that his NRF block funding is “*guaranteed*” for a number of years “*has actually been very positive*” compared to the past, when he “*was working from hand to mouth from year to year*”.

When the women mention increases in funding, they refer more specifically to the way in which it has had a positive effect, for example by enhancing research facilities and/or the quality and quantity of postgraduate students one can attract through bursaries. In Beatrice’s case, for example, an increase in her publication productivity is linked to her move to a more resource-rich institutional environment, and the resulting growth – towards what she refers to as “*critical mass*” - of the research institute she is associated with. This implied “*more facilities*”, taking on more postgraduate students, and in general, “*more excitement*”. Elmarie’s publication productivity also increased in tandem with the gradual build up of her research group, and particularly when she sourced outside funding with which to attract “*some of the best students*” through bursaries. Men such as Johannes and Mike also refer to an increase in postgraduate students, particularly PhDs, as positively contributing to their publication output. Funding may increase productivity by enabling a researcher to employ more research assistants, as in Adèle’s case, where “*the more people made the difference*”.

Assistance and the time it frees up for research may come from another source as well: Thandi, for instance, identifies an increase in her number of post-doctoral students as having the greatest positive effect on her career productivity, as they helped her with teaching and by

“bringing...new ideas” into her research. The time that one is able to dedicate to research and publication are also increased by sabbatical leave or employment as a full-time researcher, as in Cecilia and Sarah’s case. One male respondent, Sean, also mentions sabbatical leave as a factor that contributed to a surge in his publication output, but in a more indirect way as an opportunity to learn to work and think *“in a slightly different way”*. In particular, during his sabbatical overseas, he learnt *“to be more strategic about what I was doing, so that increased the amount of time I devoted to research”*.

While no obvious gender differences emerge in relation to the types of facilitators mentioned, the men do differ from the women in their tendency to ascribe increases in their publication productivity to fortuitous circumstances. *“2001 and 2002 were just big years by accident”*, Sean replies, while Charles feels that, in addition to the issue of funding mentioned above, *“[s]ometimes these things just happen. You know, you get on a project and it just gets on a roll with publications”*. Bob’s publications increased appreciably after a particularly fruitful conference, but again there is a strong sense of luck or chance in his narrative: *“It just happened to be that the conference provided a focus to which everybody kind of aimed”*. Another male respondent, Jacob, is adamant that his involvement in a large international research project, a factor greatly contributing to his publication productivity, resulted from a chance encounter:

“I did not always go looking for it. It was just J from [an overseas country] who, while my wife and I were touring around there, made an appointment and asked if I didn’t want to become a member of the group. This stuff all just happened like that”.

For the women, on the other hand, increases in their publication productivity are not perceived as accidental at all, but are ascribed to clearly identifiable changes in their work environments.

3.7.2 **“Yes, they will tear you apart”**: self-perceptions of publication-related skills

According to the difference model, gender socialisation processes may lead women to be less confident about their scientific ability, which may, in turn, disadvantage them in the predominantly masculine occupation of scientific research. Indeed, in a study of American biologists - similar to the respondents interviewed here in the sense of also being an elite group - women considered themselves as being average almost twice as often as the men did, while men reported themselves substantially more often above average. Also, women evaluated their own technical skills lower than men did, and thought others rated their scientific ability lower than men were prone to do (Holton 1999).

The data collected during the present study do not reveal many differences between the sexes in terms of perceptions of their own abilities as scientific researchers, most probably because the respondents are all highly qualified and skilled researchers. One exception relates to the extent to which women and men report self-efficacy in terms of writing and reading skills. Both of these “*are essential for research*”, Sean remarks, but as Graham (1970) points out, writing for publication is not easy. It is therefore of more than just passing interest that self-efficacy in terms of advanced literacy skills is more explicitly mentioned among the males than the females as a facilitator in their publication careers.

Only one female respondent, Sarah, refers in passing to the fact that it “*might have been a bit positive*” that she “*always enjoyed writing*”. In the males’ narratives, however, the ability to write well is frequently reported as highly conducive to a strong publication output. For Charles, the “*most fortunate thing in his life*” is that writing is where his talent lies - rather than in what are stereotypical masculine domains, as he “*can’t fix a car*”, and he is “*completely hopeless with building or something like that*”. Thus, for him “*writing is not a problem*” as it is for some of his colleagues who “*battle and battle and battle to write something, and produce one article a year, and for them it is a major trauma*”. Rather, for Charles “*It flows, the words come easily, and [he] can conceptualise things very well in terms of writing an article*”. Similar to Charles, Sean does not “*have problems with comprehension of stuff I read, and [he does not] have problems in writing - at reasonably thrifty writing*”. Jacob was taught to “*write well*”, particularly in Afrikaans. Consequently, he enjoys “*writing in Afrikaans by far the most*”, because he has “*a very good command*” of the language. Finally, Ted considers the progressive increase in one’s skills, particularly due to the accumulation of one’s “*experience on how to write articles*” as the reason for the steady increase in his publication output during his career.

The men tend to ascribe their skills to training at school or university. For example, Sean ascribes his above-average reading and writing abilities to the fact that he was a voracious reader at school (he “*read and read and read and read*”) - as he was “*taught the value of books*” and reading “*from an early age*” - as well as to “*an outstanding teacher*” during the last few years of high-school. Jacob was taught “*to write well*” by his postgraduate supervisor, whom he describes as “*quite a language purist*” – a man who took “*a proper look at one’s language, and let one rewrite and rewrite*” one’s dissertation.

Although these findings do not warrant the conclusion that the women in general hold weaker self-efficacy beliefs in relation to writing than their male counterparts, it is probable that the women are not all like Charles, who experiences no “*stress and trauma*” when writing papers

for publication. It is also significant that women tend to express their self-efficacy in terms of teaching tasks much more readily than they do in terms of research tasks (see section 3.6.2 above), as this may indicate that women do feel more confident when fulfilling their teaching than their publication-related roles. This is again important, given the often rigorous standards of evaluation that academic scholarship is subjected to, as strong self-efficacy beliefs and perceptions of confidence would be needed to ensure persistence in performance in the face of setbacks such as repeated publication rejections (see section 2.1.2.2 in Chapter 2).

Although one man (Charles) admits that peer-review sometimes implies that “*somebody will have a go at you for one reason or another*”, women such as Delia and Thandi experience the peer-review process much more intensely negative, as it implies the “tearing apart” of either the author or the work. Moreover, the process is alien to the way women work and think, as Delia explains:

“You put your work forward, and then everybody tears it to pieces – not a particularly supportive system saying, ‘You know, well, this fits quite nice; you know, it’s very good, but what about a little bit of help here’. It’s like, almost: ‘What have you done wrong, and let’s tear it to pieces’. It’s not a very natural mode of working...I think women do tend to work quite differently”.

She therefore advises that, in response to a paper being rejected one has to “*almost start taking an attitude: well, that reviewer was an idiot - which is quite hard, and it’s not natural*”. Thandi is also aware of the fact that young women academics in particular are “*afraid to submit papers*” for fear of rejection, with the result that they:

“sit on it...sit on it [and] keep correcting it, because you are afraid they’ll tear you apart. Yes, they will tear you apart”.

Thus, similar to the respondents in other qualitative studies of women academics at South African HBUs, women respondents such as Delia speak of “a conscious choice” that they have to make when the peer-review process expects them to compromise “aspects of their ‘natural’ mode of being” (Maürtin-Cairncross 2003:151). Although transforming themselves “from a naïve academic to an ambitious, competitive individual fully informed of the system” (De la Rey 1999:176) may be problematic, women do understand and cope with the peer-review system as well as men do. In this regard, the sexes are similar, though, as both males and females consider their own self-confidence as paramount to cope with the highly critical peer-review process. Charles does “*not get upset when things get rejected*”. To cope or “*roll with the flow*”, according to him, it is important “*to have some confidence in what you’re doing*”, as well as to

have a sense of humour, while according to Thandi, the fact that she does not “*fear rejection*” is what “*pushes [her] and keeps [her] going*”.

When asked to provide advice to students or young staff members, the most common responses among both genders also centered around dealing with the peer-review process. The women and men tend to focus equally strongly on learning from the comments or feedback of referees and other critics, who “*will tell you where the problems are*”, according to Thandi, who herself has “*learnt from criticism*”. Elmarie is also of the opinion that one learns every time one’s paper is reviewed, for Charles the comments help you to “*learn the ropes*”, and Leon suggests:

“From the start you should give your stuff to as many people as possible to read and ask them to be very critical; and fast become thick-skinned, but not so thick that you can’t...react constructively to the criticism”.

Thus, both sexes are equally aware of the importance of developing self-confidence, or becoming “*thick-skinned*” in order to cope with rejections. Actually, according to some of the female and male respondents, women handle such criticism better than men do. This gender difference already emerged from the perspective of student supervisors, such as Leon, who experiences women students to be less sensitive to criticism than their male counterparts (see section 3.5.3.2 above). Another male respondent, Martin, observed among his colleagues that “*women are much better at criticism...they deal with criticism a lot better than men do*”. However, the women also seem to share this view, and the sexes’ explanations for the observed difference are very similar. According to Thandi, “*men have a bigger problem*” with criticism, because they have larger egos than women. With their “*smaller egos*”, women find it easier to “*wake up very quickly and go on*”. Martin’s explanation for the fact that men “*take criticism very badly*”, while women “*just get on with their job and kind of deal with it, not feel offended*” is very similar to Thandi’s, i.e., “*[m]en are pretty egotistical*”. This gender difference is considered inherent to sexes: “*It’s just the way we are*”, Martin admits.

The genders do differ in that a number of the men suggest a strategy to avoid (or at least lessen the chances of) rejection of papers as a postgraduate student, while none of the women do. This strategy involves initially submitting papers only to journals in which “*there is a reasonable chance to get published*”, in order to “*build confidence in one’s own ability*”, according to Charles. This may imply directing “*initial publications*” locally, rather than “*at the top journals in the field, because those are the ones that are most likely to reject you, and shatter*

your ego". Leon agrees that local journals are probably the best choice for a young academic starting out in his or her publishing career:

"In this way you can then probably first build up a bit of self-confidence, by publishing stuff nationally, and then you can start sending to international journals"

And although Sean expects international journal publications from his students in order to push them *"into the international scene"* and putting their names *"out there"*, he also proposes they choose a "lower-end" or "lower-tier" international journal *"when they are starting out"*.

3.7.3 **"I'm not really a fun sort of person": cutting down on leisure time**

Reaching the levels of productivity that these respondents have implies making sacrifices of a personal nature, as the section on marriage, parenthood and publication productivity has shown. Further data show that for most of the women, work and leisure are more distinct or separate domains in their lives than they are for men. This conclusion is based partly on the finding that the women refer to themselves (mostly in negatives terms) as lacking of interests outside of work more often than men do. Thandi contemplates the possibility that she is a *"workaholic"*; that she does not *"have a life"*, because she certainly does *"work hard"*. In a similar vein, Sarah describes herself as *"not really a fun sort of person"*, as she works *"at nights, and all week-end, every week-end"*.

These narratives again show what Cole and Zuckerman refer to as "personal adaptations" (1991:170) that women with family responsibilities undergo in order to manage their status-set (see also section 3.4.3.2 above). In particular, they reduce their "discretionary time" – i.e., other obligations and activities, such as social and cultural activities – to the bare minimum and concentrate almost entirely on work and family (Cole & Zuckerman 1987) – *"I have my family, and I have my work, and that's it"*, as Beatrice says. Other researchers in the United States, Denmark and Israel have also noted this tendency among women faculty, particularly those with young children, to take time out of leisure activities (Sax *et al.* 2002; Toren 1991), or what Beatrice refers to as *"hobbies"*:

"I used to read people's CVs with immense awe, and they always have in there that title called 'hobbies'. OK, people would have these most amazing hobbies, and I'd think: 'Well, why is it that I don't have any hobbies?'"

Just like Thandi and Sarah, Beatrice characterises herself unfavourably as *"very boring"*. While she hopes that, as she nears retirement age and her children leave home, she *"can actually have*

some hobbies”, Adèle’s worklife dominates her life world to such an extent, that the prospect of retiring raises a “*problem*”: “*what will one do the day I do not work any more?*”, she wonders.

The men also express an awareness of the fact that they have less leisure time than most. When Martin embarks on a description of his leisure activities, he ends up not having much to say: “*my spare time I spend...well, there’s not very much of it*”. Bob even acknowledges that he does not “*really... do much else but write*”. However, the pressure to compromise seems less severe for them: “*time is not such a problem*”, Jacob acknowledges, as it is possible to make time “*for other things as well*”. Even among those men who explicitly refer to working instead of engaging in social and/or cultural activities, the self-criticism and sense of regret that emanates from the female narratives is less palpable in their narratives. Ted does all his writing “*when other people are going to watch movies, and do other things*”, but he prefers being “*by [him]self, doing [his] own thing*” rather than having to deal with people he does not “*really like*”, or who do not “*inspire*” him. Similarly, Martin explains that other people do not manage to do what he does, because they “*take off*”, particularly on weekends, when he does not, as “*nothing comes free*”. Jacob also works “*often on week-ends*”, as well as “*many evenings*”, “*not because it’s a burden*” to him, but because he likes it. In fact, research is perceived as so inherently enjoyable for both Jacques and Bob that they describe their work as their “*hobby*”, while Martin feels that, when he does research, “*it’s like a holiday*”, and when he takes a holiday, he tends to “*talk about work*”. Thus, compared to the female respondents, the male respondents maintain a much more vague distinction between work and leisure – if they maintain such a distinction at all. Only one female respondent, Linda, acknowledges that she works hard because she likes her “*subject very much, and it’s my interest and my hobby*”.

3.7.4 A labour of love versus a love of labour: what motivates high productivity?

A central tenet of the difference model is that women are socialised to eschew ambition, which renders them less committed to their careers, less driven to achieve, and, ultimately, less productive than men. The analysis thus far has provided some evidence that socialisation processes may lead some of the women respondents, as well as many women students, to be less assertive, less apt to pursue their goals aggressively, and less combatative and self-promoting in the pursuit of career success, in comparison to their male counterparts. In this, one of the last sections of the data analysis, the issue is investigated further, by comparing the women and men respondents’ responses concerning their personal level of motivation and factors that motivate them to produce a high publication output.

A number of the women responded by highlighting the importance of having passion for one's subject, or for research in general. According to Linda, this is the prime mover, "*more than anything*" else. For Adèle, research is "*like a detective story: you are always searching for answers, for a cause*". Cecilia loves her work, particularly when she is "*learning new things*" when on sabbatical or when she attends courses. These sentiments are usually associated with a strong personal work ethic that drives their publication careers. In Adèle's "*search for an answer and a cause*", her approach is that "*one does one's research as well you can, and in the best way you can*". In Linda's view, having "*a personal sort of passion for the subject*" implies that one maintains "*a critical view of oneself*", as well as one's personal integrity, while Cecilia simply states "*I've driven myself...It's just...I do that*".

Only one woman refers to institutional expectations in motivational terms. Beatrice explains that the university that employs her, "*pays her salary*", which means she is a "*paid scientist*". In her view "*somebody is not a scientist if they haven't published*". Although women such as Adèle feel that the institutional emphasis on research outputs as a criterion for salary increases, promotion and rating "*drives one to do as much as possible within one's limits*", this "knife at the researcher's throat" represents only part of what drives a scientist to publish prolifically:

"It rests on two pillars: the one is personal – that you feel you like the work and you'd like to do as well as possible – and the other reason is that today the circumstances for the researcher are such that...[one] has to deliver outputs, otherwise, sooner or later [one] perishes".

Moreover, Adèle does not consider institutional pressures – "*[to] feel you have to perform*"- to ever have been a "*driving force*" in her own research career. Actually, Adèle as well as Delia express concerns about the extent to which institutional pressures to publish limit the level of innovation one can attain in one's research. According to these women, it "*causes very boring research to be done*", because it "*renders one afraid to take risks*", increasing the stress associated with developing "*new areas of science*", as Adèle illustrates in the following quote:

"Suppose you state a hypothesis and the hypothesis does not work out, or the hypothesis is a complete failure, or you come across unexpected experimental problems, so that you cannot show anything; suppose you work three, four, five years and you cannot really show anything for it – everything is just a failure – it also reflects terribly badly on your record...one just always keeps it in the back of one's mind: will this thing work, or is it a terrible gamble? And it just stays here in the back of one's mind".

Actually, some of the women feel that institutional recognition for high publication productivity is quite irrelevant to their careers. Thandi has "*come to a point*" in her career where she feels

“*publications maybe are not that important, to be honest...It is no longer **that** important*”. What is important to her is to enable her students to build up their publication records: “*My students must publish. So I’m pushing for their sake now, because I want them to get good jobs*”, she says. For Louise, personal integrity concerning the quality of one’s output, combined with a critical attitude towards institutional evaluation mechanisms, is more important than blindly striving for institutionally defined goals.

“...in the long run you set a standard for yourself, no matter if the university or the NRF or whoever gives you so much money or so much recognition, or whatever, you set yourself a sort of a personal standard...maintaining a certain sort of integrity is actually more important than the numbers...You should actually develop sort of an instrument, according to which you know, ‘Look, here I wrote something really good, and there I wrote something less good; no matter who says what about it’. I think that...personal value system that you develop for yourself is quite a very important one...one should sort of question the institutions, the procedures according to which they assess your value...It is what I also think is important for a scientist: to try to personally cultivate, as it were, sort of a standard for yourself – and I think, a high standard – so that you can also question these institutional...measuring instruments; that you mustn’t think you’re wonderful if you get a rating or an award, or whatever...For me, personally as a researcher: if I’m not satisfied with myself, then they may as well give me flowers and bonnets and cake...you yourself must remain critical - absolutely”.

These findings on the forces that drive the women to perform show how they are critical of the “game of publication maximisation”, particularly if it runs counter to what they perceive to be “good science”, i.e. risk-taking, the breaking of new scientific ground, and producing more comprehensive, high-quality outputs. However, the fact that they prefer to uphold what Holton (1999) refers to as traditional standards of good science, may also imply that they have to spend more time on their research, resulting in them working at a slightly slower pace, and possibly publishing at a slower rate than men. So, although there is a recognition among women like Cecilia that, “*you have to play the game...that’s one of the things you also have to learn very quickly, and that’s being able to play the strategic game*”, Linda acknowledges that women “*do not always make such strategic decisions*”.

When comparing the driving forces behind the men’s high output with those the women highlight, it emerges that having intense passion for the research one is doing is more salient in the male than the female narratives. Jacob considers himself an academic “*in essence*” – it runs in his blood; it is his “*first love*”. Actually, he considers himself “*blessed*” to be able to enjoy work that much. Leon also harbours a “*love for research*”, combined with a deep interest in the topics he writes about. Bob also loves doing research. Martin “*fell in love with research as an*

honours student”, and today he still professes his love of his discipline and for science in general – simply stated, his “*productivity is doing what I like to do*”. For other male respondents, “enjoyment” or at least “interest” is also what keeps them highly motivated. Ted remains “*fundamentally driven*”, because he really enjoys science and the work he does, and for Sean “*it’s fun*”. For both he and Charles, passion for one’s work is so obviously the central reason for doing it, that they found the probes on motivational factors rather rhetorical: Sean “*wouldn’t do it if I wasn’t enjoying it*”, and Charles “*wouldn’t do the topics [he] does research on if [he] didn’t have an interest in them*”.

The need to search for answers or the excitement associated with exploration, expressed only by Adèle, is evident in a quite a number of the male respondents’ narratives. Sean “*always wanted to find the answer*”, therefore his team works until they “*know the answer. Then [they] come up with something else*”. Martin “takes on” research questions, because he is interested in answering them, while Bob is “*excited about ideas and exploration...it’s exciting, and [he] can’t help doing it*”. For some of the male respondents, research is viewed not merely as enjoyable or interesting problem-solving experience, but as a “cause”, or a “calling” into which they have been socialised by mentors. “*We did it for the love of the cause*”, explains Jacob, who finds it gratifying to be able “*to make a contribution*”. Leon was socialised into “*a tradition of Christian science that believed science to be a calling that you fulfill*”. In this regard, the same personal work ethic that emerges from a number of the female respondents’ narratives is reported to drive some of the male respondents’ publication careers. Leon admits that he “*has not yet lost*” the work ethic that he built up during his graduate years: “*It feels to me to be the right thing to do*”, he explains. While Leon focuses on his Calvinist training, Martin ascribes his extreme thoroughness, which other people perceive as “*unbalanced*”, to his German background. For Jacques, like for Adèle, one simply has to “*work to the best of your ability*”, and he believes that “*one should perform*”.

Still, a comparative analysis of the male and female narratives leaves one with the distinct impression that the men ascribe their high level of motivation more frequently and intensely to a passion for scientific research than the women do. Similar to Asmar’s (1999) findings among relatively young PhD graduates in Australian universities, the women in this study also seem to be less “passionate” about research than their male counterparts (262). It is therefore not surprising that, when asked to provide advice to students or young academic staff, a number of the men emphasise the importance of an inherent, deep-seated love of research. For example, Leon would counsel students and young academics to “*Know yourself; know if you love*

research, the academy, and then it's the place for you". Another male respondent, Bob, provides advice of a similar nature when he states that, *"it's really got to come from inside...research is something you got to need to do"*.

While men like Leon and Bob advise their students and young colleagues to love research, *"feel some of the excitement; and just get involved"*, women it seems are more likely to emphasise the pragmatic realities of the "job", i.e., in their advice to students or young staff members. Linda advises young lecturers that they should *"reconcile"* themselves with the fact that they *"won't find the happy medium immediately"* between time spent on teaching and research. Like the men who are quoted above, Cecilia tries to instill in her students *"a love of science, and a love of knowledge"*, but at the same time she acknowledges her tendency to be *"fairly rigorous in encouraging [them] to write up and to present at conferences and to actually try and make something tangible out of their work"*. Rigour is also emphasised in Elmarie's advice:

*"...the greatest advice I can give to anyone, to write a publication, is... 'put your butt down on your chair and **keep** it there'. It's **only** discipline; it's **only** discipline"*.

It may be argued that, in their advice to students and young colleagues one sees a reflection of the women's perception of an academic career as characterised more by time-constraints, hard work and discipline, than by an inherent passion for one's work. As such, it reiterates what the analysis has found thus far, i.e. that effectively balancing the teaching and research aspects of an academic job is more of a concern to the female than male respondents, and that a successful research career is not perceived to be as much the outcome of fortuitous circumstances, as it is the outcome of hard work and discipline that are imperative in a work-environment where "the rules are tougher for women" (White 1989:107). This is not to say, however, that the men do not work hard, long hours. When the respondents were asked how they manage their time in order to maintain a high output, the men tend to mention working outside office hours and during holidays much more often than the women do. Only Elmarie and Sarah voluntarily report working nights and weekends as a time management strategy, while Charles, Sean, Martin, Leon, Jacob and Jacques do so.

The men are even less likely to ascribe the result of this dedication - their publication productivity - to institutional incentives than the women are. Bob, the only man who refers to such incentives, perceives them as less relevant to his career than simply enjoying what he does:

“One would have to say these days, that the fact that there is R95 000 for the institution counts for a lot. But, when I first started publishing at [the university where I worked previously], that wasn’t a factor at all: there was no subsidy for publication...I enjoyed doing it”.

Jacob makes exactly the same point, i.e., that he started publishing long before there was talk of receiving *“any remuneration that you may use for research”*. He did it, *“because [he] liked it”*. Martin illustrates his lack of concern with institutional pressures and incentives to publish by the fact that he does not actually have *“the faintest idea”* how many papers he has published, because he simply does not *“care about this stuff”*. *“I want to answer questions; I don’t count publications”* is his curt response. Thus, as in Adèle, Thandi and Linda’s case, these male respondents also perceive institutional recognition to be irrelevant to their careers.

Actually, being motivated by institutional pressures to publish is considered inimical to being an academic researcher, according to Ted, Jacob and Leon. Ted is of the opinion that *“People who have to be forced to publish, shouldn’t be in the business”*, while Jacob does not consider *“people who say, ‘I had better do my two or three publications a year, otherwise the university will start accosting me’”* as *“truly academics”*. Leon’s advice to students who find it burdensome *“to go sit and work and do research”*, is that they *“can just as well stop early and first do something else”*. Publishing for the sake of constructing *“a long list of publications”* is also frowned upon. Rather, *“you need to have something to say...something that is worth sharing”*, says Leon. The only external pressure to publish that is acknowledged is the requirement to be accountable to a public who funds one’s research. According to Jacques,

“If you want to be a good scientist, then you have to...for the money you get...deliver something. And results that are not published are worthless for the country...If you have taken money in the form of bursaries and so forth, then...your payment is the publications you provide, which again provides something for your country”

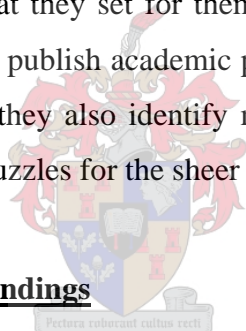
Thus, the men sketch a picture of a *“true academic”* who, rather than being motivated by institutional expectations, pressures and/or incentives to publish, is driven by the need to answer research questions and to be creative in what is his or her *“first love”*. *“Science should be creatively driven. You should be so creative, that you want to work, not forced to do it”*, explains Ted. According to the few women who did provide detail in this regard, *“true academics”* – as we have seen above - are driven by the need to meet personal criteria of excellence, or simply by the fact that they like to do research. Like the women, the men also voice some criticism of institutional incentives that are aimed at increase publication productivity. In some instances, they express the same concern as the women do about government subsidy increasing the

questionable practice of “splitting up” papers, while in other cases the men (e.g. Ted) are more concerned about a resulting increase in fraud than a stifling of creativity (e.g. Adèle and Delia).

In general, the interview section that dealt with the motivation or driving force behind the careers of the interviewees provides one with the distinct perception that the men take more enjoyment from their research work – and more often **only** from that aspect of their academic role - than the women do. This is partly reflected in the male respondents’ frequent use of adjectives - such as fun, enjoyment, pleasure, love, satisfaction, and a sense of humour - that are by and large absent among the women’s narratives. In the interviews the women were much more likely to use adjectives such as challenges, pushing, having a knife at one’s throat, going under, anger and irritation. *“One of these days I will write a little book on how to make it in the female academic world”*, says Cecilia, *“because it is not easy”*.

While women do speak of passion or fun now and again in relation to their research careers, there is a sense that they primarily experience their high publication output as a duty they perform to meet the expectations that they set for themselves, or to address the needs of their students. When men do research and publish academic papers, on the other hand, they are doing it because they simply love it, and they also identify much more strongly with the traditional image of the scientist as solving of puzzles for the sheer enjoyment of finding answers.

4 **Summary of the main findings**



Although quantitative data provide important information about gendered patterns and trends in academic publication productivity, deepening our understanding of these requires an approach that goes beyond statistics. The primary objective of this second part of the dissertation is to develop a more detailed understanding of gender differences in publication productivity and related aspects of the academic career among a highly select group of “elite” researchers in South Africa. The aim is therefore not to generalise from this sample to other South African academics, but rather to deepen our existing understanding of some of the issues that emerged from the literature review, and from the analysis of SA Knowledgebase.

4.1 **Measuring publication productivity**

A comparison of the findings generated by the two measures of publication productivity shows how, in this particular sample, women’s publication productivity in relation to their male counterparts is dependent on how the construct is operationalised. If one takes into account

article length, the time (and therefore opportunity) an author has had to be productive, and if one excludes the years an author is “inactive” in terms of publication, the gender gap is decreased. This suggests that women may be disadvantaged by measures that do not take into account their tendency to: (1) produce longer articles (which is, most probably, a result of their concentration in the social sciences and humanities); (2) postpone their PhD to raise small children, and therefore to have shorter publication career spans; and/or (3) to interrupt their research and publication momentum because of maternity leave and other family-related demands on their time and energy.

Even when these factors are taken into account, however, the gap in publication productivity is still much larger for this small sample of highly productive men and women – most of whom are in their mid-fifties - than it is for South African academic authors as a whole. This finding is consistent with some American research, which has shown the productivity gap between men and women tends to increase with age. It is also in line with the data analysis of SA Knowledgebase (reported in section 3.3.2.1 in Chapter 4), which indicates that as authors age, the gender gap widens, primarily because men in their late forties and early fifties increase their productivity by larger increments than women do, while woman authors’ productivity tends to level off at this stage⁴². “Time-period effects” may also be relevant here, as the chronologically older group of women were professionally socialised in a much less gender-equitable academic work-environment than the rest of the authors in SA Knowledgebase.

4.2 Accounting for gender differences in publication productivity

The CV data show that, on average, the women are considerably younger in terms of career age than the men are. Those women who are professionally the youngest, postponed their academic publication careers in order to accommodate the needs of young children, or of a husband’s career. Combining postgraduate studies, childbearing and full-time lecturing is shown to have been incredibly demanding at the initial stages of the women’s careers, often leading to a delay the attainment of the PhD, and therefore also the start of a productive publication career among women academics in particular – a delay that other research has already shown may cost them dearly in terms of later publication productivity. Its cumulative disadvantage effects can, however, be countered to a certain extent by focusing on the writing and presenting of academic papers at a later stage, particularly when children reach schoolgoing age. Also, marriage may

⁴² It has to be noted, however, that a slight *decrease* in gender differences in publication productivity was found among the oldest group of South African authors who are in their mid-fifties to mid-sixties.

bring its own advantages to bear on a woman's academic career, as a husband may initiate or strengthen her research interest and publication productivity. Although the discontinuity so common at the initial stages of many of the women's academic careers is mostly absent among the male narratives, a number of the men also experience publication discontinuity, but mostly later in their careers because of fluctuations in internal motivation or drive.

With regard to their obligations in terms of motherhood, the women experience these as considerable and associated with difficulty, exhaustion and guilt. However, they tend not to spontaneously mention motherhood as a factor that has slowed down their rate of publication productivity. Possible reasons for this include memory effects, a reluctance to define children as constraints, or acceptance of the situation as corresponding to prevailing norms. When the effects of children on publication careers are described, loss of time is experienced as most salient. Although a general concern is also voiced over fractured or discontinued careers, the women themselves did not interrupt their academic careers for more than a few months at a time to raise their children. Rather, it is their mobility during postgraduate studies and their professional mobility that have been limited by their tendency to shape their careers around their family members' needs. The fact that such mobility is advantageous for any research career and that any limitation in this regard is absent among the male respondents, contributes to our understanding of women's lower career publication productivity in relation to that of their male counterparts.

Notwithstanding, the women – of whom all but one have children - still maintain more than competitive levels of publication productivity. They are clearly strongly attached to their work - therefore being primarily responsible for childcare and household chores does not necessarily lead them to greatly reduce their work effort outside the home, but requires of them a high level of personal discipline and sacrifice. Personal adaptations are required, not only on a practical level (such as narrowing the distance between the workplace, childcare facilities and schools; calling on paid help, friends or family; and generally increasing their efficiency), but on a psychological level they have to consciously, and continuously, manage the potential for role strain by accepting the inevitability of compromise, both in their work and personal lives. An important finding in this regard is that teaching is perceived as more compatible with raising young children, than research is.

In order to successfully combine a research career, marriage and/or motherhood, women need to negotiate a supportive environment in the institutions where they work, as well as in their marriages. Due to their advanced career age, most of the women respondents provide a historical perspective – reaching back almost four decades - on the extent of support offered to mothers in

the South African academic work environment, as well as what the general values were that relate to women's role in society. Their experiences show that women have come a long way in negotiating such support from a time when maternity leave was not even an option, and raising the issue of childcare responsibilities at work was considered taboo, to a more adapting and flexible working environment for mothers in academia. With regard to their marriage partners, most of the women report a supportive husband who allowed them to combine their family and career lives with more ease, particularly if their spouse worked or even co-operated with them in a similar field. However, in many cases equitable domestic arrangements were only reached through conscious negotiation with their partners, and again generational differences - and therefore changes over time - are apparent, as the further back in time the narratives stretch, the more co-parenting is reported to have represented a violation of societal norms.

The study shows that these traditional gender-role expectations at home have worked strongly in favour of the male respondents' research careers. Probably the most salient gender difference among the respondents in this study is that most of the males are married to wives who do not have the additional responsibility of being economically active, while all the females' husbands work full-time. Because traditional gender-role divisions have been maintained in the men's private lives, their domestic circumstances have arguably been much more favourable than the women's, particularly in terms of enhancing publication productivity. In fact, almost all the male respondents perceive parenthood to be irrelevant to their own career experiences, causing them to focus in their responses on the family commitments affecting the women that they work with.

There is a strong tendency for the men to portray these female colleagues, who are able to work full-time and be mothers, as "superwomen". However, the male respondents express much stronger concerns than the women do with regard to the potentially negative effects that mothers' research careers might have on their children, or even on the institution of the traditional, nuclear family. According to most of the men, it is also inevitable that the research careers of women with children will be less productive than the careers of their childless counterparts, and that employers should therefore be realistic, pragmatic, and accommodating in this regard. However, the men - who are themselves employers, managers or supervisors of women staff and students - tend to conceptualise parenthood, and especially its effects on a career, as a "women's issue", for which the women (and not their male colleagues or partners) should take primary responsibility. Instances of concrete support offered by male partners, or references to any form of co-parenting are rare - not only in the male narratives, but also in the men's "superwomen narratives", which suggest that superwomen succeed by their own volition. The men also

mention themselves or other husbands in a supporting role to a much lesser extent than the women mention their male partner's support.

Most of the men differ strongly from the majority of the women in that they have not experienced constraining effects of their own role as a parent on their careers, which allows these men to often prioritise their work over family. However, similar to a number of the women, the men experience feelings of anxiety and guilt when they do so, which leads them to reflect much more on the negative effect their careers might have had on their children, than on the effect their children might have had on their careers. Sentiments of relief that the children were not affected too adversely by the frequent absence of their father are expressed, as well as the perception that negative effects may have been countered by various benefits the children experience as a result of their fathers' career success.

The male respondents' wives are reported to have had a number of positive effects on their husbands' careers. As most of these wives are not economically active, they have provided their husbands with the opportunity to focus almost exclusively on their academic careers. In addition, all of those men whose wives are economically active have collaborated in various degrees on the research front with their wives. The male and female perspectives on these intimate academic partnerships do, however, differ. In particular, the men tend to mention only the academic advantages associated with such co-operation, while most of the women focus on the fact that it practically ensures a supportive, understanding spouse. Also important in one case, is the reportedly gender discriminatory way in which the broader research community tends to consider a women respondent's contribution to publications she co-authors with her husband as less valuable than those of her husband, which negatively affects her career. Thus, while both men and women may gain certain advantages from research collaboration with their spouse, in some cases prejudice may jeopardise such gains for the women in particular.

When the respondents mention institutional factors, a number of constraints to publication productivity, and gender differences in this regard, may be identified. While both genders identify the lack of a research culture before the nineties at most South African universities as a constraint on their publication productivity earlier in their careers, the men seem to have been more mobile during that time, which allowed more overseas travel and exposure to more dynamic research cultures, than the case has been for the women. The women in this study are also much more likely than the men to refer to administrative duties associated with holding senior management positions in academia, while the men mention gate-keeping responsibilities, such as editorships, as time-constraining. These findings may very well reflect the South African

reality that, because only a small number of women hold senior positions in academia, they have to carry a proportionally greater load of management, administration and committee responsibilities, which impacts negatively on their publication productivity.

A working environment that supports and facilitates research and publication productivity is a function not only of the wider institutional context, but also of the more immediate social system consisting of university managers, colleagues and peers. It is also in this system where gender discrimination is usually played out. However, when the women are directly probed on the issue of gender discrimination in the workplace, the majority tends to view it as having been largely irrelevant throughout their careers. The women themselves account for this by referring to their particular discipline or scientific domain as inherently less discriminatory, or at least less male dominated, or by acknowledging that they are simply not inclined to focus on gender discrimination. The latter may be understood as a result of the subtle nature of gender discrimination in the academic work environment, such as the social construction of the male as breadwinner, or the androcentric nature of the publication system, which some of the women indeed report. However, it is the exclusion and isolation of women in male-dominated contexts, i.e., in high-level management and in fields where men dominate numerically, that is more commonly reported.

A counter-intuitive finding concerning gender discrimination issues is that the men tend to exhibit a greater awareness of instances of gender discrimination – and in particular direct gender discrimination - than the females do. The men also have a lot to say about gender issues in relation to their postgraduate students. In this regard, they compare women favourably in terms of certain traits, but not in terms of primarily masculine characteristics, such as single-minded ambition and drive, that to these men matter most for performance at the doctoral level and beyond. The men tend to ascribe these differences to gender-role expectations, although biological differences between women and men are also emphasized.

When the men discuss barriers in their own day-to-day working environments, many of them perceive either their racial, gender and/or language status to be that of a minority, and a number of them report an extremely unsupportive institutional environment – even more so than the women generally do. The genders also differ in their responses to these institutional constraints. While the men voice a much higher level of assertiveness, self-efficacy and self-determination to succeed regardless and to disprove people who do not support them, the women tend to focus more on the importance of emotional support (not necessarily from other women) and people who are willing to invest in them. In general, there are strong indications in many female

narratives of challenge-avoidance behaviour rather than of assertiveness, which may well be the result of their traditional gender-role socialisation.

The CV data show that, regardless of the fact that a number of the women report some form of exclusion and isolation in male-dominated contexts, on average they are more likely than the men to publish in collaboration with others. However, because discipline may be a confounding factor⁴³, men and women's views on collaboration provide a more useful gendered perspective on the issue. The interview data show that men view collaboration as a facilitator of new research ideas, that increases the number of publications one can produce, particularly when time is short. A number of women also refer to the advantages of collaborations in terms of increasing the quantity and quality of their publications, but they tend to focus much more on the opportunities provided by collegial interaction to counsel with colleagues on problems that they might be experiencing. The women also tend to explicitly mention the positive role mentors played in their publication careers, while the men rather focus on their own role as mentors. This may indicate a larger degree of dependence on mentoring and research collaboration among women than is the case among men. It is therefore of concern that the women seem to have less access to peer networks, particularly those involving informal contact with editors and collegial favours, than the men do.

Gender differences in undergraduate teaching loads are important to consider in any comparison of men and women academics' publication productivity. This study shows that, at the time of the interview, teaching large undergraduate classes is still much more common among the women, while their male counterparts tend to refer to undergraduate teaching loads as a commitment that belongs to the past, and/or report a much stronger postgraduate than undergraduate focus. As is the case with combining family responsibilities and work, balancing the teaching and research aspects of an academic job is therefore much more of an issue in the women's academic careers than in the men's. Although these findings suggest the existence of a gendered division of labour, which may account in part for the women's lower publication productivity, none of the women refer to ever being at the receiving end of an unfair allocation of teaching duties that is linked explicitly to their gender.

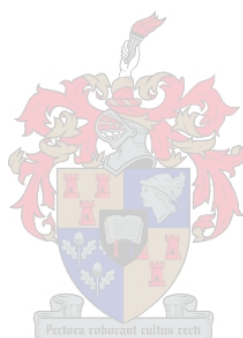
Neither does it seem that the women in this study are less aware than the men are of their obligation to publish, or of the relevance of publications for achieving academic credibility. The

⁴³ The CV data supports this claims, as joint publications represent on average approximately 85 percent of the article publications of respondents in the natural, engineering, medical and health sciences. On the other hand, for those respondents in the social sciences and humanities, the figure is reversed, with an average of 80 percent of their publications made up of solo-authored journal articles.

women in this study do, however, seem to place a higher priority on their teaching responsibilities than the men do. If one links the women's greater devotion to this aspect of their academic role to the finding that they experience teaching as more rewarding and enjoyable, the findings suggest that gender-role socialisation may account for the differential effect of teaching on women and men's research careers. This conclusion is further supported by the strong nurturing approach that some of the women respondents adopt, not only towards their undergraduate students, but in relation to their postgraduate students and younger (mostly female) colleagues as well. However, women's socialised preferences are not the only reason why they take the teaching aspect of their academic work as seriously as they do. Teaching is at times preferred to research for more pragmatic reasons by women who find it more compatible with raising small children than research is. Teaching and research are also experienced by the women as complementary aspects of the academic role, which should not be compartmentalised into separate functions. The men do, however, subscribe as strongly as the women to the view that undergraduate teaching fulfils an important function, by cultivating a strong postgraduate presence and/or by informing future research foci.

With regard to factors that have facilitated these highly productive academics' publication productivity, the men and women are quite similar in their identification of monetary and human resources as imperative. However, the men do differ from the women in their strong tendency to ascribe increases in their publication productivity to fortuitous circumstances or chance encounters. On a more personal level, it stands to reason that these respondents' high levels of productivity are associated with high levels of self-efficacy. The data collected during the present study do not reveal many differences between the sexes in terms of perceptions of their own abilities as scientific researchers, although self-efficacy in terms of advanced literacy skills is more explicitly mentioned among the males, while the females tend to express their self-efficacy much more readily in terms of teaching tasks. This further supports the argument that the women find teaching to be more "natural" - or aligned with or their gender-socialised selves - than, for example, the highly critical peer-review process. It does not mean that these women are less capable in getting their papers published: according to some of the female and male respondents, women handle the criticism and rejection that is part of the "publication game" better than men do. However, women do tend to invest more time and energy into non-research related roles, such as teaching, that gravitate more towards their "natural" mode of being. Fulfilling these roles do not leave much leisure time - a compromise that the women also perceive as less "natural" than the men do.

The male respondents maintain a much more vague distinction between work and leisure – if they maintain such a distinction at all. This finding also links to fact that the men take more enjoyment from their research work – and more often *solely* from that aspect of their academic role - than the women do. The men ascribe their high level of motivation much more frequently to a more intense passion for scientific research than the women do. Although the women are also passionate about their research role, this is not necessarily their “first and only” love. Rather, their energy and enthusiasm extend to other roles as well, both academic and family-related. As the analysis has shown, in terms of academic roles the women are more committed to their teaching role than the men, while commitments outside of the workplace, particularly to husbands and children, preclude the option of approaching research as the only calling in their multifaceted lives.



CHAPTER 6

Conclusions and Recommendations

1 Introduction

This dissertation is aimed at describing the gender difference in publication productivity among South African academic authors, and to develop a deeper understanding of possible reasons for the differences. The motivation or rationale for the study hinges on the fact that scientific communication through publication is one of the most central social processes in science, but has as yet received very little empirical attention in South Africa. This is an issue of concern, if one considers that South Africa's world share of research articles published in journals listed in the indices of the ISI has declined since the late eighties. Partly in response to this trend, South Africa has followed the worldwide trend of ascribing a very high level of importance to such peer-reviewed articles in the reward system of South African academics – the producers of almost all of the country's scientific output. At the same time as our HEIs have become more competitive and outcome-oriented with regard to research, women have been increasing their representation in academia, but not their proportional contribution to our country's output of research articles published in accredited journals. The lack of systematic empirical research on the factors influencing publication productivity of academic staff in South Africa also means that we have very little understanding of the reasons why women in this country produce a lower output in relation to men.

In an attempt to address this deficit, an existing dataset of articles published in DoE accredited journals by South African academic authors was analysed in order to quantify gender differences in publication productivity, both cross-sectionally and longitudinally; to control for factors that may confound this measured difference; and to identify any gender difference in the tendency to co-author peer-reviewed articles. This quantitatively oriented project was complemented by the analysis of primary data collected from the CVs of, and qualitative in-depth interviews with a small group of highly productive and highly rated South African academics.

In this final chapter, the results of the analysis of SA Knowledgebase, and of the CVs and career narratives of the select group of researchers will be summarised and integrated in terms of existing empirical and theoretical work on gender differences in publication productivity. The

distinction between the three sets of explanations that was developed in the literature review – the difference model, family-related factors and the deficit model – is maintained. Within each section, an indication is provided of whether results confirm or deviate from previous findings and theories, and possible reasons for the latter are proposed. Also, gaps and uncertainties that might require further research are identified and, on the basis of these, recommendations are made with regard to further research and future attempts to measure the gender gap in publication productivity.

2 A summary of the results and recommendations for further research

2.1 Publication productivity trends at South African HEIs

The analysis of SA Knowledgebase shows that the tendency among South African academics to publish research results in DoE accredited journals reflects inequalities in the higher education landscape. Those who do publish are predominantly white males who are over the age of forty and employed as professors at HAUs. These inequalities in terms of race, gender, age, rank and employing institution are to a great extent reproduced by the increasing emphasis on accredited journal articles in the reward system of our HEIs. With regard to the issue of race, the findings show that the output of black women is lower than that of black males, and lower than that of white authors, both male and female, which supports the argument of a “double burden” affecting black women in a predominantly white and male working environment. However, the findings also seem to indicate that the disadvantages associated with race have less of a negative effect for black women authors, than for their black male counterparts.

With regard to the issue of gender, this study is the first to provide a measure of national scope, over an extended period of time, of the extent of the gender gap in publication productivity among South African academic authors. It shows that men at HEIs in South Africa publish in aggregate almost twice as many articles in DoE accredited journals than their female counterparts do. The gender gap originates from (1) the fact that a higher proportion of men than women publish much more than the average of about one article equivalent per decade, as well as from (2) women’s over-representation among relatively unproductive authors.

The findings are consistent with the average gender differences in publication productivity that has been found to exist among other samples of academics in South Africa and elsewhere. The gap, measured at 43 percent, is somewhat smaller than previously measured (*cf.* DST 2002;

White 1989), and the present longitudinal analysis shows a 50 percent increase in women authors' contribution to the total scientific publication output of South Africa: from 16 percent in 1990, to 24 percent in 2001. Again, this relatively recent narrowing of the gender gap is not a uniquely South African phenomenon, as it has been observed in a number of other countries as well. As it is unlikely that female newcomers to academia (who are mostly situated at the lower ranks with lower qualifications) have contributed in any significant way to a narrowing of the gender gap over time, it is hypothesised that the trend is probably due to deliberate increases in the provision of research support, funding opportunities and capacity building programmes for women faculty.

The qualitative interviews with women of an advanced career age support a similar, more context-based explanation, as they provide a historical perspective – reaching back almost four decades - on changes in the extent of support offered to mothers in the South African academic work environment and in values that relate to women's role in society. Their experiences show that women have come a long way in negotiating such support from a time when maternity leave was not even an option, and when raising the issue of childcare responsibilities at work was considered taboo, to a more adapting and flexible working environment for mothers in academia. Generational differences, and therefore changes over time, are also apparent with regard to domestic arrangements, as the further back in time the narratives stretch, the more co-parenting is reported to have represented a violation of societal norms. These “time period effects” are also intensified by the tendency for certain disadvantages – discussed in more detail below - to accumulate more over the course of the academic careers of women, than that of men.

Still, the findings are disconcerting if one considers that the women and men who are compared in both studies are all – to a greater or lesser extent - a select group of faculty, in the sense that academics who have at least published part of an article in an accredited journal were excluded. If we assume that women academics in South Africa are disproportionately represented among non-publishers, as is the case in most other countries, it is reasonable to expect that the gender difference in publication productivity measured here is smaller than what would have been the case had all academics – including the non-publishing ones - been taken into account (see Chapter 3, section 2.2.3.2). Considering the increasing extent to which South African academics are rewarded – through promotion, salary and research funding - by exactly the type of publications analysed here, the findings do not bode well for women's future status at our HEIs.

In order to address gender imbalances that exist in terms of publication productivity - and, in turn, in terms of academic rewards - it is important to determine what may account for the gender difference in publication productivity. In this regard, the wide range of overseas and local literature that was reviewed and organised into three broad categories provides us with an indication of what the most probable explanations for the gender difference may be. The results of the analysis of a large database of South African academic authors, integrated with the results of the more focused analysis of the CVs and career narratives of a smaller sample of highly productive academic men and women, allow us to identify those explanations that make the most sense in the South African context, and therefore merit further investigation.

2.2 Psycho-social explanations: the difference model

The multivariate analysis of SA Knowledgebase data shows that, compared to their male counterparts, South African women academics have on average poorer qualifications, are of a younger age, and occupy lower ranks. Based on the relationships between these and other publication-related variables reported in the literature, it is reasonable to assume that these women therefore have, on average, lesser skills, professional experience, self-confidence and commitment to research than their male counterparts do. In previous surveys, South African women academics have indeed highlighted self-esteem and a lack of confidence in their ability to conduct research as important issues in their careers. However, this is not true for all women academics alike: the sample of highly successful, experienced women researchers interviewed for this dissertation do not exhibit a lower level of career motivation or aspirations, or lack of self-confidence in relation to research. Neither are they in any way more naïve than their male counterparts about the high level of recognition research performance brings in relation to other academic roles, although some of the women do refer to having been unaware of the importance of publication at the initial stages of their careers, mainly because of a lack of mentoring and a weak research culture at South African HEIs.

Evidence of gender-socialised differences between the men and women interviewed emerges more indirectly from an analysis of their perceptions of facilitators and constraints that they have experienced throughout their careers. Unlike the men, the women do not ascribe increases in their publication productivity to fortuitous circumstances or chance encounters, but they emphasise hard work and discipline that has allowed them to fulfil both their academic and parenthood roles. The seeming ease with which the men integrate their work and personal lives into a seamless whole stands in stark contrast to the women's mostly negative perceptions of the

compromises and sacrifices that their role as researchers has required them to make in the non-research related realms of their lives. Ultimately, the men take more enjoyment from their research work – and more often solely from that aspect of their academic role - than the women, whose passion extends much further to other academic and family-related roles.

The qualitative data on women and men's *responses* to institutional constraints highlight further, possibly socialised, gender differences in terms of tendencies towards self-promotion and assertiveness. While the men voice a much higher level of assertiveness and self-determination to succeed regardless of the work-related constraints they encounter, there are strong indications in many female narratives of challenge-avoidance behaviour coupled with a higher level of dependency on the support of colleagues and husbands, rather than on self-promotion. These findings are further supported by the women's tendency to focus more on the opportunities provided by collegial interaction to counsel with colleagues, while the men view collaboration first and foremost as an opportunity to increase the scope and quantity of their research output. Women also explicitly mention the positive role mentors played in their publication careers, while the men focus more on their own role as mentors. At least three research projects on women at South African universities have also found that these women's research needs centre strongly around mentorship, networking, and collaboration. This dissertation takes these results further – and replicates those of researchers abroad - by showing how the genders differ in the extent to which they are dependent on collegial support, most probably because it mediates the role overload that so clearly distinguishes women faculty from their male counterparts.

Although the women are no less aware than the men are of the heavier weight that publications carry as a promotion criterion, some of the women's undergraduate teaching load seems to be higher than that cited by most of the male respondents, and the qualitative data show that a number of the women experience attempts to balance this load with their research commitments as much more of a career issue than most of the men do. The men, on the other hand, tend to report a much stronger postgraduate than undergraduate focus, which most probably increases their publication productivity via co-authorship with the postgraduate students they supervise.

According to the difference model and previous research on the issue, women academics tend to give their teaching duties priority over research, because teaching is perceived as more compatible with their gender-socialised preference for nurturing, person-oriented, and caregiving roles, than the one-on-one competitiveness associated with research publication. A gender

comparison of the relatively small number of narratives on the issue of teaching echoes these sentiments to a certain extent. Some of the women evince a high level of devotion to the teaching aspect of their academic role, partly because they experience teaching as rewarding and enjoyable, but not necessarily more so than research. At the same time, most of the women tend to express their self-efficacy much more readily in terms of teaching tasks, while self-efficacy in terms of advanced writing skills is more explicitly mentioned among the men. This further supports the argument that the women may find teaching to be more “natural” - or aligned with their gender-socialised selves – than, for example, the critical peer-review process. However, the women’s perceptions in this regard have not prevented them from being highly productive in terms of research publications. Indeed, according to some of the female and male respondents, women in general handle the criticism and rejection that is part and parcel of the “publication game” better than men do.

Again, these findings need to be interpreted with care, as the women represent a highly select group of “superwomen”. Also, it needs to be taken into account that women academics may carry a heavier burden of teaching because of gender discriminatory allocation of labour-intensive teaching tasks. However, none of the women report ever being at the receiving end of an unfair, gender-based allocation of teaching duties. Considering previous findings that it is particularly those women academics in South Africa who are the least qualified who feel that they are unfairly discriminated against in this manner, it is more than likely that the findings reflect the fact that only highly qualified and productive female researchers were interviewed. Nevertheless, the qualitative interviews do provide new insights into some reasons - not yet identified by previous research - why women may at times accord a higher priority to teaching than research. For example, in a more pragmatic manner than the difference model suggests, women sometimes make this choice to mediate the role overload they experience when their very young children require some reduction in work responsibilities. It is at this stage in their lives that they often opt for a reduction in their research activities (and therefore publication productivity), rather than in their teaching responsibilities, as the routine characterising the latter can be combined more easily with motherhood.

The difference model further proposes that the genders may differ in terms of their research and/or publication styles. Unfortunately, the small, elite sample selected for this study preclude the drawing of any generalised conclusions in this regard, and further research on larger samples is needed to determine if and how South African academic men and women differ with regard to publication preferences. In order to control for the potential confounding effect of discipline

(highly likely in the case of publication preferences), such research needs to focus either on one discipline, or to control statistically for disciplinary variations in a larger sample of academics who hail from a large range of disciplines.

In summary, the qualitative and CV analysis, as well as the quantification of the gender gap in publication productivity has *not* shown gender – in a psycho-social sense - to be a strong, direct predictor of publication productivity. Other factors, some of which are related to gender, need to be taken into account. These may be classified as either family-related, or work-related influences.

2.3 The gender differential effect of family responsibilities

Although the greater part of the available empirical evidence – mostly from research conducted in the United States - clearly indicates that, at least on their own, family responsibilities do not cause gender differences in publication productivity, the topic continues to engender debate. Not all research produces results consistent with these negative findings, especially when it is conducted outside the United States. In addition, the perception of incompatibility between a family and an academic career does vary from country to country, depending on how strongly the emphasis on the essential nature of the mother's care for children is in a particular socio-cultural context.

With regard to the South African context, it has been claimed that family-related responsibilities, particularly childcare, limit South African women researchers' career progress and publication productivity. Some observers elsewhere have argued that such a belief constitutes a “motherhood myth”, and that it is the myth itself, rather than marriage and motherhood, that is the source of incompatibility in women's careers. Moreover, an emphasis on this “myth” may draw attention away from other factors that may prove to be more important barriers to women's careers in academia. The literature review therefore highlights a need to critically scrutinise the differential effect of marriage and parenthood – as produced by the traditional gender division of labour in the domestic sphere - on women and men's publication productivity in the South African context.

The findings of this dissertation clearly show that traditional gender-role expectations at home work strongly in favour of the male respondents' research careers, while it has exactly the opposite effect on the research careers of married women with children. The analysis of both the CV and interview data shows the disruptive effects of marriage and family status on women's

publication productivity, both directly (by limiting the time and energy available for research and publication) and indirectly (by causing career interruptions and by limiting geographic mobility). On the other hand, most of the male respondents perceive parenthood and negotiations concerning co-parenthood to be irrelevant in relation to their own career experiences.

The effects of this gender difference are heightened in an institutional context that has been and still is dominated by men, and is therefore organised on the basis of the assumption that academics have wives that attend to obligations of family and household. This is reflected in the tendency among the men – who are themselves employers, managers or supervisors of women staff and students – to conceptualise parenthood, and especially its effects on a career, as a “women’s issue”, for which the women and not their male colleagues (or male partners, for that matter) should take primary responsibility. The institutional context is also designed according to the masculine life cycle. As such, it disadvantages women who tend to have fractured rather than continuous academic careers and publication records.

It therefore stands to reason that women who are highly successful in terms of research productivity have probably adapted their lives to masculine norms by limiting their family-related responsibilities. However, the findings of both the quantitative and qualitative studies deviate from this expectation. First, SA Knowledgebase data show that no women – not even the proportion that one could reasonably expect are single and without families - establish publication records that parallel those of their most productive male peers. Secondly, the top-publishing women academics that were interviewed as part of the second study are not less likely to be married or to have children than their male counterparts. And even if women choose not to have children, it seems they still tend to fracture their careers in order to adapt to the professional lives of husbands.

Such findings lead one to question if there is any direct link between women’s family responsibilities and their publication productivity. However, it is highly significant that, while a number of the women interviewed interrupted their own careers for the sake of their husbands’ careers, none of the men did so. These results dovetail with the results of the SA Knowledgebase analysis that the average gender difference in publication productivity is greater for women and men in the mid-thirties to mid-forties age group, than among younger age cohorts. Seen against the background of the career narratives, it is highly likely that this age-related trend reflects the tendency among women authors to interrupt their research careers because of childbirth and maternity leave in their thirties, and the fact that women have more caring responsibilities in their early forties than men do. It is primarily these family-related career interruptions that

produce the finding, produced by the CV analysis, that women achieve both doctoral and full professor status – two crucial determinants of publication productivity – at a later age than men do. Consequently, they are professionally younger and therefore less experienced than males their own age.

In addition, women start lagging behind in the development of their careers as well, in part because their mobility during postgraduate studies and their later professional mobility are limited by their tendency to shape their careers around their family members' needs. Consequently, publication-enhancing opportunities to further an academic research career overseas, or simply the chance for research-related travel, is much more common among men than women during this stage of the life cycle. A gender difference in mobility means that the lack of a research culture at most South African universities before the nineties had a more negative effect on the women, who had less opportunities than their male counterparts to be exposed early in their careers to more dynamic research cultures overseas.

As Cole (1979) predicted, the effects of family-related career interruptions accumulate for women, resulting in the SA Knowledgebase findings that a widening of the gender difference in average publication productivity occurs to a certain extent with an increase in age. These findings do not, however, justify the conclusion that the careers of men follow a much more orderly, or at least linear, progression, than women's careers do. The CV data, combined with career narratives, show that men are not immune from disrupted publication careers. However, the genders differ in that the men who experience publication disruptions do so mostly as a result of fluctuations in internal motivation or drive experienced at a later stage in their careers. The men are also not free of the feelings of anxiety and guilt that are often associated with a tendency to accord an extremely high priority to their work: when they do talk about work and children, they focus not so much on the effect that their children had on their careers, but on the mostly negative effect their careers – in hindsight - might have had on their children. These findings show the importance of including men in any study that focuses on gender issues in the academic workplace, as empirical research seems to counter some of the assumptions that underlie research on women only.

Although male academics tend to attribute women's lower publication productivity partly to their involvement in childcare, the findings differ from that of previous research, in that the men do not harbour a negative, stereotypical view of women with children as "unreliable". Although a number of the men consider it inevitable that the research careers of women with children will be less productive than the careers of their childless counterparts, there is also a strong tendency

in some of the male narrative towards a portrayal of female colleagues who are able to combine full-time academic employment with motherhood as “superwomen”. The women academics also did not talk about being hampered in any way by negative stereotyping, as other researchers have argued. Thus, of the four hypothesised ways in which family-related responsibilities may adversely affect women’s publication productivity, it is only negative stereotyping that is not supported by the empirical evidence gathered here.

Unlike most quantitative research on the issue, but in line with most qualitative research, the career narratives indicate that marriage and children have quite a significant disruptive effect on women’s publication productivity. In fact, women’s greater responsibility for childbearing, combined with a gender-socialised tendency to prioritise their husbands, children and students rather than their own ambition, is probably the greatest contributor to the gender gap in publication productivity among the highly select group of South African men and women interviewed as part of this study. Moreover, the effect of family responsibilities may even have been understated in this dissertation, as a contribution-based definition of “scientist” was applied throughout, which by definition excludes women who have left academic employment. It is therefore biased in favour of women who persisted in academic careers despite domestic responsibilities, but against those women who probably face the greatest conflicts between domestic and professional commitments.

This dissertation does *not* show, however that the “productivity puzzle” – the absence of a disruptive effect of family-related factors on women’s publication productivity – is irrelevant in the South African context. Actually, if the career publication productivity of the eight women who were interviewed were compared in purely quantitative terms with the publication productivity of unmarried, childless academic women, it is inevitable that the former (who are among the most “productive” women in the country, according to SA Knowledgebase) would show higher publication productivity than the latter. However, the tendency to *interpret* such results as providing “evidence” of a non-negative or even positive effect of marriage and/or children on publication productivity, as previous researchers elsewhere have done, is flawed. The women’s career narratives and CVs clearly show the disruptive effect of marriage and children, particularly if they are compared with their male counterparts.

It is therefore proposed that the puzzle would be best solved by determining what has allowed these highly productive women to overcome the effects of family-related factors referred to above. The findings show that the women are clearly strongly attached to their work, and therefore being primarily responsible for childcare and household chores does not lead them to

reduce their work effort outside the home, but requires them to apply an exceptionally high level of personal discipline and sacrifice. Personal adaptations are called for - not only on a practical level (such as narrowing the distance between the workplace, childcare facilities and schools, and calling on the ready availability of domestic help in South Africa), but also on a psychological level, as role strain has to be consciously and continuously countered by accepting the inevitability of compromise in their work and personal lives.

In order to successfully combine a research career, marriage and/or motherhood, these women were also quite successful in negotiating a supportive environment in the institutions where they work, as well as in their marriages. With regard to institutional support, the qualitative findings show the important positive effect that family-friendly academic workplace, such as on-campus day care centres, may have on academic mothers' publication productivity, and as such, strongly support future developments in this regard. With regard to marital support, previous qualitative research among South African women academics has shown that co-equal parenting is still extremely rare, with male partners participating only in a limited way. In contrast, most of the women in the present study report a supportive husband who allows them to combine their family and career lives with more ease, particularly if their spouse works - or even co-operates with them - in a similar field. However, in many cases equitable domestic arrangements were only reached through conscious negotiation with male partners.

A focus on what sets these women apart also shows how the effect of marriage and children on women's publication productivity is much more complicated than the productivity puzzle suggests. In a number of the women's lives, the same children who demand time and energy from their mother, stabilise and routinise her life. Similarly, the same marriage that fractures her publication career and limits her geographic mobility provides her with an academic husband who facilitates her publication by encouraging and intellectually stimulating her in her career, and by collaborating with her in her research and publication endeavours.

The male and female perspectives on these intimate academic partnerships do, however, differ. In particular, the men tend to mention only the academic advantages associated with such co-operation, while most women focus on the fact that it practically ensures a supportive, understanding spouse. And while both men and women may gain certain advantages from research collaboration with their spouse, these may be negated for the women by gender prejudices in the broader research community that evaluates the combined output. Very little research has been conducted on the impact of marriage to another academic on the spouse's publication productivity. This dissertation shows how important this factor is in explaining why

some married women with children have a higher publication productivity compared to their unmarried and/or childless counterparts, and it is hoped that the insights gained would provide the foundation for future research on the issue.

On a methodological note, it is important to keep in mind that the extent of evidence of a disruptive effect of family-related factors on women's publication productivity that is found, is to a certain extent a function of at least three methodological considerations. First, in order to counter the effects of *sample selectivity* inherent in this study, it is recommended that future research should include women who left academia, in order to identify more fully the effect that family responsibilities may have on academic careers, specifically in the South African context.

Secondly, in the qualitative interviews conducted for this study, the female respondents tend not to spontaneously mention motherhood as a factor that has slowed down their rate of publication productivity. Only when the issue is probed in more depth do they report obligations of motherhood as considerable and associated with difficulty, exhaustion and guilt. Possible reasons for this include memory effects, a reluctance to define children as constraints, or acceptance of the situation as corresponding to prevailing norms. If a quantitative, survey design is therefore used in the future, questionnaire items that measure the perceived effect of marriage and children on publication productivity need to be developed in such a way that *social desirability and memory effects* are minimised. Thirdly, research should move beyond simply correlating the number of articles published with current marital and parental status. Rather, the aim should be to consider, from a *life course perspective*, the dynamic relation between family life and publication productivity, in order to identify issues that academics face at each stage in their career development.

2.4 Organisational factors: the deficit model

As previous research elsewhere has relatively consistently indicated that certain attributes of the environments in which women scientists work are more powerful influences on their publication productivity than are external, non-work influences such as marital and family obligations, the present research also focused on this "deficit model". This model refers to structural deficits of the institutional environment in which men and women academics work, which lead to women's lesser access to the means of scientific production (material research resources), and/or exclusion from male-dominated networks.

2.4.1 Unequal access to the means of scientific production

Research worldwide indicates that women academics have less access to the facilities, resources, rewards and opportunities required for research and publication - in particular those resources that are associated with high academic rank, a full-time, permanent position, and affiliation with a prestigious institution. It is very likely that such structural deficits are a feature of the higher education system in South Africa. Despite recent advances in terms of gender equity policies at our HEIs, the South African higher education system still bears the legacy of the apartheid system, which for a long time reinforced male dominance and the marginalisation of women. Consequently, women are still over-represented in the two lowest academic ranks of junior lecturer and lecturer, in contract and temporary appointments, and among faculty who have yet to attain a doctoral qualification.

The extent to which some of these and other inequalities mediate between gender and publication productivity was tested empirically by means of an analysis of SA Knowledgebase. The finding that there are important variations in gender differences in productivity for academics of various ages, with various qualification levels, and in various ranks and fields, again provides evidence that it is not gender *per se* that contributes significantly or meaningfully to the explanation of differences in publication productivity. First, women as a whole publish less than men, partly (and ironically) because moves toward gender equity in academic appointments inevitably lead to women's over-representation among the chronologically and professionally younger "newcomers" to academia. Women authors therefore have less professional experience than male authors have – a status differential that is exacerbated by what the career narratives have shown to be a family-related tendency towards fractured careers that renders women professionally younger than men their own age. This results in the women not only being more concentrated, but also retained for a longer period of time, in lower academic ranks where teaching generally takes precedence over research and publications.

The multivariate analysis supports this argument, as it shows how women's lower average publication productivity is partly a function of their under-representation in the higher professorial ranks where one finds the highest levels of publication productivity, primarily because research-facilitating resources are associated with these ranks. In fact, of all the possible mediating factors that were investigated, controlling for rank reduced the observed gender disparity in publication productivity most dramatically. However, previous South African research and the present qualitative analysis problematises the underlying assumption of a universal positive relationship between rank and publication productivity, as the likelihood that a

higher rank provides working conditions that are more conducive to publication productivity seems to be dependent on gender-related factors. The fact that only a small number of women hold such senior positions in academia means that they have to carry a proportionally greater load of management, administration and committee responsibilities, which impacts negatively on their publication productivity.

The argument that women are more often in lower academic ranks because they publish less than men, is also not supported by the data: women academics in South Africa are still at a disadvantage in terms of rank, independent of how much they publish. These findings point towards the possibility of gender discrimination in appointments and promotions, but such inferences cannot be drawn solely on the basis of the SA Knowledgebase analysis. The qualitative interview data provide a more in-depth understanding of the issue of gender discrimination in the workplace. However, as most previous studies based on women's self-reports on the issue have found, the majority of women interviewed reported that they have never had to contend with overt gender discrimination in the academic workplace. This may reflect the subtle nature of gender discrimination in the academic work environment, as reflected in the social construction of the male as breadwinner, or in the perceived androcentric nature of the publication system, which the women do indeed report.

The analysis of SA Knowledgebase further indicates that the greater prevalence at South African HEIs of women authors without graduate training - particularly on a doctoral level - contributes to the observed gender differences in publication productivity, but to a much lesser extent than chronological age or academic rank does. Still, it is highly likely that women's research-related skills and self-confidence, as well as their commitment to research, is negatively affected by their lesser tendency to proceed to a doctoral qualification level. The issue of gender and qualification level also emerged in the qualitative interviews, and the resulting data provide for the first time a glimpse of male academics' perceptions of their female postgraduate students and, by proxy, of their female colleagues. The male respondents compare women postgraduate students favourably in terms of certain traits, but not in terms of primarily masculine characteristics - such as single-minded ambition and drive - that, according to these men, define performance at the postdoctoral level and beyond. The men tend to ascribe these differences to gender-role expectations, although biological differences between women and men are also emphasised.

In summary, part of what we see on the surface as gender differences in publication productivity can be explained by women's lower position in the academic hierarchy, as indicated by a combination of their younger age, lower qualification level and lower rank as a gender group. Controlling for institutional variables did not, however, produce the reduction in the gender difference in publication productivity that was expected on the basis of the literature review. Although the research-related prestige of an institution where an academic is employed has been shown to be one of the strongest correlates of publication productivity in countries such as the United States, institutional affiliation has the smallest effect, of all the variables controlled for, on the average gender difference in publication productivity in South Africa. Although men are slightly more concentrated at institutions that are arguably most able to encourage and facilitate the publication productivity of the academics in their employ, "institutional ghettoisation" of women academics seems to be largely irrelevant to our understanding of the gender gap in publication productivity in this country.

Controlling for scientific domain also produces results that are quite unique to South Africa: disciplinary gender segregation produces only a small part of the observed gender differences in publication productivity across disciplines. Nevertheless, the fact that the gender difference in average publication output is much smaller in the social sciences and humanities fields than in either the other scientific domains seems to support the argument that in the social sciences and humanities there are fewer barriers to the publication productivity of South African academic women than is the case in the other domains. This is possibly because of a negative relationship between the number of women who are working in a field (highest in the social sciences and humanities) and the likelihood of gender discrimination in that field, as the qualitative data indicate that some women associate exclusion and isolation of their gender with fields where men dominate numerically.

2.4.2 **The exclusion hypothesis**

In addition to unequal access to resources, the deficit model also posits the existence of mechanisms of more informal exclusion of women scientists. This so-called "exclusion hypothesis" focuses particularly on the effect of gender differences in access to collegial interaction and collaborative opportunities on the publication productivity of men and women. The hypothesis is based on the assertion that, as a consequence of men's numerical domination in the higher education sector as a whole, academia is a predominantly male milieu with a male culture, in which males accept, support and promote one another. Thus, networks that are

strongly related to publication productivity are per definition “old boy” networks - a closed fraternity from which women (and other minorities) are arguably more isolated or estranged.

Considering that high rank is also a requirement for full participation in the inner circles of academia, it is highly possible that women, who are concentrated in the lower ranks, lack integration into informal networks of collaborators. In this way, women are often shut off from information, intellectual stimulation and opportunities that are conducive to research and publication productivity. In addition, networks offer collegial support, encouragement and informal rewards for achievements that increase the motivation to do research, while exclusion from informal collegial networks may erode motivation and inhibit an individual’s investment in research.

The hypothesis that women lack integration into informal networks at male-dominated academic institutions is the most widely used explanation for gender differences in publication productivity. As co-authorship may be considered a proxy of research collaboration, one way to test this hypothesis in the South African context is to determine, through an analysis of SA Knowledgebase data, if men and women differ in their propensity to co-author articles published in accredited journals. The results support the exclusion hypothesis, as they show that South African women faculty are slightly less likely than their male counterparts to publish in collaboration with other authors. However, the difference between the sexes is quite small, and is equally likely to be a reflection of women’s concentration in the social sciences and humanities, than of exclusion. In addition, the analysis of CV data, although too small in scope to warrant generalisation, produces the opposite result: on average, the eight women studied are more likely than the eight men to publish peer-reviewed articles in collaboration with others.

The issue of the possible exclusion of women from informal and formal networks was also investigated more qualitatively. It was found that, although most of the women denied any overt gender discrimination (in terms of, for example, promotion), exclusion and isolation in male-dominated contexts, i.e., in high-level management and in fields where men dominate numerically, are reported. Moreover, there are some indications of an “old boy network”, involving informal contact with editors and collegial favours, from which women are excluded. Exclusion and isolation is not, however, a female-only experience in academia. Many of the men who were interviewed perceive their racial, gender or language status to be that of a minority, and a number of them report an extremely unsupportive institutional environment – even more so than the women generally do.

Even so, this and other research abroad has shown that access to collegial support and counsel is especially important for the publication productivity of women faculty. It may therefore very well be that an unsupportive work-environment, and particularly a lack of collegial interaction, would have a more negative impact on women's publication productivity than it would have on the men. These insights emphasise the importance of carrying forward and strengthening women faculty development initiatives at our HEIs that focus on providing mentoring and a more supportive collegial environment to these women.

2.4.3 **Recommendations for future research relating to the deficit model**

Particularly when interpreted against the backdrop of qualitative and CV data, the SA Knowledgebase analysis provides us with some answers as to the manner in which a number of factors mediate (or not) between gender and publication productivity in the South African context. However, it also raises new questions that would need to be answered in future research endeavours that aim to also overcome its limitations. Some of the challenges include the following:

- 1) Developing a more nuanced understanding of why the difference between black women and white women's publication productivity is much smaller than the gap one finds between black and white men
- 2) Accounting for the 50 percent increase since 1990 in women's contribution to South Africa's output of accredited journal articles, with a particular focus on the conditions, practices, and policies that may have had a positive effect
- 3) Disentangling time period effects that reflect recent changes toward a more gender equitable environment in academia from the effects that family responsibilities might have on women's publication productivity in certain stages of the life cycle
- 4) Comparing South Africa with other countries in terms of the effect of children on women's academic careers to determine the effect of differential societal expectations concerning motherhood and the effect of country-specific factors, such as the availability of domestic help
- 5) Testing the hypothesis that men with a master's qualification tend to focus more on achieving their doctorate, and are therefore less able to concentrate on further research for publication, than their female counterparts are

- 6) Investigating the usefulness of Cole and Fiorentine's (1991) theory of "normative alternatives", particularly in comparison to the hypothesis concerning the proportional under-representation of women in high academic ranks, to understand why, among South African academics the greatest gender gap in publication productivity is found not among the lower ranks, but among full professors
- 7) Testing the relationship between discipline, gender minority size and publication productivity, by drawing finer distinctions between disciplines than the three broad science domains distinguished in the SA Knowledgebase analysis
- 8) Determining with more accuracy if women and men differ in their propensity to co-author papers, and investigating possible reason(s) for any gender difference, including the role of disciplinary norms and the relative ease with which the genders have access to collaborative opportunities.

Some inconsistencies also emerged from both the SA Knowledgebase and career narrative analysis, and in future these need to be investigated in more detail. For example, why is the gender gap the largest where one would expect inequality in access to resources the least, i.e., among academics with an undergraduate degree, and again among those with a PhD? Similarly, why is the gender disparity in publication productivity far greater among full professors than among academics in any of the other ranks? Finally, the counter-intuitive finding that males tend to exhibit a greater awareness of instances of gender discrimination – and in particular direct gender discrimination - than females do, also warrants further empirical attention.

A survey among faculty that is aimed at providing data on a larger number of gender and publication-related variables would prove useful to address some of the issues highlighted by this dissertation. The ideal would be to collect longitudinal data in order to draw more reliable conclusions on changes over time in authors' publication productivity, and how these relate to, for example, chronological age, socio-historical context and rank. Also, future research on the incidence and effects of discrimination in the academic workplace should investigate issues that extend beyond gender discrimination as perceived by women only, by including male's perceptions of the effects of racial, gender or language discrimination on their own publication productivity as well.

2.5 Bibliometric considerations

In addition to the three sets of explanations dealt with above, the CV analysis has shown that the extent of the gender gap in publication productivity is to some extent an artefact of the way in which publication productivity is measured. The detailed review in Chapter 3 of the possible gender biases in bibliometrics indicates that the most common indicator used to measure the construct of research productivity – the cumulative number of articles published in ISI- or otherwise accredited journals in a certain data collection period - does not capture the possibility of gender diversity in publication format and/or style that has been proven to exist elsewhere. Because of a tendency toward mono-operation bias, a single indicator of publication productivity might not provide a clear picture of real gender disparities in research productivity.

In this dissertation, a modified measure of “page equivalents” was developed on the basis of CV data, in an attempt to control for two reportedly gender-related variables that may confound commonly used measures of publication productivity: article length and opportunity to publish. This “page-equivalent” system takes into account that women may differ from men in that they tend to produce longer, more narrative articles, most probably because of their concentration in the social sciences and humanities, but possibly also because they tend to publish less fragmented, more comprehensive and synthetic work, as research overseas has indicated. Secondly, as the qualitative analysis shows, women often postpone their PhD to raise small children, and therefore to have shorter publication career spans, and/or interrupt their research and publication momentum because of maternity leave and other family-related demands on their time and energy. By incorporating these considerations into the page equivalent measure, the gender gap and therefore the bias against women seems to decrease quite substantially, at least in the small sample of elite scientists studied.

As these findings are based on the analysis of the CVs of a quite small, highly select sample of academics, the results need to be replicated in larger studies. This would allow us to identify more reliably what the methodological considerations are that need to be taken into account in future attempts to measure and explain the gender gap in publication productivity in South Africa. “Quick and dirty” measurements, or those that continue to conceptualise and operationalise research productivity from a masculine perspective, will systematically disadvantage women. Also, gender differences in publication productivity cannot be truly understood without comparing men and women through the course of their academic careers as a whole. An analysis of CV data provides the opportunity for developing such a long-term and more gender-sensitive picture of publication productivity, but it is time-consuming and relatively

inefficient when judged against the small amount of data ultimately generated. However, this must not prevent a continuing search for more sophisticated measures of research and publication productivity that would be less biased against women as a gender group.

3 Concluding comments

This dissertation has generated a number of key insights that are of relevance to the study of gender differences in academic, scholarly, or scientific publication productivity. First, an extensive review of a wide range of literature, published over the extent of half a century and concerned with describing and explaining the near universal gender gap in publication productivity, provides a more up-to-date and globally representative summary of empirical and theoretical work on the issue than has hitherto been available. The categorisation of the work into three main explanations, and an integration of South African studies on the issue with the overseas literature, should provide a valuable basis from which to approach, in a more informed manner, further research in this country on publication productivity differences between women and men.

Secondly, the dissertation addresses the lack of empirical data on the gender gap in publication productivity highlighted in the literature review, by providing for the first time ever on a national scale a comparison of South African academic authors' publication productivity in terms of gender and a number of other publication-related variables. This represents a valuable step in the ongoing process of mapping women's current status in academic science in South Africa. It shows the extent of the gender gap, but also indicates that part of what we see on the surface as gender differences in publication productivity can be explained by women's lower position in the academic hierarchy, as indicated by a combination of their younger age, lower qualification level and lower rank as a gender group.

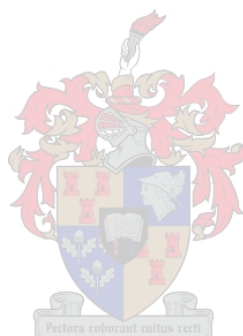
Thirdly, triangulating three different methodologies – a quantitative analysis of a large, bibliometric database with a smaller-scale quantitative analysis of CV data and a qualitative, career publication history approach – allowed an investigation of a wider range of possible explanations for women's lower publication productivity than individual studies on the issue thus far have covered. It also allowed one to move beyond the statistics toward a more in-depth understanding of quantitatively produced patterns. For example, the quantitative data show that the average gender difference in publication productivity is greater for women and men in the mid-thirties to mid-forties age group, than among younger age cohorts. The qualitative data

provide us with a more in-depth understanding of this pattern: women authors exhibit a tendency to interrupt their research careers because of childbirth and maternity leave, and have more caring responsibilities than men do. It is primarily these family-related career interruptions that produce the finding that women achieve both doctoral and full professor status – two crucial determinants of publication productivity – at a later age than men do. Consequently, they are professionally younger and therefore less experienced than males their own age.

Triangulation also meant that the productivity puzzle could be approached in a different, more nuanced way than most previous studies have done. From this the insight emerged that the issue of the effect of family responsibilities on women's publication productivity is not as simple as previous quantitative analyses would lead one to believe. The fact that all of the *highly productive* women interviewed have experienced either marriage or motherhood-related career fracturing shifts the issue away from whether productive academic women's careers are fractured, to how women deal with this reality. In this regard, the personal adaptations made by these women that allow them to successfully combine a research career with marriage and/or motherhood are highlighted in the study. New insights that emerged in this regard include the finding that children may provide publication-enhancing routine and stability, and that husbands may play a highly encouraging and intellectually stimulating role in their wives' research careers, particularly when both spouses are working in the same or a similar academic field.

The fact remains, however, that women and men approach and experience the interface between their academic and private lives differently. Consequently, women make choices that are different from those that men make, and they do so because of their gender. At the same time, the review of methodological considerations relating to the study of gender differences in publication productivity included in this dissertation highlights the fact that, in an institutional system that socially constructs "productivity" from an implicitly masculine perspective, and that considers these choices less worthy of consideration than the accrual of large numbers of accredited journal articles, women's choices to have children and to emphasise teaching and mutual collegial support will disadvantage them time and again in bibliometric evaluation exercises. South African statistics show us that women in academia are younger on average, both in terms of chronological and professional age, than men are, and they rank lower than men in the academic hierarchy. This is particularly true of the young females who are increasingly taking up positions in our HEIs, and who will most probably fail to conform to the ideal-type, male academic.

As long as publication productivity is measured in ways that ignore these gender differences, women will be measured as the “less productive” gender. At the same time, in a research environment that increasingly emphasises global competitiveness in terms of innovation, measures of academics’ research productivity will become more, and not less important in the way academics are rewarded. By extension, an academic reward system that does not take into account the fact that women’s publication careers differ from those of men, will continue to systematically disadvantage women, not men. In a sense such a reward system will be gender discriminatory, and probably more so than other forms of gender discrimination in the academic workplace. Consequently, gender - which should be a functionally irrelevant characteristic in science, according to Merton - will continue to determine who will be the next generation of knowledge producers in our society. In order to prevent the epistemological androcentrism that would necessarily flow from such a scenario, the challenge will be to redefine “productivity” in the academic context and to develop measures of academic output that recognise the gender differences highlighted in this dissertation.



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APPENDIX A

Cover letter

1 English version

Dear Professor _____

I am a doctoral student and lecturer at the Department of Sociology and Social Anthropology at Stellenbosch University currently undertaking research on gender differences in publication productivity among South African academics. My research is intended to shed light on the most important factors that influence the publication productivity of both men and women academics in South Africa. The first more quantitative part of my research, formed part of a recently completed research project - commissioned by the national Department of Science and Technology, and undertaken by the Centre for Research on Science and Technology (CREST) at the University of Stellenbosch - on the status of women in science, engineering and technology in South Africa (see pp. 32-37 of the attached 2004 DST booklet, *Facing the facts: women's participation in science, engineering and technology* for a summary of the most important findings).

The second part of my research consists of a qualitative study that involves conducting personal interviews with prominent and major producers of scientific publications in the country. The main aim of this part of my doctoral work is to provide a better understanding of differences between the sexes in terms of subjective motivations and experiences of facilitators and constraints, particularly in relation to the publication aspect of their academic career.

Based on your high level of output of quality publications, you have been selected as a potential respondent, and your consent to a personal interview is hereby solicited. The interview - that should not last more than **30 minutes** - will be conducted **telephonically**, tape recorded, and transcribed for the purpose of analysis. Because of the qualitative nature of the study, mostly open-ended questions will be posed. These will focus on certain themes that are all directly related to your publication productivity during the course of your career, as informed by an extensive literature review on the topic of gender differences in publication productivity. The data collected during the interviews will only be used for the purposes of my doctoral research, and will be treated with complete confidentiality.

In order to limit the time spent during the interview on the collection of background information, such as academic qualifications, employment history, and publication record, it would be most useful for me to peruse your *curriculum vitae* prior to the interview. If you are willing to grant an interview, I would therefore appreciate it if you could send me the **most recent, full-length** version of your CV (preferably electronically, attached to your responding e-mail, to prevent you from incurring any printing or paper copy costs). Please also indicate in your response the date and time (preferably, but not necessarily **before 7 May 2005**) that would be the most convenient for you to participate in an interview.

Thank you for considering my request

Heidi E Prozesky
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2 Afrikaans version

Beste Professor _____

Ek is 'n doktrale student en lektor aan die Departement Sosiologie en Sosiale Antropologie by die Universiteit van Stellenbosch, wat tans navorsing onderneem oor genderverskille in publikasieproduktiwiteit van Suid-Afrikaanse akademië. My navorsing is daarop gemik om lig te werp op die belangrikste faktore wat die publikasieproduktiwiteit van beide man- en vroue-akademië in Suid-Afrika beïnvloed. Die eerste, meer kwantitatiewe deel van my navorsing het die deel uitgemaak van 'n onlangs voltooide navorsingsprojek - uitgevoer in opdrag van die nasionale Departement van Wetenskap en Tegnologie deur die Sentrum vir Navorsing oor Wetenskap en Tegnologie (SENWET) by die Universiteit van Stellenbosch – oor die status van vroue in wetenskap, ingenieurswese en tegnologie in Suid-Afrika (sien pp. 32-37 van die aangehegde 2004 DST boekie, *Facing the facts: women's participation in science, engineering and technology*, vir 'n opsomming van die belangrikste bevindinge).

Die tweede deel van my navorsing bestaan uit 'n kwalitatiewe ondersoek, wat die voer van persoonlike onderhoude met vooraanstaande en vernome 'vervaardigers' van wetenskaplike publikasies in die land behels. Die hoofdoel van hierdie deel van my doktrale werk, is om 'n beter begrip te verskaf van verskille tussen die geslagte in terme van subjektiewe motivering en ervaringe van fasiliteerders en beperkinge, veral met betrekking tot die publikasie-aspek van hul akademiese loopbaan.

Op grond van u hoë vlak van kwaliteit publikasie-uitsette, is u as potensiële respondent geselekteer, en u instemming tot 'n persoonlike onderhoud word hiermee versoek. Die onderhoud – wat nie langer as **30 minute** behoort te duur nie – sal telefonies gevoer word, op band opgeneem word en, met die oog op ontleding, getranskribeer word. As gevolg van die kwalitatiewe aard van die ondersoek, sal meestal oop vrae aan u gestel word. Dié sal op sekere temas fokus, wat almal direk verband hou met u publikasieproduktiwiteit gedurende u loopbaan, en wat voortvloei uit 'n uitvoerige literatuur-oorsig van genderverskille in publikasieproduktiwiteit. Die data wat gedurende die onderhoude ingesamel sal word, sal slegs vir die doeleindes van my doktrale navorsing aangewend word, en sal volledig vertroulik hanteer word.

Ten einde die tyd wat gedurende die onderhoud aan die insameling van agtergronds-inligting, soos akademiese kwalifikasies, indiensnemingsrekord, en publikaserekord spandeer word, te beperk, sal dit van groot nut wees indien ek voor die onderhoud u *curriculum vitae* kan bestudeer. Indien u gewillig is om 'n onderhoud toe te staan, sal ek dit waardeer indien u die **mees onlangse, vollengte** weergawe van u CV vir my kan stuur (verkieklik elektronies, aangeheg aan u e-pos antwoord, om te voorkom dat u enige druk- of kopieerkostes op die hals loop). Dui asseblief ook in u antwoord aan watter datum en tyd **voor 7 Mei** mees geleë vir u deelname aan 'n onderhoud sal wees.

Baie dankie dat u my versoek oorweeg

Heidi E Prozesky

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APPENDIX B

Interview schedule

1 Trends in career or 'lifetime' publication record

1.1 Variations in output volume over time

What are the reasons for the variations [as indicated by the CV data] in your output volume?

1.2 Publication outlet preference

On which basis do you select a particular publication outlet [as indicated by the CV data]?

How do you proceed in selecting particular journals in which to publish your work [as indicated by the CV data]?

Do you submit to what you consider to be the top journal in your field, or are other considerations at play?

1.3 Degree of internationality of publications

Why do you prefer to publish in overseas as opposed to local journals or vice versa [as indicated by the CV data]?

1.4 Degree of multiple authorship

Why do you prefer to produce jointly authored publications, instead of solo authored papers, or vice versa [as indicated by the CV data]?

1.5 Publications during graduate training

[If the CV data show that publications were produced during graduate training] To what factors do you ascribe the publications you already produced during your graduate training?

What (if any) effect has this early start have on your later publication productivity?

2 General views on scientific publication

What are your thoughts on the adage, 'publish or perish' in the South African academic context?

Are there any positive and/or negative aspects related to maintaining a high level of publication productivity?

3 Views on teaching and research / publication

What do you think the ideal relationship between teaching and research should be? What have your own experiences in this regard been?

To what extent does your research inform your teaching?

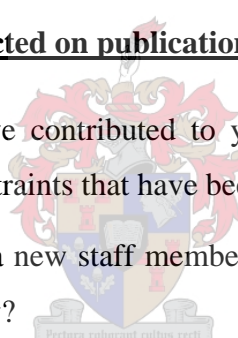
How do you compare your teaching load with that of your other colleagues?

Has your teaching ever had any negative or positive effect on your publication productivity?

4 Factors that have impacted on publication productivity

What are the major facilitators that have contributed to your publication productivity during the course of your career, and what constraints that have been encountered thus far in this regard?

What advice would you provide to a new staff member in terms of attaining and maintaining a high level of publication productivity?



[The interviewer raised the following as possible issues for discussion, if they had not yet been volunteered]:

4.1 Marriage and parenthood

[If not indicated on the CV:] Are you married, or have you ever been married?

What impact has your marriage and/or your spouse in particular had on publication productivity?

[If not indicated on the CV:] Do you have any children? When were they born?

[To all respondents, irrespective if they have had children:] What are your views with regard to combining parenthood with a research career?

[To respondents with children:] What are your personal experiences regarding the effects of parenthood on publication productivity?

[To female respondents with children:] What effect has maternity leave, or the lack thereof, had on your publication productivity?

4.2 Institutional factors

Did the institution where you obtained your PhD [as indicated by the CV data] impact positively in any way on your publication productivity?

Has/have the institution(s) at which you have been employed during your career had any consequences for your publication productivity?

[To respondents who have been employed at a variety of academic institutions:] How do the institutions where you have been employed compare in terms of their impact on your publication productivity?

4.3 Career path

What effects have particular features of your career path [any salient or unusual features, patterns, or trends, as indicated by the CV data] had on your publication productivity?

4.4 Integration into academic community

In there any relationship between your formal research collaboration and your research productivity?

In there any relationship between the informal contact you have with colleagues in your field and your publication productivity?

4.5 Personal time management

Are there any particular time management skills or strategies that you have adopted in order to cope with the multiple academic roles, such as administration, teaching, and/or community service that you need to fulfill in addition to research?

4.6 Gender discrimination

Do you know someone, or have you yourself experienced discrimination in any form during their/your academic career? Please elaborate.

[To female respondents:] What impact has gender discrimination had on your publication productivity?

APPENDIX C

Transcriptions

1 **Female respondents**

1.1 Adèle

1.1.1 **Tendense in beroeps- of 'leef tyd' publikasierekord**

1.1.1.1. *Variasies in uitsetvolume*

Ek het [in die vroeë sewentigerjare] kinders gehad, maar ek het nooit opgehou werk nie, en ek het ook vir baie lank op 5/8^{ste} basis gewerk. En dit het tog 'n...ja, dit het tog 'n impak gehad. Baie beslis. Maar ek het nooit opgehou werk, so daar was nooit 'n totale onderbreking in my werk nie.

Dit is gewoonlik iets wat so drie, vier jaar voor die tyd begin...Toe...vir die eerste keer kon ek genoeg geld kry om ook assistente aan te stel. Kyk, poste in ons wêreld is baie skaars, en daar is baie min professionele navorsers. En die mense wat in die laboratorium werk, is hoofsaaklik van die tegniese mense wat op die diensstaat van die universiteit is. Maar toe [het] ons nou bo en behalwe dit...geld gekry waar ek byvoorbeeld...daar's...twee getroude vrouens wat kinders gehad het, en toe bereid was om halfdag te kom werk vir R1 000 'n maand...En as hulle eers hier is, nou ja, eers halfdag, en dan word hulle voldag, en dan het ons weer ander mense in hulle plek gekry, en so aan. So, ons het meer geld gekry, sodat ons meer mense kon aanstel. En die meer mense het die verskil gemaak.

1.1.1.2 *Voorkeur vir bepaalde tipes publikasie-uitsette*

- Seleksie van bepaalde publikasietipes

Omdat...in die natuurwetenskappe...is [artikels in geakkrediteerde vaktydskrifte] die ding wat vir my die swaarste tel. En ook by jou evaluering – beide by die NRF en by [’n navorsingsraad] – is dit baie belangrik, terwyl hoofstukke in boeke, byvoorbeeld - in dié milieu wat ons beweeg - word nie so hoog aangeslaan nie, omdat dit nie eweknie-geëvalueer word nie...So, dit is makliker – nogsteeds nie baie makliker nie – maar, dit is makliker om 'n hoofstuk in 'n boek in te kry, as wat dit is om 'n artikel te kry in 'n hoë-impak joernaal...Soos ek sê, in ons milieu is dit definitief die ding wat die swaarste weeg, so 'n mens gaan maar daarvoor.

- Seleksie van vaktydskrifte waarin werk gepubliseer word

Daar's ander oorwegings ook...Die inligting wat jy wil oordra wil jy hê moet 'n geskikte teikenpubliek bereik...In die veld wat ek in werk, is daar so 'n paar tydskrifte wat jy - as jy daarin publiseer - dan's jy seker die regte mense gaan dit lees, en hulle gaan kennis neem van wat jy gedoen het. So, 'n mens kies die tipe tydskrif wat die regte leserspubliek sal bereik, en dan kies jy die beste ene, en dan kies jy die ene met die beste impakfaktor. Nou, dit beteken natuurlik nie dat jy jou artikel gepubliseer kan kry in die een wat die hoogste impakfaktor het nie, want dit raak progressief moeiliker. Maar jy mik ten minste vir die beste in die veld, en as jy dan nie gelukkig is nie, dan kies jy maar een waarvan die impakfaktor 'n bietjie laer is.

1.1.1.3 *Internasionale aard van publikasies*

Die moeilikheid met die Suid-Afrikaanse tydskrifte wat in ons gebied publiseer, is dikwels nie geïndekseer nie, met die gevolg dat as jy daarin sou publiseer, dan kom dit nie op die internasionale indekse nie. So, mense neem nie kennis van jou werk nie. Gelukkig, [een Suid-Afrikaanse tydskrif in my veld] is geïndekseer, en ook [’n ander een]. Jy móét, anderste is dit nie die moeite werd nie.

1.1.1.4 *Veelvoudige outeurskap*

Almal wie se name bykom, het op een of ander manier 'n bydrae gemaak. En, ons werk is van só 'n aard, dat jy - as jy die enigste outeur is - dan kan mense in jou groep dikwels ongelukkig voel, want hulle sê, "Ek het dit en dat gedoen, en my naam is nie op die outeurslys nie". So, ek voel dat vir die algemene gees in die laboratorium is dit beter. Maar dit is natuurlik so, dat daar mense in die span is, as hulle nie 'n bydrae maak nie, dan word hulle naam nie bygesit nie. So, almal se name wat bykom, het 'n bydrae gemaak, al is dit relatief min. Maar hulle moet almal 'n bydrae maak vir hulle name om gelys te word.

[Die studente] se name kom almal by. Al daai name wat jy daar sien: hulle was op een of ander tyd studente.

1.1.2 Sienings oor publikasie

1.1.2.1 Algemeen

- Wetenskaplike publikasie

Jou vordering by [’n navorsingsraad], byvoorbeeld, of meer onlangs jou evaluering as navorser, is baie sterk gekoppel aan jou uitsette. En as jou uitsette nie voldoende is nie, dan reflekteer dit...ja, sleg op jou as navorser. En dit, natuurlik, is ook ’n dryfveer, want jy voel jy móét presteer, anderste...ja, anderste, byvoorbeeld, sou jy nie byvoorbeeld maklik gradering gekry het as ’n NRF navorser. En by die [navorsingsraad] ook: as jou uitsette agterbly, dan word jy ook nie oorweeg vir verhogings, en so aan nie. So, ek sou sê dit staan op twee bene: die een is persoonlik – dat ’n mens voel jy hou van die werk, en jy wil graag so goed doen as moontlik – en die ander rede is dat die omstandighede vandag vir die navorser só is, dat hy tog ’n bietjie met die mes op sy keel is; dat hy móét uitsette lewer, anderster gaan hy vroeër of later onder.

As ’n mens net dink aan die volume navorsing wat gedoen word, en die aantal artikels wat jaarliks verskyn; en die aantal joernale...neem nie tot dieselfde mate toe nie: so, daar is al hoe sterker kompetisie. Soos byvoorbeeld [’n oorsese vaktydskrif in my veld]: hulle kan ongeveer 20-25% van alle artikels wat hulle ontvang, kan hulle publiseer. En daarby die feit dat elke artikel gaan nog deur ’n *review*-proses, en daar gaan dit na ten minste twee, drie *reviewers* toe, en hulle moet altwee sê, “Ja, die artikel is goed genoeg”, sodat dit in die joernaal gaan verskyn. Ja, my ervaring is werklik dat dit raak al hoe moeiliker.

Wat hulle ook dikwels vereis, is as nie een van die drie regtig tevrede is nie...jy kry ’n verslag, en as jy kan bevredigend antwoord op hulle kommentare, dan kyk hulle weer na die artikel, en dan – heel dikwels – word hy dan aanvaar.

- ‘Publish or perish’ in die Suid-Afrikaanse akademiese konteks

Ek dink, as ons nog nie daar is nie, is ons baie vinnig besig om daarnatoe te beweeg. [In] Suid-Afrika...as iemand in ’n navorsingsomgewing werk, en sy uitsette is baie weinig...ons is so ’n klein gemeenskap, dat...mense weet van mekaar. En – ag, ek sou nou nie sê kry ’n slegte naam nie – maar iemand word nou nie so hoog aangeskryf nie. En dit kan weer op sy beurt sy...sê nou maar hy sou aansoek doen vir ’n pos of wat ook al: in so ’n klein milieu...kan dit tog teen hom tel.

Ja, *publish or perish*: ek het baie dubbele gevoelens daaroor, want aan die een kant dryf dit vir jou om soveel as moontlik te doen binne jou perke, maar aan die ander kant maak dit ook dat jy bang is om te waag. Want, sê nou maar jy stel ’n hipotese, en dié hipotese werk nie uit nie, of die hipotese is ’n totale mislukking, of jy tel onverwagte eksperimentele probleme op, sodat jy niks kan wys; sê nou maar jy werk drie, vier, vyf jaar en jy kan werklik niks wys nie – alles is net ’n mislukking: dit reflekteer ook vreeslik sleg op jou rekord. So, dit maak dat mense bang is om te waag, en as ’n mens nie waag nie, dan gaan baie van die meer belangrike dinge nooit ontdek word nie. So, ’n ou moet maar baie versigtig wees, jy weet, en jou keuses:...gewoonlik...met honneursstudente is ek redelik konserwatief – hulle moet altyd ’n klein projek doen – en dan kies ek gewoonlik ’n projek wat ek wéét redelik seker is om resultate te gee. Maar later, dan...kan jy bekostig om bietjie meer waaghalsig te raak. Maar ’n mens het dit maar altyd in jou agterkop: gaan dié ding werk, of is dit ’n verskriklike waagstuk? En dit bly maar hier in jou agterkop, en as *publish or perish* nie daar was nie, dan sou ’n mens baie meer waaghalsig gewees het, en miskien baie beter gevaar het.

1.1.2.2 Sienings oor onderrig en publikasie

- Mate waarin navorsing ’n invloed het op onderrig, en/of omgekeerd

O ja! Kyk, die studente is ons slawe. En jy kry uit ’n honneurs en uit ’n M en uit ’n PhD kry jy baie meer as jy kry uit ’n tegniese persoon wat net werk van agt tot vyf. Want hulle is baie gemotiveerd, en hulle wil so gou as moontlik hulle graad klaarmaak, met die gevolg: hulle is bereid om baie harder te werk. En hulle werk...in ons opset moet hulle werk op ons sentrale projekte, sal ek maar sê...In ons geval sentreer alles om [’n bepaalde navorsingsonderwerp]. So, almal wat kom, moet werk op een of ander aspekte van ons sentrale projek op [daardie onderwerp]. En die werk wat hulle moet...vorm deel van ons algemene raamwerk, en dit vorm deel van die projekte wat ek geld voor kry. En die werk wat hulle moet doen, móét van so ’n gehalte wees, dat dit eerstens gepubliseer kan word, en tweedens natuurlik dat hulle hul graad kan kry. So, die studente is die mense wat eintlik die werk doen.

- Vergelyking met ander kollegas se onderriglading

Ek het in die verlede vir die...studente so ’n bietjie klasegegee, maar dit was altyd maar ’n baie klein deel van my aktiwiteite. Maar ons het wel honneurslesings, wat nogal baie kan wees, en baie werk van ’n mens...baie insette van jou vereis, en so aan.

Dat ’n mens soveel onderrigverpligtinge het, dat dit jou navorsing aan bande lê: in my geval was dit regtig nooit so nie. Ek kon alles heel gemaklik hanteer.

Man, my werksomstandighede is eintlik baie lekker, want ek het nie veel klasgee-verpligtinge nie...So, ek vind dat ek eintlik veel meer tyd tot my beskikking het, as wat ek voorheen gehad het, wat vir my maak dat ek redelik kan bybly.

1.1.3 **Motivering vir publikasie**

Ek is maar 'n eenvoudige ou wat nie vreeslik geneig is tot introspeksie nie, want ek het nie veel tyd daarvoor nie. Maar as ek moet sê: ag, ek sou sê, miskien twee redes. Die een rede is, om navorsing te doen is vir my soos 'n speurverhaal, en jy soek altyd na antwoorde, na 'n oorsaak. En in daai soeke na 'n antwoord en 'n oorsaak is my benadering dat 'n mens jou werk doen so goed jy kan, en op die beste manier wat jy kan, en van die beste hulpmiddels gebruik maak. En dan 'n tweede rede – maar ek moet werklik sê, dit was nooit regtig vir my 'n dryfveer nie – is dat 'n mens tog...dat jou vordering by ['n navorsingsraad], byvoorbeeld, of meer onlangs jou evaluering as navorser, is baie sterk gekoppel aan jou uitsette. En as jou uitsette nie voldoende is nie, dan reflekteer dit...ja, sleg op jou as navorser. En dit, natuurlik, is ook 'n dryfveer, want jy voel jy móét presteer, anderste...ja, anderste, byvoorbeeld, sou jy nie byvoorbeeld maklik gradering gekry het as 'n NRF navorser. En by ['n navorsingsraad] ook: as jou uitsette agterbly, dan word jy ook nie oorweeg vir verhogings, en so aan nie. So, ek sou sê dit staan op twee bene: die een is persoonlik – dat 'n mens voel jy hou van die werk, en jy wil graag so goed doen as moontlik – en die ander rede is dat die omstandighede vandag vir die navorser só is, dat hy tog 'n bietjie met die mes op sy keel is; dat hy móét uitsette lewer, anderster gaan hy vroeër of later onder.

Ek hou daarvan, en my probleem is: wat gaan 'n mens doen as ek nie meer die dag werk nie?

1.1.4 **Hoofsfaktore wat op publikasieproduktiwiteit ingewerk het**

1.1.4.1 *Algemene fasiliteerders: advies aan studente, of 'n nuwe personeellid*

Weet jy, ek weet amper nie wat om vir jou te sê nie. Dit is – sonder om vreeslik negatief te klink – iets wat my geweldig bekommer, is die gebrek aan poste, en die gebrek aan beskikbare loopbane. Want jy kry honneursstudente wat kom, en wat vir jou vra, “Wat kan ek gaan doen met hierdie graad?”. Weet jy, en dan het ek werklik, werklik 'n probleem, want die aantal werksgeleenthede vir sulke mense is só weinig, en in die akademie...ek dink die akademie is nog die grootste sonder van dit alles, want in die universiteite is daar nie...behalwe lektorate, en daar moet jy wag vir mense om dood te gaan voordat daar 'n opening kom. So, die [navorsingsrade] en ook die NRF en so aan, probeer nou baie hard om bewegings daar te stel om mense aan te moedig om 'n wetenskaplike loopbaan te volg. Maar dit is myns insiens is dit 'n bietjie laat, maar êrens moet 'n mens tog begin. Maar selfs so, as ek nou dink aan hierdie geweldige beweging wat aan die gang is om van die agtergeblewenes en die swartmense te kry om nagraadse studies te doen en so aan...My groot bekommernis is net altyd: wat gaan van hulle word? Want daar is op hierdie huidige oomblik nog nie vir hulle...daar is baie min werk. Dit is werklik vir my 'n groot rede...en dit ontmoedig mense. Jy weet, ek sal eerder vir iemand gaan aanmoedig om [byvoorbeeld] te gaan medies loop: “gaan loop medies, en behou 'n akademiese belangstelling”, want ten minste het daai mense 'n beroep om op terug te val. Maar...vir die MSc en die PhD is die werksgeleenthede werklik nie optimaal nie.

1.1.4.2 *Algemene hindernisse*

Ag, ek dink dit was grootliks 'n gebrek aan hulp in die laboratorium. Aanvanklik het 'n mens soortvan alles gedoen, en dan kry jy maar hulp by, en fondse. Tegnieuse hulp en fondse: dis die twee...beperkende faktore in ons gebied.

1.1.4.3 *Spesifieke faktore*

- Sienings oor die kombineerbaarheid van die huwelik met 'n navorsingsberoep

[My man] was op 'n stadium...hoof van [die departement waaraan ek verbonde is], en in daai verband het ons een of twee goed saam gedoen. Maar toe het hy weer ander belangstellings en ander weë gevolg, en ja, ons samewerking het toe tot 'n einde gekom.

Ja en nee. In baie opsigte, omdat...hy't nou nooit vréelik in dieselfde rigting as ek gewerk nie, maar hy't die nodige agtergrond gehad. So, ek kan byvoorbeeld iets met hom gaan bespreek, en dan kan hy altyd 'n sinvolle bydrae maak. Aan die ander kant was hy maar van die outydse soort, en hy't nie baie daarvan gehou dat ek gewerk het toe die kinders klein was nie - wat vir my baie angstig gemaak het, en gemaak het dat 'n mens nie regtig jou volle aandag aan die werk kon gee nie, want jy's altyd bekommerd oor die kinders. Maar ek dink dit geld maar vir alle werkende ma's. Die kinders word gelukkig groot, en hulle is minder van jou afhanklik, en dan het...daai faktor weer verdwyn. En daarna was hy...ja-nee wat, hy's heeltemal in sy skik met sy vrou wat werk.

- Institusionele faktore

In so 'n wetenskaplike milieu soos byvoorbeeld die [departement waaraan ek verbonde is] – ek praat maar uit my eie ondervinding uit – word jy geweldig gestimuleer; nie net in jou eie veld nie, maar ook allerhande ander...ek meen, daar's mos baie ander rigtings waarin mense werk, en so aan. En jy het die...in [ons fakulteit] het jy die

voordeel dat, as jy sou probleme kry, dan is daar gewoonlik talle mense wat jy kan gaan raadpleeg. So `n akademiese milieu dink ek het oneindig voordele bo mense wat byvoorbeeld, sê nou maar, in `n geïsoleerde instituut sou werk, met baie min buite-kontak. Ek het dit nog altyd baie bevredigend gevind.

- Opvallende of buitengewone kenmerke, patrone of tendense in loopbaan

Ek het later `n PhD gekry, ja. Dit was `n redelik afgeronde stuk werk gewees wat ek gedoen het as deel van my werk – in aanhalingstekens – en ek gedink dit sou `n goeie onderwerp wees vir `n PhD. En toe het ek maar ingeskryf daarvoor, en...ja wat, dit was eintlik vreeslik maklik. Dit was nie soos iets ekstra nie: ek het dit in elk geval gedoen, en ek het in elk geval die werk opgeskryf as artikels, en dit was net `n kwessie van dit saamvoeg in die vorm van `n tesis. Maar daar was nie `n beweegrede: dit het my nie finansiële gebaat, of enige so iets nie.

- Integrasie in die akademiese navorsingsgemeenskap

In [ons fakulteit] het jy die voordeel dat, as jy sou probleme kry, dan is daar gewoonlik talle mense wat jy kan gaan raadpleeg. Só `n akademiese milieu dink ek het oneindig voordele bo mense wat byvoorbeeld, sê nou maar, in `n geïsoleerde instituut sou werk, met baie min buite-kontak.

- Tydsbestuur

Man, my werksomstandighede is eintlik baie lekker, want ek het nie veel klasgee-verpligtinge nie, en my huislike omstandighede raak al hoe makliker, want dis nou net my man en ek self. So, my verpligtinge daar raak al hoe minder. So, ek vind dat ek eintlik veel meer tyd tot my beskikking het, as wat ek voorheen gehad het, wat vir my maak dat ek redelik kan bybly.

- Gender-diskriminasie

Ek het werklik nog nooit probleme ervaar nie. Of miskien is ek net nie so ingestel nie: ek is regtig nie `n feminis nie, en ek het nog nooit in sulke terme gedink...maar aan die ander kant het ek nog nooit rede gehad om verontreg te voel dat daar teen my gediskrimineer is oor ek `n vrou is nie. Miskien sou ek anderste gevoel het, as die situasie anders was. Maar wat netwerke en samewerking met ander mense...nee, ek kan nie sê dat geslag enige rol hoegenaamd gespeel het nie.

1.1.5 **Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit**

1.1.5.1 *Die verenigbaarheid van ouerskap met `n navorsingsberoep*

Navorsing is veeleisend, en `n ou moet jou kop bymekaar hou. En dit is nie altyd verenigbaar met `n huisgesin en met klein kindertjies en alles wat daarmee gepaard gaan nie. Maar, as jy dit nie doen nie, dan kan `n ou só agterraak in jou veld, dat dit baie, baie moeilik is om later weer by te kom. En, ja...in retrospek dan, vergeet `n mens [lag] dat dit moeilik was, en jy onthou net die aangename.

1.1.5.2 *Inwerking van ouerskap op publikasieproduktiwiteit*

Ek het toe kinders gehad. Maar ek het nooit opgehou werk nie, en ek het ook vir baie lank op 5/8^{ste} basis gewerk. En dit het tog `n...ja, dit het tog `n impak gehad. Baie beslis. Maar ek het nooit opgehou werk, so daar was nooit `n totale onderbreking in my werk nie.

[My man] het nie baie daarvan gehou dat ek gewerk het toe die kinders klein was nie - wat vir my baie angstig gemaak het, en gemaak het dat `n mens nie regtig jou volle aandag aan die werk kon gee nie, want jy's altyd bekommerd oor die kinders. Maar ek dink dit geld maar vir alle werkende ma's. Die kinders word gelukkig groot, en hulle is minder van jou afhanklik, en dan het...daai faktor weer verdwyn.

`n Mens leer mos maar om...jou tyd na die beste van jou vermoë in te pas, en so. Maar, ek het `n bediende gehad, wat die huishouding hanteer het. En dan het ek die kinders by die skool afgelaai, en dan middag as die skool uitkom, hulle weer gekry. So, en...ja, dan werk `n mens maar saans, en wanneer jy ook al kan. Maar dis nie baie maklik nie.

My huislike omstandighede raak al hoe makliker, want dis nou net my man en ek self. So, my verpligtinge daar raak al hoe minder. So, ek vind dat ek eintlik veel meer tyd tot my beskikking het, as wat ek voorheen gehad het, wat vir my maak dat ek redelik kan bybly.

1.1.5.3 *Hanteringsmeganismes*

Ek het `n bediende gehad, wat die huishouding hanteer het.

1.1.5.4 *Moeilikste stadium*

Toe hulle heel klein was; sê nou maar tot so ses jaar oud.

1.1.5.5 *Kraamverlof*

As ek terugdink, dink ek nie ek het ooit gevra [vir kraamverlof] nie. Ek is op [n navorsingsraad] se diensstaat altyd gewees, en ek kan nie onthou dat ek ooit daarvoor gevra het nie. Maar aan die ander kant, as dit 'n opsie was, dan dink ek sou ek daarvoor gevra het. So, ek dink dit was miskien op daai stadium net nie 'n opsie nie.

1.2 Beatrice

1.2.1 **Trends in career or 'lifetime' publication record**

1.2.1.1 *Variations in output volume over time*

That's called post-PhD blues, I think. It's also clear that it coincided with the move [to another South African university], and the change in disciplines, and all sorts of other things...I think this is common of people with who, after their PhD's go change fields, which is effectively what I did. And from my own personal standpoint I was determined I was not actually going to work with my husband until I've establish myself, and once I got my PhD, I decided, "Well, OK, I've vaguely established myself", so, working with him was marginally OK. So, finished my PhD...and then started actually moving into a completely different [field]...Any kind of change of field, or focus: there's always a bit of a lag. But there's also establishing yourself...establishing a lab - because during your PhD you're working in somebody else's lab, whereas I had to establish my own little group, and start of with one honours student, and that honours student became a masters student, and then he became a PhD student (thank God!). My first honours student didn't carry on...and it's luck of the draw, really.

One of the things that happened is that - I guess it's not necessarily that obvious in my career path - is that I moved to [another South African university] in 1998. But like any move...especially a move that big...We knew a full year ahead of time and, I suppose, we knew that we were going to be growing. And so, there was then a major push, and we actually took on more students...We moved from a very good programme to - actually for the first time for me - to really understand what critical mass was. And you see that in kind of '99, 2000 already happening; and that was part of the move [another university]: it was more facilities, more excitement...there's the aspect of: change always makes you more excited...so we definitely were pushing that much harder.

1.2.1.2 *Preference for certain types of publication outlets*

- Selection of particular publication outlets

For me, it's very simple. The *Web of Science* is definitely the website I love the most - my husband says that I'm completely besotted by that website...There's all sorts of information on that. It's absolutely...the...impact ratings are incredibly important...I think, once you've crossed the boundary into, I don't know, the *Landbouweekblad*, or something like that: that's not science. That's something you offer, and that's not also unimportant. What I've actually done is not necessarily reflected in my CV; it's not science...Maybe I shouldn't say this, but maybe it's the important stuff gets on - grand stuff.

- Selecting journals in which to publish work

Obviously, the topic matter of the publication is important...If the publication has a [certain] focus...it needs to be published in a [particular] journal...One has to go for the best, and the best is...ja...the best is always an interesting thing to even talk about...You have to go to your specialty journal.

1.2.1.3 *Internationality of publications*

Look, there is a tension there that I think one has to also understand...One needs to publish in some of the local journals as well, partially to help them make it. So, certainly we do consciously publish in [a local journal]...So, some things that are particularly local, and maybe they're not also...you're not going to win the Nobel Prize with the work, but I think it is important to publish in some of the local things.

1.2.1.4 *Multiple authorship*

Partially, [collaboration] is going to be biased by field. We also will collaborate in preference to not collaborating. So, we collaborate freely, and...I don't know, some people [are] kind of uptight about, "Well, I would probably need to talk to so and so, because we have to put their name on the paper". And then, "You've got to get this money from whatever". And we say: "Look beyond that". Don't worry about (it's actually ridiculous) these small amounts of money one ends up actually getting, whichever formula you follow in terms of publications - and you know there are publication units. Maybe it's a philosophy of: if you give, and you collaborate, you do get back. It sounds awfully biblical, and stuff, but it actually works...We say, "They can do whatever they want to with their formulas".

1.2.2 Views on publication

1.2.2.1 General

That's par for the course. [My husband] will tell you about [an] exception – I think it's the only publication he ever had accepted without any changes.

The university pays my salary: I'm a paid scientist, and somebody is not a scientist if they haven't published.

1.2.2.2 'Publish or perish' in the South African academic context

I think that publishing is something that you can learn how to do. I don't know if the right incentives are necessarily given in the university environment, where everybody says, "Publish", but they're not necessarily...sometimes a research culture is not being actually explained to people; that doing research so that it actually results in a publication is something that you learn. You could actually spend a lot of time doing nothing.

1.2.2.2 Views on teaching and publication

- The relationship between teaching and research

We have a really clear philosophy when it comes to publication, which is not necessarily the route that all academics take. The first thing is that we are in a university, and our primary responsibility then is to mentor young people, so you have to do your teaching responsibilities, which is important in the undergrad, and to have your postgrad students. And part of running a research programme that mentors postgrad students means that they need to learn how to publish. And so, that we feel very strongly about that: that our postgrad students must publish preferably one – at least for a masters – and we try and aim for about three for a PhD...But you can...if you plan your questions carefully with that focus. One can argue that, maybe we could focus on having some publications where you'd incorporate three or four PhDs in the one publication. But we feel that's unfair to the students; that part of their education process is that they must learn how to publish - and that's our job. If we were in a research institute, then I think our way of doing things would be a bit different. I mean, I feel I have...that the university pays my salary.

The thing is: you can look at second years, or first years – who are even more horrifying in some respects – you can look at them as being negative, but they are your PhD and masters students to be. And if you're not prepared to engage with them, why should they be prepared to engage with you down the line? You know, there's that side of it...And I know a lot of people talk about having research posts...I believe only [my husband] doesn't actually do huge amounts of routine lecturing, but even he thinks he really enjoys going into the classroom occasionally, and interacting with these young people. Because, well, they are our future. I mean, in ten years' time they're going to be PhD students, so you need to interact with them. You must.

I think we are quite lucky in the South African circumstance. On average, I think you can get hold of good students.

- Where interests primarily reside (research or teaching)

The other thing is, ah, the second years are such a sweet bunch. Yes, I mean, they're not the majority, and you have the masses - and we [teach] hugely large classes - but they're always so incredibly enthusiastic; those people are just so excited. You've got to enjoy them. I mean, yes, they're completely off-the-wall and unrealistic sometimes, but that's actually very nice. I think it's nice to...I think to renew yourself, and you know, remember when you used to...Yes, you've got to manage it, and they could - do definitely - undergrad lectures and the interaction with undergrads kind of overwhelm you, and I think that may be one of the tricks: is to manage it so it doesn't overwhelm, but that you can get that positive aspect out of.

- Extent to which teaching load has this been the result of own choice or preference

I think the biggest conflict comes in when the kids arrive, and your time is incredibly stretched. And then I think it becomes...it becomes almost difficult **not** to say, "Well, OK fine. I'm going to do something that doesn't necessarily require the midnight hours, the...all the other time, and get into something that is actually more routine, and you can actually manage it between 8 to 5...The teaching is way more amenable to that, because research just isn't. Research is happening all sorts of strange times. Research means many more travel. Research just means more insanity, actually.

I feel very, very definite about the fact that the average academic must lecture undergrads.

1.2.3 Motivation for publishing

The university pays my salary: I'm a paid scientist, and somebody is not a scientist if they haven't published.

1.2.4 Major factors that have impacted on publication productivity

1.2.4.1 General inhibitors

I think one of the greatest inhibitors is not having enough hours in the day. The real inhibitor to publication is not having equipment or money to do the science...OK, I battle with this...I think there's an American programme where - I read about a number of years ago - where they [gave] I think it was a million US dollars to fifteen researchers, or something. Just no strings attached. And I thought, well, there's the vision of realising that sometimes you can just give people money, and they'll actually do the most amazing things...We do a lot of reporting, a lot of accountability that we're required to participate in. And then, while I understand the reason for that, I think sometimes they should just fire the accountants. And then, in actual fact, there's going to be some money that's going to go to waste, and maybe there is even going to be some fraud, but in actual fact, on average: your average research scientist is so passionate for what he or she does; they're not going to misspend the money.

1.2.4.2 Specific factors

▪ Views on combining marriage with a research career

I think we've grown together, as much as we've been critically positive and supportive, and all those good things. Look, there's no question in either of our minds that we couldn't do what we do if we weren't working in the same field together. And it works both ways: I can fill in for [my husband], and he can fill in for me; and if there's a family crisis, he understands that as much, that I'm kind of in the middle of it. And occasionally he helps out with a family crisis and I have to go and do the stuff. So, that I think is really very powerful. Look, it's not always possible, but it certainly makes a huge difference for me, because you've got the support. Of course, my children say we never talk about anything other than work. And that's true...there really isn't a boundary line between our work and our home life. And maybe we actually still love each other, because we've been married for 25 years - that's a scary thought. I must admit: sometimes I kind of think, "Well, if I didn't work with [my husband], what would I talk to him about?" [In] most other successful marriages...there is something that couples identify that they do together,...because if there isn't something that they do together, then everything collapses. And I suppose what [my husband] and I do together is our work. But that then means we're not trying to find something out[side] of work to do together - then we can work these incredibly ridiculous hours at work...Look, there are dangers associated with this. The one is, if something actually happens with the marriage, then it's complete chaos. And that's something we've always kind of...not talked about too much, but realised that that was a reality. Ja, look, we had to be very, very careful. And the other negative is... (and this is not the case) people have the tendency to assume that what I know, [my husband] knows. And so, sometimes he will say, "Oh, well you know, I told [your husband] this", and therefore there is this assumption that I must [know] it. And it's like we might talk work all the time, but that doesn't mean that we kind of share the same brain cells.

Look, he's not perfect. But I think we've both compromised, and we've divided things in ways that are comfortable to both of us...It's happened to a greater or lesser extent like this on a number of occasions: [my husband] had a really, really heavy day, and arrives home sometimes quite late - 7:30, 8 o'clock - like he's not had any food...really all he wants to do is come home, sit down and eat. And he'll walk into chaos! It doesn't always happen that way: sometimes you **do** get food on the table. And sometimes he said to me, "Food would be nice". So, rather than being...we accommodate each other. So, it is not expected that I have food on the table.

▪ Institutional factors

We moved from a very good programme to - actually for the first time for me - to really understand what critical mass was. And you see that in kind of '99, 2000 already happening; and that was part of the move [another university]: it was more facilities, more excitement...there's the aspect of: change always makes you more excited...so we definitely were pushing that much harder.

As far as I'm concerned, the only thing you need is to have the research culture, and passion. The research culture is different things to different people...some of [the] things that people don't take seriously, is having regular teas to be able to discuss things with people, because ideas happen at strange times. But it's also having...I suppose we've had at various times different people who've believed in us. I remember the first Apple Mackintosh I purchased was as a result of some NRF money that they were giving to young researchers. And that was incredibly important: having that little bit [of] extra money to buy a piece of equipment that, without that I wouldn't have been able to take the next step. So, having people who are actually prepared to believe in me...the Head of Department at [the university I worked at previously]: at one stage I was desperate for a piece of equipment, and he believed enough in me to put departmental money into it. Continuously, I see that with my students and some of the young members of staff: sometimes a little bit of money - it's not huge; it's not hundreds of thousands of rands - can make a huge difference to somebody, especially when they're starting off.

- Integration into the academic research community

Partially, [collaboration] is going to be biased by field. We also will collaborate in preference to not collaborating. So, we collaborate freely, and...I don't know, some people [are] kind of uptight about, "Well, I would probably need to talk to so and so, because we have to put their name on the paper". And then, "You've got to get this money from whatever". And we say: "Look beyond that". Don't worry about (it's actually ridiculous) these small amounts of money one ends up actually getting, whichever formula you follow in terms of publications - and you know there are publication units. Maybe it's a philosophy of: if you give, and you collaborate, you do get back. It sounds awfully biblical, and stuff, but it actually works.

I think people don't easily work in groups enough, and I think that's also part and parcel of one of the reasons I get so irked about units and stuff like that. There isn't as much as the NRF and various of our other funding bodies say that they try to promote collaboration. In actual fact, there is quite often very little value in collaborating...granting agencies giving you money and stuff like that. And that promotes an individualistic behaviour that then...and there's no question: I mean, if you're working in a research group, and you can get to critical mass, it's amazing what you can do.

The research culture is different things to different people...some of [the] things that people don't take seriously, is having regular teas to be able to discuss things with people, because ideas happen at strange times.

I think if you are the only female in a group of males you will always feel, to an extent, excluded. And part of that is association with...the **topic** of conversation. OK, you get exceptions, and I must agree my husband's an exception, but most South African males are excited about cricket and rugby - I'm afraid to say! And I know some of my female students are also excited about cricket and rugby, but it doesn't excite me, and I can't participate in a conversation that has that as a central theme.

I think there are positive spin-offs associated with having equal numbers. Secondly, I've been in circumstances where there's been all females that...I don't think an all-female environment is a good one. I think both sexes bring different strengths. I think that positive tension comes out of having a balance. I think an all-female environment is almost as bad as an all-male environment.

- Gender discrimination

If you knew me well enough, you'd know that a lot of the gender stuff tends to just kind of pass me by, because I ignore it, just because I've got probably...I don't know...maybe I'm not focused on it. But having said that: yes, there has been a certain amount of...it's never been horribly blatant...other than I can remember when I resigned from my job at [a South African university]. The Head of Department was very annoyed about the fact that I'd resigned, but then I told him in the next breath that I was pregnant, and suddenly it was OK. I was thinking: it's OK, because he was actually interested in me as I was not pregnant, but until I was pregnant, then I was kind of beyond the pale of former gender discrimination, and there is a reality associated with that. Other than that, most of the discrimination that I reckon that I've actually been subjected to, had been much more subtle than that. And subtle in the sense of: Well, I'm married. Do I really need a promotion? I've got a husband. Do I really need that extra money that comes with promotion? Do I need that little extra push?...And certainly, I mean I've been to departmental meetings every now and then, and some people would say, "Oh, so-and-so is married and has a baby, and a wife". And I'm going, "And so?...That's their problem. What about *our* problem". So, it actually works both ways.

I think in the [broader field in which I work]...I consider myself - I don't think I'm the reason for it - but I consider myself very lucky that I'm in one of the few science departments in the country, where there are actually more female members of faculty than male. So, the women rule, and keep the men under good control.

1.2.5 Views on the effects of parenthood on publication productivity

1.2.5.1 *Combining parenthood with a research career*

Look, I think the one reality - and I mean to me - I always call it the "mommy divide"... I think the biggest conflict comes in when the kids arrive, and your time is incredibly stretched. And then I think it becomes...it becomes almost difficult **not** to say, "Well, OK fine. I'm going to do something that doesn't necessarily require the midnight hours, the...all the other time, and get into something that is actually more routine, and you can actually manage it between 8 to 5...The teaching is way more amenable to that, because research just isn't. Research is happening all sorts of strange times. Research means many more travel. Research just means more insanity, actually. And you should actually interview my children, and they'll tell you about the fact that they never see their mother.

1.2.5.2 *Coping mechanisms*

The only easy way to encapsulate it, is: I know, I used to read people's CVs with immense awe, and they always have in there that title called "hobbies". OK, people would have these most amazing hobbies, and I'd think: "Well, why is it that I don't have any hobbies?" So, I have my family, and I have my work, and that's it. I'm afraid I'm

very boring. So, I hope at some stage, maybe in the next ten years I can actually have some hobbies...but my hobbies might be my grandchildren.

I basically never really had family around. Our move to [another South African university]: actually there was a positive side in the fact that my husband's mom is in [this city], and there's a little bit of family here – but, arguably, by that stage the kids were not in the baby stage. My mother-in-law, however, has been incredible various times. I've been able to dump the kids with her, go off to various conferences and stuff...I was talking to somebody who had their life planned the next ten years with regards to their little three-year old, and I looked to her and said, "You actually have no idea". Things change. What works one year doesn't work the next year. [Someone] said to me once: when you look at a working mother, from the outside it looks like chaos - but sure, it's incredibly organised chaos.

I actually never did with a nanny, but certainly a nanny is really nice - until they're about five or six, then they don't want the nanny any more.

1.2.5.3 *Most difficult stage*

Oh, it's getting progressively worse as the children get older.

1.3 Cecilia

1.3.1 **Trends in career or 'lifetime' publication record**

1.3.1.1 *Variations in output volume over time*

I was working...and I also had a year on a...scholarship [at an overseas university], at which time I was collecting data for my thesis every day. I've never not worked full-time, and...at the beginning of an academic career that certainly limits one's potential to publish, because you're busy developing lectures, and working flat-out. So, yes: at the beginning. But, probably I had some time; published my thesis research quite early on. Ja, I published some of my honours-level research, and then I...immediately registered for a masters, which was then converted to a PhD, on the basis of the fact that it very large and original.

Sabbatical leave. There's no question that you need time and you need space in order...to be productive. Unfortunately, academia in South Africa means a whole lot of things besides just doing academia. It's teaching; it's administration – I was chair of my department for ten years, and I had a sabbatical in 2000...I find it very, very difficult to have a [large] publication record, particularly if you're efficient, and particularly if you wind up the university ranks, because it just implies that...you do more stuff that you're less trained to do: administration and dealing with budgets...and having an infrastructure which does not support you. I mean, if I were allowed to just do research, I'd probably produce five or six articles a year.

1.3.1.2 *Preference for certain types of publication outlets*

In terms of promotion and confirmation criteria, there are very strict rules as to what counts and what doesn't – always one was on that kind of bandwagon in order to try to get promotion and confirmation. I would have written more chapters in books, if they'd be given more subsidy; subsidy always counts, because I've used the subsidy – the research subsidy part to you – to fund my overseas trips. So, it's a vicious cycle: you actually have to do what the DoE list tells you to do. I would not think of publishing in a publication which is not on the DoE list, because it's a waste of time and effort as far as the current DoE reward system goes.

1.3.1.3 *Internationality of publications*

Because I like to get the feedback, and I'm working pretty much in isolation in this country. So, I really need to interact with overseas specialists in my area, and about one way of doing it, is putting your work out there for evaluation by peers. I mean, that's a very important thing.

I wouldn't waste my time now [with a journal that cites South African relevant research], because I think that I'd rather have an international reputation.

We have a wide international network, and I will always do that research.

1.3.1.4 *Multiple authorship*

You will see from my CV that a lot of my publications are actually co-publications with students whose careers I have developed.

1.3.1.5 *Publications during graduate training*

I had a good psychology professor who saw my potential, and encouraged me to present at...a local psychology conference, and I think that was published. And then I've really had some nice mentors...who supported me and recognised my work. And also, I've driven myself. It's just...I do that.

1.3.2 Views on publication

1.3.2.1 *'Publish or perish' in the South African academic context*

It's a vicious cycle: you actually have to do what the DoE list tells you to do.

You have to play the game, and that's one of the things you also have to learn very quickly, and that's being able to play the strategic game.

Getting an A-rating is not necessarily...I mean, you're going to get accolades from your peers, and you get very snooty comments from some people who, I suppose, are very jealous, or better, or try to belittle the process, or whatever.

I think that in principle [the NRF rating] is a very good idea...it's very time-consuming to do, and I'm sure that [there are] a lot of worthy people out there who haven't got a rating simply because they didn't have the time to do it. The only reasons that I got my rating was that I had the time: I was [in an overseas country] and I was on leave then, and it took me about three weeks of concerted effort...Not to say that other people can't do it, but it's very time-consuming. And it has been an enabling step up: I've some funding now, which I probably wouldn't have had access to before. And it's enabled me, I suppose in my job to say, "Hey, I don't want to do too much teaching, because I've got an A-rating and I want to do my research". So, you fight for all those things. It's just a constant...raising...the level of awareness of people and fighting for your battles.

1.3.2.2 *Views on teaching and publication*

- The relationship between teaching and research

I actually don't think that you can be a good researcher, unless you are able to teach it too...I make students enthusiastic, and those students – those undergrad students who rise to the top – in fact, that's where I ultimately recruit my doctoral students. And you will see from my CV that a lot of my publications are actually co-publications with students whose careers I have developed. So, good teaching is an integral part of good research, but that means sometimes that you get exploited and that sometimes, if you...have large classes, and assignments and exams and everything: [those] really interfere with good research time. So, there's a balance there.

- Where interests primarily reside (research or teaching)

One of the things that I pride myself on is that I'm a very, very good teacher: I make students enthusiastic.

I've enjoyed very much postgraduate teaching, because then you've got a group of people who you know are motivated and you know are very sort of on the same page. Undergraduate teaching is not always easy.

What I am trying to instill in my students is a love of science, and a love of knowledge, and a love of what they do.

I get very upset, actually when my students do wonderful work, and wonderful students who just leave and never come back to academia. There's such a lot of lost potential.

- Extent to which teaching load has been the result of own choice or preference

[The A-rating] has enabled me, I suppose, in my job to say, "Hey, I don't want to do too much teaching, because I've got an A-rating and I want to do my research". So, you fight for all those things. It's just a constant...raising to the level of awareness of people and fighting for your battles.

Good teaching is an integral part of good research, but that means sometimes that you get exploited.

Anybody who does the job well is likely to be asked to teach a course again and again.

1.3.3 Motivation for publishing

I really love times that I am on sabbatical, or going to courses, or learning new things, and everything. And I have...a very active life in that way.

I've driven myself. It's just...I do that.

And sometimes what's driven me is not so much anything but anger – just irritation.

1.3.4 Major factors that have impacted on publication productivity

1.3.4.1 General facilitators

- Most important contributing factors

[The A-rating] has been an enabling step up: I've some funding now, which I probably wouldn't have had access to before. And it's enabled me, I suppose in my job to say, "Hey, I don't want to do too much teaching, because I've got an A-rating and I want to do my research". So, you fight for all those things. It's just a constant...raising to the level of awareness of people and fighting for your battles.

- Advice provided to students, or a new staff member, specifically in relation to publication productivity

I tend to be fairly rigorous in encouraging people to write up, and to present at conferences, and to actually try and make something tangible out of their work. Not everybody! I mean, some people: they just go and enjoy life and don't come back to academia. But some are really...I weep when I see the waste of potential - very often in women. It's horrible!

I actually do think that there are a lot of enabling systems which a lot of postgraduates are not made aware of: there is funding, there is access to overseas bursaries, there is the opportunity to do kind of full-time kind of research. And a lot of people actually just don't know, and don't explore those channels and avenues...I think the best model is somebody who comes straight into a full-time masters to get something, and to move straight into a doctoral study, before they get the taste of the real world and earning money and everything. But it's almost impossible, I think, to be a part-time student. I myself was: I mean, I never studied full-time; you did it in conjunction with an academic job. Fortunately, my context sustained an academic way of life. People who are working out in the field, and are doing part-time studies: oh, it's impossible to get the balance and the quality that you need.

What I am trying to instill in my students is a love of science, and a love of knowledge, and a love of what they do. I used to be fiercely suggesting that they stay in this country. Now I am giving them the strategic know-how how to get out. And that's horrible, because I never did that until about three years ago.

- Advice provided to young women staff members in particular, specifically in relation to publication productivity

My advice is - I have a lot of postgraduate females - I just say: "If you can't juggle several balls in the air, and if you can't come to terms with the fact that you'll always feel guilty, whatever you're doing - if you're playing with your children, it's the worst thing when you're writing a thesis - whatever you're doing, you always feel that the other should be attended to; that in some respects you have to learn how to compromise and to be satisfied that you accept that".

I teach my postgraduates: you just have to...one of our female deans, who I really like, she says, "Women just have to be like Avis people with the little badge: 'We try harder'".

A lot of my supervision of students is giving them [advice on] how to take permission to ask for a negotiating space in their relationships in order to do that. Again, it's strategic; you have to learn strategic skills. Honestly, sixty percent of my time with female academics particularly, is showing them how they can say...they're **right** to do their own thing...One of these days I will write a little book on how to make it in the female academic world, because it is not easy. I mean, one woman said to me, "I can't do my thesis, because my husband says I have to do the curtains" - I mean, "make the curtains in the sitting room". This is on a master's level. That's bullshit.

1.3.4.2 General inhibitors

I think that women who have made it are only those women who have learnt how to play strategic games.

I think I should say that one should not always assume that females in high places necessarily support the development of other females. OK? I mean, some of my best mentors have been male. And sometimes females in high places are either jealous, or something, or whatever. I've encountered some [queen bees] on my way, and I have not enjoyed those interactions...Unless I am to stay in academia. If I would retire out the administrative route, which is not something that I necessarily wish to do, I would certainly not be like that. But equally, I am not overly understanding and empathetic and forgiving when people come to me and say, "Oh, I can't do this, because my husband says I can't make the curtains", or "I've got three children", or these kinds of things. They look at me and say, "Well, **you** can do it, I know, but **I** can't do it, because I can't do all these things". That's rubbish. There are women throughout the world who've managed to do that. And it may be a matter of phasing and planning in a way that men maybe don't have [to] - I mean, to make decisions about phasing and planning. But I honestly think that women **can**, but they can also choose not to. They mustn't **whine**. They must make choices, but they mustn't whine. Be able how to juggle, and be able how to compromise, otherwise you'll drive yourself crazy.

1.3.4.3 *Specific factors*

- Views on combining marriage with a research career

I think it's possible, as long as there's give and take. It's was very, very difficult when I had young kids: my husband was away a lot – he's a managing consultant. It was very, very difficult, but I created a fake image: I negotiated, like, week-ends, periods with lots of time when I was writing up my thesis. But he was very supportive of me. That was great. But not everybody's husband is like that. A lot of my supervision of students is giving them [advice on] how to take permission to ask for a negotiating space in their relationships in order to do that. Again, it's strategic; you have to learn strategic skills. Honestly, sixty percent of my time with female academics particularly, is showing them how they can say...they're **right** to do their own thing...One of these days I will write a little book on how to make it in the female academic world, because it is not easy. I mean, one woman said to me, "I can't do my thesis, because my husband says I have to do the curtains" - I mean, "make the curtains in the sitting room". This is on a master's level. That's bullshit...I would have no compunction, actually, with someone to say: "This is not your time. Do not do this. You will drive yourself crazy; you'll drive me crazy. Go away". I don't think it's everybody's cup of tea. I think there are certain personality characteristics and certain times and contexts which make it possible to be the successful academic woman. But there are equally a number of women...under [my] supervision, and I've said to them: "You should not do that". That sounds callous, discriminatory, and everything, but some people can manage and some people can't. If you're multi-tasking, it also has to do with discipline, and energy.

- Institutional factors

I have to say that...I've always been promoted...they gave me a period of ...study leave...it was kind of a bursary at the time that I was writing my PhD for three months. I've asked [for] support; they supported me. I won [a scholarship] at some stage to go overseas for a year on sabbatical, which they paid for also. In **that** – the enabling kind of things – that they offer...when I had babies, I had a month's maternity leave (it's about to change; actually, thanks to me it's now four months). But...big things in the broad scheme of things actually have enabling qualities: access to funding, blah, blah, blah, blah. But the infrastructure, especially in the last few years is appalling. People...because there's such incompetence at personnel level, budgetary level, blah, blah, blah, blah...especially in [the faculty that I am part of]. But: really, nothing gets done; there is no ease of access. I'm an A-rated scientist: I don't have a laboratory like my colleagues; I don't have really research assistance, and anything is very difficult...I just think that the administrative infrastructure of universities in general, make it very, very difficult, actually, to smoothly run a lab, without actually having daily frustrations.

It's definitely not institutional. I mean, institutional so far...these days I feel sorry for young academics, because I think that there are hidden ceilings. I mean, we knew about the women's glass ceiling, but at present it's not just the gender glass ceiling, but the race glass ceiling – and it's there, and it's actually horrible in being enacted every day. It's really, really awful...in terms of people, promotions and employment criteria. It's almost like: why bother?

- Integration into the academic research community

We have a wide international network.

I feel that...they're majority female. Many people think why don't I...why is our discipline not in [a different] faculty – it is, in fact, at [another South African university] – and my answer would be that, internationally there has been a failure...in my discipline, if it gets attached to the [that] faculty. That could be an exclusion by discipline, but I think that there may be more gender issues playing there. And that's an interesting question. My predecessor, Professor A, would say, "Over my dead body would I move to [that] faculty", because I have sort of flourished in this...environment, because – it's a fact! – one of the reasons is that I haven't had some of those battles to fight that other female scientists have had to in other contexts.

I had a good psychology professor who saw my potential, and encouraged me to present at...a local psychology conference, and I think that was published. And then: I've really had some nice mentors...who supported me and recognised my work.

One should not always assume that females in high places necessarily support the development of other females. OK? I mean, some of my best mentors have been male. And sometimes females in high places are either jealous, or something, or whatever. I've encountered some [queen bees] on my way, and I have not enjoyed those interactions.

- Gender discrimination

I gave the university authorities a hard time...a lot...I was really very active in those days, fighting for things like housing subsidies, maternity leave - those kinds of things.

You just...it's something that you live with on a daily basis, and you learn to cope with. And I mean, I teach my postgraduates: you just have to...One of our female deans, who I really like, she says, "Women just have to be like Avis people with the little badge: 'We try harder'". There's no question about it. You have to be...you have to do the work, and you have to be seen to be doing the work.

These days I feel sorry for young academics, because I think that there are hidden ceilings. I mean, we knew about the women's glass ceiling, but at present it's not just the gender glass ceiling, but the race glass ceiling – and it's there, and it's actually horrible in being enacted every day. It's really, really awful...in terms of people, promotions and employment criteria. It's almost like: why bother?...Anyway, I tried for a chair at another university...in this country recently, with my CV, and the person who got it, had three publications.

1.3.5 Views on the effects of parenthood on publication productivity

1.3.5.1 *Combining parenthood with a research career*

When I had babies, I had a month maternity leave (it's about to change; actually, thanks to me it's now four months).

I had a month maternity leave for both [children]. I brought both back to my work in my office, and I breastfed in lectures, and I...just somehow managed.

I think you just have to accept that you'll always live in a guilty mode, and you'll always be fragmented. Some women can't handle that. My advice is - I have a lot of postgraduate females – I just say: "If you can't juggle several balls in the air, and if you can't come to terms with the fact that you'll always feel guilty, whatever you're doing - if you're playing with your children, it's the worst thing when you're writing a thesis – whatever you're doing, you always feel that the other should be attended to; that in some respects you have to learn how to compromise and to be satisfied that you accept that". And I think my male colleagues never even think about that. I think their expectation is that they live for work, and they go home at the end of the day, and that's when they are focused on the family. But most women will leave for work, and while their working, they're worried about the water bill, or little Johnny at school...Not everybody can do it. Certainly, in my experience, I've seen some women who just **cannot** do it and can't stand the strain.

When people come to me and say: "Oh, I can't do this, because my husband says I can't make the curtains", or "I've got three children", or these kinds of things. They look at me and say, "Well, **you** can do it, I know, but **I** can't do it, because I can't do all these things". That's rubbish. There are women throughout the world who've managed to do that. And it may be a matter of phasing and planning in a way that men maybe don't have [to] - I mean, to make decisions about phasing and planning. But I honestly think that women **can**, but they can also choose not to. They mustn't **whine**. Make your choices! Be able how to juggle, and be able how to compromise, otherwise you'll drive yourself crazy.

1.3.5.2 *Coping mechanisms*

I had domestic help, which was fantastic. I didn't have my parents around, although the reason for that was [that they were] very far [away].

1.3.5.3 *Maternity leave*

Oh ja, you know what did? I lied to my university, because you're only supposed to have your baby after pay day, in order to receive money. So, I had my babies on the 11th and the 18th of August, but I told the university that my babies were born on the 26th of the month, after pay day, which was on the 31st. It's changed the last few years.

1.4 Delia

1.4.1 Trends in career or 'lifetime' publication record

1.4.1.1 *Preference for certain types of publication outlets*

I work with the most recognised.

We tend to end up publishing in the same few journals, because we know there we'd get a good response to our work...Because the editor now knows us, and basically we get acceptance from him, and I'm not really interested in going to fight with another journal. If you don't like the work, then tough.

1.4.1.2 *Internationality of publications*

It is aimed at the overseas market.

I was actually editor of [a South African journal] for a while. We ran out of funding, other people to put papers in - we couldn't just put stuff from our group in.

1.4.1.3 *Multiple authorship*

That's the way our group works: is actually quite different for a typically science or engineering group, in that we work very much as a group. A number of our PhD students have joined us and are now part of the group – just like I stayed on and worked with D. And so, we tend not to within ourselves sort of hold on to who produced an idea. We

tend to brainstorm: ideas come about, they get grown, they get developed. And we also put our postgraduate students in groups, because we find it helps their performance. They go from a junior sort of member of the group, to heading their particular research group. And we specifically do that, because we find it helps our new students' performance. They're often quite nervous: coming to ask me, or one of the more senior members of the group, the same question two or three times - which actually has to happen if you're in a new field and you're learning. Whereas, if you put them in a group where there are other research students, they seem to progress much, much more quickly, and feel much more comfortable, and make their contribution much more quickly. We are very much group-focused, and we don't tend to worry about whose idea it was – we just take the ideas, grow them, use them.

1.4.1.4 *Publications during graduate training*

I think ours is the more classical way of starting, in that you sort of wait...Because we were working in an area...where my supervisor...had been working a long time, we knew where the forefronts were, so it was very quick and easy to get to that. What we do with our new students is as well: we put them in an area where we know...we tend to fund our own research, and so we put the students in areas where we know we're working at the sort of edge of what's known. And what we now find is that within six to eight months of their starting on their masters, they're ready to start publishing. We typically do that, because if we are funded by industry it takes us a long time to understand where the forefront is, what exactly the next question is that should be answered, and...is this a next easy question to answer? Because sometimes the question you ask isn't the one you can answer: you've got to first answer other ones along the way. And so, by pulling students in like we do - we fund them; we put them into our research areas - ...we can get results very quickly. Most of our PhD students now are getting three to four publications by the time they each graduate.

1.4.2 **Views on publication**

1.4.2.1 *'Publish or perish' in the South African academic context*

I think it causes bad research, and I think it causes very boring research to be done. If you have very innovative research, the worst thing to do is to try and get it published...in little bits. You know, "I've done all of this and now I've changed that tiny little bit". And if you want to get [a] large publication [record], that's the way to do it. If you're going into a brand new area, and trying to develop new areas of science, it's actually stressful. It's easier for reviewers to pull you apart, than to say, "This is actually quite a good idea. There's some funnies in it, and I'm not quite sure where it goes, but that's quite good". It's easier to say, you know, "Paragraph here: you did this wrong, or paragraph there". I have an idea: if you have more open research - it went on the net and people could read it if they liked it – [it] would change the way research was done completely.

1.4.2.2 *Views on teaching and publication*

- The relationship between teaching and research

There is all that conflict, because of the time involved – there's just never enough time for everything one needs doing. I luckily can rely on postgraduates, and I tend to twist their arm - even if it's not been allocated to me to help with the marking, because I'm supervising them - I tend to twist their arm and tell them: if they need help from me, they can start with the marking. But that doesn't happen naturally; the department doesn't give me any more postgraduates helping with tutoring...so, I tend to have to call in favours from them.

- Where interests primarily reside (research or teaching)

Some of them are nice, because some of the courses you can actually push the undergraduates, and show them where the limits of knowledge are. Those are quite fun lecturing, and for the brighter students: I think they find that quite fascinating. And those are aimed particularly at the high-level undergraduates, and it is nice to have courses for them – you don't throw anybody on it – but it's just to give them a taste of what is out there, and where the current state of knowledge is.

- Comparison with other colleagues' teaching load

What I often try and do, is try and protect the younger members of staff. And so you taking stuff off them, it ends up on you...I think often because you [as a woman] also try and protect other people. And so, yes, it can happen. I don't think we often shout loudly enough in our defense, although I'm trying to learn how to do that.

- Extent to which teaching load has this been the result of own choice or preference

If someone has a problem, you feel probably more obliged to help, I think, on average...not, "It's my job to deliver the lecture, and when I'm finished, I walk out" We try to make the teaching part a lot more friendly for the students. That does adversely influence publications in the end.

1.4.3 Major factors that have impacted on publication productivity

1.4.3.1 General inhibitors

- Constraints encountered

Lack of funding: I mean, we spend huge amounts of our time to try to raise funding. It takes huge amounts of time, and it's very difficult to raise funding...I think one of the main problems with students currently, is that you need to find funding for them. It doesn't help taking on a student unless you can be assured of funding them. And so, raising funding for these students is just a huge...and applying for something is very complicated: the systems are not particularly geared towards that. And I would think it's one of the leading problems in trying to get research done currently...the universities are understaffed, the teaching loads have gone up, and access to funding is much more complicated; much more paperwork...The other problem – when you **do** access funding, be it through the THRIP mechanism, or whatever – the funding has to be spent that year: you aren't allowed to build up reserves. So, I mean, if you take on a PhD student, you might take them on for four years. Very, very difficult. We're running on three million a year. And so, it's very, very complicated. If one could, when one got the funding, put it aside in a fund and say, "Alright, at least I've got student excess funds for the next four years", it would be much safer for the students, and much easier, that you could at least control a little bit more of the cash flow.

- Possible reasons why women publish less than men do

I think the whole publication system is really set up...in a way geared much more for the way men work and think. You know, it's fairly hostile...You put your work forward, and then everybody tears it to pieces – not a particularly supportive system. [Instead of] saying "You know, well, this fits quite nice; you know, it's very good, but what about a little bit of help here", it's like, almost: "What have you done wrong, and let's tear it to pieces". It's not a very natural mode of working. You know, there are more natural modes of working that would probably happen as more women would get into research. It will happen naturally, because I think women do tend to work quite differently; tend to, you know, I tend to...I **do** prefer working in groups, I **do** prefer a more supportive environment. You know, if something's hostile...rather than me saying, "Well, let me change it", it's like, "Well, let me go somewhere else"...if it has to happen, then I'll do it, but it's not something that I find is entirely exciting. And you'll find even our journals: we tend to end up publishing in the same few journals, because we know there we'd get a good response to our work...Because the editor now knows us, and basically we get acceptance from him, and I'm not really interested in going to fight with another journal. If you don't like the work, then tough.

You got [to] almost start taking an attitude: well, that reviewer was an idiot - which is quite hard, and it's not natural. Another system I think is being geared up more for a different way of working.

You'd probably find that women also spend more time on teaching, simply because they're very concerned with students; find it harder to turn them away.

1.4.3.2 Specific factors

- Views on combining marriage with a research career

[My husband] is fairly good, but I still think the bulk of often running the house and bringing up the family still falls on the woman. And I still see it with my young colleagues. I keep looking at them to see how they manage.

In South Africa, we are lucky that we do have home help and maids and so on, and one relies on that tremendously to keep sort of things going...Otherwise, I think you just got to multi-task when you can, and when you realise you're exhausted, pull out; put your feet up, and forget about the pile of work – it's always going to be waiting for you. And...you've got to prioritise. The thing about sitting on committees: I just don't do. That's just tough. I mean, I know it advances your career and does all the rest, but you work at the balancing of what you're doing now and what you're not doing.

- Institutional factors

Well, here [at the university where I work] it's very much focused on research. And they do give you time. One of the big plusses here, is there's a lot of flexibility. And then, if you do want to work – not that I get much chance these days – but if you do need to work away from the office, you can work away from the office, which helps. One needs flexibility to juggle all these things. And it's really, I suppose, allowances and flexibility, and the degree of trust the institution has in you to do your work, even if you're not sitting at your desk. I've got a laptop, I've got a cell phone, and I'm getting back to working – my youngest is now three – so, we are going to end up back working at MacDonalds and Lifestyles – anywhere where there's a jungle gym, and places where I can sit and have coffee - so he feels he has an outing, and I can get work done.

- Career path: salient or unusual features, patterns, or trends

I didn't plan it at all. I actually registered...for my first degree...for a BA - my first registration - because that's what women did. And then, at the last minute - I mean, we could still change registration – I changed it to a science

degree, which is...I'm going to miss maths and science so much. You know, I was going to become a nuclear physicist, of all things. Then at the end of first year I realised I'm not going to get a job as a nuclear physicist, because I wasn't going to pass physics, firstly; and the other major I had was chemistry, which I didn't want a job in. So, I went around all the branches of [my field], and only [one] would take me into second year. Not particularly well planned...It is very much more a more, kind of: "Well, I'm here; what can I do next?"

- Integration into the academic research community

Well, it's just that one of the things [is] to try and keep in touch with overseas people – because here in the southern hemisphere we are quite isolated – and so we do try and send some people from our group to international conferences, just to try and keep in touch on a personal level with the people in our field.

What I tend to do...with all the conferences you would notice that we've been publishing, and we send other members of our group; we send our senior researchers – it's a big plus for them; they enjoy it – and sort of network that way.

[My supervisor] very much - as in research and career development. [Mentorship] is very important, but it also needs to be the right person.

- Time management

You've got to prioritise. The thing about sitting on committees: I just don't do. That's just tough. I mean, I know it advances your career and does all the rest, but you work at the balancing of what you're doing now and what you're not doing.

1.4.4 Views on the effects of parenthood on publication productivity

1.4.4.1 *Combining parenthood with a research career*

It is huge, because it is a huge time drain on you...It does actually have a big impact. You do have to multi-task; you do learn to have to do research while waiting at swimming lessons, or at MacDonalds, or wherever. Fetching and carrying: you tend to do some of the research while you're driving around.

We were looking for funding from the European Union, because I have a professorship at [an overseas university], and we were wanting to see if we could access funding that route. And they're set up in such silly ways: I mean, the one we could find that was applicable, would give me money to travel. But at this stage I really don't need to travel. You know, traveling I need...I fill up the fridge with pages of instructions – you know, "Remember, get x to here". It's not something that is high on my list of priorities; I mean, traveling isn't fun: it is something you really have to do and, if possible, you send someone else and he has a funding opportunity with THRIP. The other person we could use it for is a German lady working for us. [She] is sitting with – at that stage - a six-month old baby. And it's like, "Oh, wonderful. I'm sure she'll be so happy for the travel money". You know, it's just inappropriate the funding is set up. Maybe if you're young – even if you're married and you leave wife and baby at home – it's great to travel, but...

1.4.4.2 *Effects of parenthood on publication productivity*

You're in a stage in your career where people are asking you to do various things, and your answer is, "No, I'm going to MacDonalds, now; or swimming lessons". You have to live with it, but...I do pull out of lots of things that people say I should be part of, and the answer is, because if I'm doing that, then I'm not doing something else I should be doing, and some is spending time with kids. Which is again an adverse influence, but it's tough: you can't do everything...but I don't think my male colleagues would feel probably the same way.

I hope when I get 'round to that age [55-65], I can do all the things I'd like to do without guilt.

1.4.4.3 *Coping mechanisms*

Luckily, because we are working in a group: if I pull out a little bit, the rest of the group can push in, you know, and help a bit. And so, there is always that advantage when working in a group: that we do tend to cover for each other when times are rough.

Just having a circle of friends: both as far as the kids are concerned – that you can, sort of, farm them out when necessary, and take them to people's kids when necessary – and then the group sort of working at work.

In South Africa, we are lucky that we do have home help and maids and so on, and one relies on that tremendously to keep sort of things going.

One needs flexibility to juggle all these things. And it's really, I suppose, allowances and flexibility, and the degree of trust the institution has in you to do your work, even if you're not sitting at your desk. I've got a laptop, I've got a cell phone, and I'm getting back to working – my youngest is now three – so, we are going to end up back working

at MacDonalds and Lifestyles – anywhere where there’s a jungle gym, and places where I can sit and have coffee - so he feels he has an outing, and I can get work done.

1.4.4.4 *Most difficult stage*

It’s actually probably the child: my oldest is much more complicated, much more time-demanding. It was very difficult when he was a baby, and I find it quite difficult now again, with all the carrying and fetching and whatever, to get him to various sports and whatever.

1.5 Elmarie

1.5.1 **Tendense in beroeps- of ‘leef tyd’ publikasierekord**

1.5.1.1 *Variasies oor tyd in uitsetvolume*

Doodeenvoudig dat: ek het laat in die akademie ingekom. My man was ’n [professionele persoon] in [’n Suid-Afrikaanse dorp], en ek het skoolgehou. En toe het ons eers [in die middel-sewentigerjare na hierdie universiteitsdorp] toe gekom, en toe het ek deelyds begin klasgee in twee departemente daai tyd - [in een departement] en ook in [’n ander] *ge-locum* - en deelyds met nagraadse - my dogter is in ’74 gebore - en deelyds met nagraadse studies begin. En ek moes van die begin af eers ’n honneurs doen, en toe ’n M, en toe ’n baie lang pad met ’n PhD...Dit was besonder lank gewees, want dit was alles deelyds, en ek het klein kindertjies gehad, en ek het voltyds klasgegee. So, dit was maar die *constraint* daar. Plus natuurlik dat daai tyd [by die universiteit waar ek werksaam is] was daar glad nie ’n publikasiekultuur nie...Dit was nie van ons verwag nie. Ek bedoel, daar was nie *constraints* in die sin van dat jy dit nie mag gedoen het, of so iets nie; dis doodeenvoudig: dit was nie deel van die denkpatroon nie. Veral in die departement waar ek was - ’n klomp mans met die enigste vrou: hulle het nie vreeslik gehou van die feit dat ek voedingnavorsing doen nie, so ek moes vroeg-vroeg uitspring en buitefondse kry. En dit het eintlik gemaak dat ek baie onafhanklik gewerk het, veral aan die begin: heeltemal alleen. En toe het...ander...op kampus na my toe gekom, en gesê, maar hulle sal graag nagraadse studies by my wil doen. En toe het ons ’n [navorsings]groep geleidelik opgebou: van die beste...studente getrek, buitefondse gekry, vir hulle betáál - beurse gegee uit buitefondse. En so het die [navorsings]groep toe nou maar ontstaan, en geleidelik gegroei.

1.5.1.2 *Voorkeur vir bepaalde tipes publikasie-uitsette*

- Seleksie van bepaalde publikasietipes

Baie van die goed wat ek in die afgelope paar jaar geskryf het, is *editorials*. Ek het, byvoorbeeld - vanjaar veral al, dink ek - drie *editorials* geskryf...Dit is op uitnodiging, en ek dink dit reflekteer ook ’n sekere fase in ’n mens se loopbaan. Ek is op die oomblik besig om ’n groot internasionale kongres te reël, so ek is nie so verskriklik *hands-on* met skryf, met eksperimentele werk nie. Maar deel daarvan, en ook deels omdat ek meer in bestuur as in *hands-on* navorsing is, is dat: ek het byvoorbeeld twee artikels wat nou in die pyplyn is, wat altwee eintlik oorsigte en opinie [is]. Dis alles op uitnodiging.

- Seleksie van vaktydskrifte waarin werk gepubliseer word

En dan is ek op die redaksie van [’n internasionale vaktydskrif]: taamlik jonk – ek dink hy bestaan nou ses, sewe jaar – maar hy het uitgekóm nogal met ’n taamlike hoë impakfaktor.

Ek dink wat ’n mens moet doen, is om seker te maak dat jou navorsers - en ek self ook - in ordentlike tydskrifte publiseer, met ’n impakfaktor, wat beteken dat dit nou ’n tydskrif sal wees wat jy regtig *ge-peer-review* word.

Jy kies die tydskrifte waarin jy publiseer...jy kies so goed as moontlik ’n tydskrif, wat gereflekteer word deur sy impakfaktor.

1.5.1.3 *Internasionale aard van publikasies*

- Voorkeur vir oorsese vaktydskrifte

As die internasionale mense moet kennis neem van die werk.

- Voorkeur vir plaaslike vaktydskrifte

Dis sodat Suid-Afrikaanse [vakspecialiste] die werk kan lees. Met hierdie Suid-Afrikaanse tydskrif: hy word gelees deur alle [vakspecialiste] en alle [professionele persone] wat aan [’n professionele vereniging] behoort – met ander woorde, [dié] wat belangstel in [my vakgebied]. So, as jy iets wil hê dat hierdie mense dit moet raaksien en doen, en lees, en miskien ook jou idees ’n impak op praktyk maak in Suid-Afrika, dan publiseer jy daarin. Dit is baie kere ’n oorweging.

Omdat ’n mens wil hê jou goed gelees moet word deur die Suid-Afrikaanse [professionele persone].

1.5.1.4 Voorkeur vir veelvoudige outeurskap

Twee redes: die eerste is om studente te leer – M- en D-studente – om te publiseer, so dit is hoekom hulle mede-outeurs is. En baie keer sal ek die grootste gedeelte van die artikel skryf, maar dan maak ek hulle eerste outeur. sodat hulle half...ook in die kultuur kom om...en agterkom dis glad nie so moeilik om te publiseer nie. Die ander is natuurlik ook eksperimentele werk: dat dit baie, baie selde is dat jy alleen `n eksperiment doen. Nou, dit is absoluut deel van die kultuur: jy werk saam, jy beplan as `n groep saam `n eksperiment, jy doen dit saam, jy skryf saam ook. [Spannavorsing] is een van die dinge wat ek graag doen, nou, asook as...direkteur, is om mense te leer om nie selfsugtig te wees nie: dat jy baie meer kan publiseer as jy [dit] met mede-outeurs [doen].

Ons het hier [by die universiteit waar ek werksaam is] besef om [my vakgebied] ordentlik te kan doen, moet jy uit die boks uit kom, en jy moet weer begin dink, en jy moet ander dissiplines intrek. En...dit berus byvoorbeeld daarop: die feit dat...ons in Afrika nie...probleme [in my vakgebied] oplos nie, want ons kyk te nou daarna. En dit het gemaak dat ons ons navorsing baie meer multi- en trans-dissiplinêr gedoen het; dat ons met oorsese netwerke saamwerk; dat `n mens saam dink, saam beplan - wat dan maak dat jy meer geïntegreerd werk, meer holisties kyk, en dan natuurlik dan ook baie meer medewerkers het.

1.5.1.5 Publikasies gedurende graadopleiding

Dis maar net dat, ek het lank gewerk aan die D, en ander werk gedoen, en ander studente opgelei – op daai vlak natuurlik net M-studente. Ek was die heeltid besig. En teen die tyd wat ek die D geskryf het, was die meeste van die werk waarvoor ek geskryf het, reeds gepubliseer.

1.5.2 Sienings oor publikasie

1.5.2.1 Algemeen

- Wetenskaplike publikasie

Die kultuur wat ons probeer skep, is: “Jou werk is nie klaar - jou navorsing is nie klaar - as dit nie gepubliseer is nie”. Dis nie die moeite werd om iets te doen, as jy dit nie kan deel met jou mede-navorsers wêreldwyd nie. Om dit te kán deel, moet jy publiseer; om te kán publiseer, moet jy goed beplan - moet dit hoë-kwaliteit werk wees. Dit is so half `n sirkel, nê. En dit is absoluut deel van wat ons doen, is dat alle werk moet uitloop op `n ordentlike publikasie.

- ‘Publish or perish’ in die Suid-Afrikaanse akademiese konteks

Ek dink wat `n mens moet doen, is om seker te maak dat jou navorsers - en ek self ook - in ordentlike tydskrifte publiseer, met `n impakfaktor, wat beteken dat dit `n tydskrif sal wees, wat jy regtig *ge-peer-review* word. En dit sal keer dat jy nie sommer maar net gaan publiseer om te keer dat jy nie *perish* nie.

1.5.2.2 Sienings oor onderrig en publikasie

- Die verhouding tussen onderrig en navorsing

Dis `n klagte wat `n mens vreeslik baie hoor...Dis die eerste verskoning wat mense gebruik as hulle nie publiseer nie, dat hulle sê, “Ja, maar hulle het te veel klasse”, of so aan.

Ek dink nogals by baie vrouens is dit waar. Ek sien byvoorbeeld - omdat ek nou...`n direkteur van navorsing [is]; dis self-ooreenkoms doen met al die navorsers wat in [’n bepaalde fokusarea] werk – en ek sal baie dikwels sien dat die vrouens sê vir my, maar die dryfkrag in hulle lewe, die ding wat vir hulle belangrik is: hulle wil `n goeie dosent wees. So, ek dink jy’s heeltal reg: daar is `n genderverskil. Ek het nou nog nooit so daarvoor gedink of nagevors nie, maar ek sien dit baie meer by vrouens as by mans: dat dit is vir hulle vreeslik belangrik om `n goeie dosent te wees.

- Mate waarin navorsing inwerk op onderrig (en/of omgekeerd)

Ek het álle fasette van [my vakgebied] op álle vlakke voorgraads gegee...In die proses het ek absoluut my basiese [vakkennis] totaal deel van my lewe gemaak. Ek het dit verskriklik goed verstaan, omdat ek dit aan die heel slimste tot die heel domste studente in die fakulteit moes verduidelik. En daai basis wat ek deur klasgee vir myself gelê het, het my later in my lewe, toe ek nou meer...met [’n spesifieke onderwerp] te doen gekry het op `n internasionale vlak...ek het altyd nogal vir myself gevra, “Wat bring ek tot die tafel wat gemaak het dat ek so vinnig in daai veld” – as ek die woord mag gebruik – “gevorder het?”, dan was dit miskien dat ek `n onderbou van verstaan van [my vakgebied] gehad het, wat baie van die ander mense wat in die veld is, nie gehad het nie. So, my klasgee was vir my verskriklik lekker, en dit het my loopbaan baie gehelp. Dit het my nooit gekeer om navorsing te doen nie.

- Mate waarin onderriglading die gevolg is van eie keuse of voorkeur

My eie klasgee is: ek het in [twee vakgebiede] begin, en toe voltyds aangegaan met [een vakgebied] as `n dosent. En ek het nou nogal nooit omgee om die *skivvy* te wees, as iemand byvoorbeeld nie [’n bepaalde onderwerp] daai jaar

wou gee nie, het ek dit gegee...ek het álle fasette van [my vakgebied] op álle vlakke voorgraads gegee. Ek dink ek was nogal nie 'n – as ek dit nou mag self sê – 'n slegte dosent nie; die studente het baie van my klasse gehou. En ek het ook die eerstejaars onderrigtoekenning gekry, *et cetera*...My klasgee was vir my verskriklik lekker, en dit het my loopbaan baie gehelp. Dit het my nooit gekeer om navorsing te doen nie.

1.5.4 Hooffaktore wat op publikasieproduktiwiteit ingewerk het

1.5.4.1 Algemene fasiliteerders

- Belangrikste bydraende faktore

Jy weet wat het met my gebeur, is dat ek was genooi na 'n [Suid-Afrikaanse] kongres toe...Daar het ek vir A ontmoet. Dit was hierso...o, ek dink seker omtrent 1981, of in die laat sewentigers. Hy het toe nou by dié kongres gehoor ek stel belang in [’n bepaalde onderwerp], en hy self het al hier in die vyftigerjare op [daardie onderwerp] begin werk. En toe was ons op dieselfde vliegtuig terug van Durban af Johannesburg toe, en hy’t my so ’n bietjie uitgevra, en my genooi om met hom te kom praat. En toe het hy vir my – op daai stadium het ek hoofsaaklik [’n bepaalde tipe] werk gedoen – en toe’t hy vir my omgepraat om liewers op [’n ander onderwerp] te werk. En, hy het ook vir my toe as buitestaander gesê dat my resultate beteken niks, as ek dit nie publiseer nie. So, hy was soortvan ’n mentor wat my gemotiveer het, en gewys het, “O, maar jy weet, ’n mens moet jou resultate publiseer”. En toe het ek begin om [navorsings]resultate in die internasionale literatuur te publiseer. En ek moet nou eintlik vir jou sê: ek was internasionaal bekend as gevolg van daai publikasies, lank voordat amper iemand in Suid-Afrika van my geweet het.

- Advies aan studente, of ’n nuwe personeellid, spesifiek met betrekking tot publikasieproduktiwiteit

Jy sal sien dat, een van die dinge wat ek graag doen, is om kapasiteit te skep, te deleger; om jonger mense in te kry.

Om ’n natuurwetenskaplike publikasie te skryf, is so maklik, omdat...daar’s ’n stelsel, nê. As jy logies kan dink, is dit so maklik net om die feite in te sit, mits jy die resultate het. Daar’s baie kursusse. Ons gee binne ons fokusarea aan die begin van elke jaar ’n werkwinkel om vir jongmense te leer hoe om ’n publikasie te skryf. So, daar is opleiding, daar is ’n bietjie blootstelling. Jy leer elke keer...goed, dis baie selde wat selfs top navorsers die eerste slag ’n ding net so aanvaar kry...jou *referees* gee altyd vir jou kommentaar terug: “Stel dit miskien só of só, of wat hiervan en daarvan”. Maar die grootste raad wat ek vir enigiemand kan gee om ’n publikasie te skryf, is – as ek mag lelik praat – “sit jou gat op jou stoel, en hóu hom daar”. Dis nê dissipline; dis nê dissipline.

3.2 Spesifieke faktore

- Sienings oor die kombineerbaarheid van die huwelik met ’n navorsingsberoep

Ek dink nie ek is heeltemal die norm daar nie, hoor, so...Ek is met ’n [profesionele persoon] getroud. Hy was jare lank [in ’n professionele beroep], en toe ons terugkom [na die universiteit waar ek werksaam is] toe, want...het hy later dekaan van die fakulteit geword. Hy het my geleer wat vroueregte beteken. En hy en ek [het] vyftig-vyftig na die kinders gekyk. Ons het van die begin af ’n ooreenkoms gehad.

Ons het ’n ooreenkoms byvoorbeeld gehad - ek met my departementshoof daai tyd...– die dag bestaan uit drie dele: ’n oggend, middag en aand. Ek werk twee van die dele; my man werk twee van die dele. Dit beteken: ek was in die middag by die huis vir die kinders, en hy was in die aand by die huis, want die meeste van my eksperimentele werk, byvoorbeeld – toe ek jonger was – het ek in die aand gedoen. Ek het in die oggend klasgegee; in die middag was ek by die kinders in die huis - ek het nie ’n krieket- of ’n rugby- of ’n balletding gemis nie - en dan die kinders gebad in en die bed gesit, teruggegaan laboratorium toe, en my man het verder na hulle gekyk en by die huis gesit en merk. Dit is ’n *partnership*, maar dit was baie opoffering. Maar dit was die moeite werd, want ek het twee pragtige, dierbare, oulike kinders, wat altwee baie goed gedoen het. My dogter het ’n PhD in [my vakgebied], en my seun is...ook ’n professionele. So, ons was eintlik baie gelukkig gewees.

- Institusionele faktore

daai tyd [by die universiteit waar ek werksaam is] was daar glad nie ’n publikasiekultuur nie...Dit was nie van ons verwag nie. Ek bedoel, daar was nie *constraints* in die sin van dat jy dit nie mag gedoen het, of so iets nie; dis doodeenvoudig: dit was nie deel van die denkpatroon nie. Veral in die departement waar ek was - ’n klomp mans met die enigste vrou: hulle het nie vreeslik gehou van die feit dat ek voedingnavorsing doen nie, so ek moes vroeg-vroeg uitspring en buitfondse kry. En dit het eintlik gemaak dat ek baie onafhanklik gewerk het, veral aan die begin: heeltemal alleen. En toe het...ander...op kampus na my toe gekom, en gesê, maar hulle sal graag nagraadse studies by my wil doen. En toe het ons ’n [navorsings]groep geleidelik opgebou: van die beste...studente getrek, buitfondse gekry, vir hulle betaál - beurse gegee uit buitfondse. En so het die [navorsings]groep toe nou maar ontstaan, en geleidelik gegroei.

Glad nie in die begin [fasiliterend] nie. Om jou die waarheid te sê – ek het dit al vir jou genoem – maar dit was swak bestuur. Ek het ’n vreeslike simpatieke departementshoof gehad, en ’n baie onsimpatieke dekaan (op ’n stadium), in

die sin van: dat die dekaan wou gehad het dat ek my navorsing moes gaan doen by [’n ander departement]. En ek het aangehou: ek wil graag [my] navorsing in [hierdie departement] doen...En ek is aange...daar is vir my gesê dat die universiteit dit nie sal ondersteun nie. En dit het my gedwing om buitefondse te gaan soek. En die onsimpatieke dekaan het later ’n taamlike onsimpatieke rektor geword, wat my gedwing het, en vir my letterlik *via* die volgende dekaan gesê het, as ek nie die [ander departement] gaan oorneem, en ’n navorsingskultuur stig en hulle bestuur nie, kan ek van bevordering vergeet. Met ander woorde, ek is afgepers om my navorsing soortvan te los, om in ’n bestuursposisie in te kom. Wat ek wel reggekry het, is om die navorsing nié te los nie, maar om ’n navorsingsgroep groter te maak en uit te brei en te ontwikkel. En toe die universiteit die besluit om fokusareas te stig, het hulle vir die eerste keer gaan kyk wie is die produktiewe navorsers. En toe het hulle [my vakgebied] en myself geïdentifiseer, en ek het...direkteur geword - wat nog ’n erger bestuursposisie was - maar van toe af baie goeie ondersteuning van die universiteit gekry.

- Integrasie in die akademiese navorsingsgemeenskap

Jy weet wat het met my gebeur, is dat ek was genooi na ’n [Suid-Afrikaanse] kongres toe...Daar het ek vir A ontmoet. Dit was hierso...o, ek dink seker omtrent 1981, of in die laat sewentigers. Hy het toe nou by dié kongres gehoor ek stel belang in [’n bepaalde onderwerp], en hy self het al hier in die vyftigerjare op [daardie onderwerp] begin werk. En toe was ons op dieselfde vliegtuig terug van Durban af Johannesburg toe, en hy’t my so ’n bietjie uitgevra, en my genooi om met hom te kom praat. En toe het hy vir my – op daai stadium het ek hoofsaaklik [’n bepaalde tipe] werk gedoen – en toe’t hy vir my omgepraat om liewers op [’n ander onderwerp] te werk. En, hy het ook vir my toe as buitestaander gesê dat my resultate beteken niks, as ek dit nie publiseer nie. So, hy was soortvan ’n mentor wat my gemotiveer het, en gewys het, “O, maar jy weet, ’n mens moet jou resultate publiseer”. En toe het ek begin om [navorsings]resultate in die internasionale literatuur te publiseer.

In my eie vakgebied...dis nogal een van die artikels wat ek geskryf het op...uitnodiging...Ons het hier [by die universiteit waar ek werksaam is] besef om [my vakgebied] ordentlik te kan doen, moet jy uit die boks uit kom, en jy moet weer begin dink, en jy moet ander dissiplines intrek. En...dit berus byvoorbeeld daarop: die feit dat...ons in Afrika nie...probleme [in my vakgebied] oplos nie, want ons kyk te nou daarna. En dit het gemaak dat ons ons navorsing baie meer multi- en trans-dissiplinêr gedoen het; dat ons met oorsese netwerke saamwerk; dat ’n mens saam dink, saam beplan - wat dan maak dat jy meer geïntegreerd werk, meer holisties kyk, en dan natuurlik dan ook baie meer medewerkers het.

- Tydsbestuur

Ek werk kantoor-ure, en ek werk gewoonlik Saterdag ten minste die helfte van die dag; Sondag ten minste helfte van die dag. Ek lees graag, so die meeste van my leeswerk doen ek in die aande by die huis. En dan, as ek ’n D-datum het wat ek iets moet skryf, sal ek half ’n nag deurwerk, of so iets. Ja, dit is maar soos dit gaan. Maar baie van my verskriklik vas wees, en lang ure op die oomblik, het te doen met die internasionale konferensie. Dit behoort nou beter te gaan.

- Gender-diskriminasie

In die departement waar ek was - ’n klomp mans met die enigste vrou: hulle het nie vreeslik gehou van die feit dat ek voedingnavorsing doen nie, so ek moes vroeg-vroeg uitspring en buitefondse kry. En dit het eintlik gemaak dat ek baie onafhanklik gewerk het, veral aan die begin: heeltemal alleen.

1.5.4 **Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit**

1.5.4.1 *Die verenigbaarheid van ouerskap met ’n navorsingsberoep*

[My man] en ek [het] vyftig-vyftig na die kinders gekyk. Ons het van die begin af ’n ooreenkoms gehad.

Ons het ’n ooreenkoms byvoorbeeld gehad - ek met my departementshoof daai tyd...– die dag bestaan uit drie dele: ’n oggend, middag en aand. Ek werk twee van die dele; my man werk twee van die dele. Dit beteken: ek was in die middag by die huis vir die kinders, en hy was in die aande by die huis, want die meeste van my eksperimentele werk, byvoorbeeld – toe ek jonger was – het ek in die aand gedoen. Ek het in die oggend klasgegee; in die middag was ek by die kinders in die huis - ek het nie ’n krieket- of ’n rugby- of ’n balletding gemis nie - en dan die kinders gebad in en die bed gesit, teruggegaan laboratorium toe, en my man het verder na hulle gekyk en by die huis gesit en merk. Dit is ’n *partnership*, maar dit was baie opofferend. Maar dit was die moeite werd, want ek het twee pragtige, dierbare, oulike kinders, wat altwee baie goed gedoen het. My dogter het ’n PhD in [my vakgebied], en my seun is...ook ’n professionele. So, ons was eintlik baie gelukkig gewees.

1.5.4.2 *Inwerking van ouerskap op publikasieproduktiwiteit*

Weet jy, ek wil nie sê dis **moeilik** nie...dit was nie rêrig moeilik nie. Maar, ek bedoel dit was meer ingewikkeld as gewoonlik...Maar ek kan nie eintlik sê dit was moeilik nie – dat ’n mens net meer vas is, nê.

Kom ek sê dit vir jou só: ek het in my loopbaan taamlike aantreklik *offers* gekry, nê. Die een was 'n professoraat by [‘n Suid-Afrikaanse universiteit], die een was 'n professoraat by 'n oorsese universiteit, en die ander een was 'n direkteurskap by 'n oorsese universiteit, en die ander een was 'n uitnodiging vir 'n direkteurskap by 'n ander...ek dink maar net aan die vier, waar ek eintlik *ge-headhunt* is vir 'n seker posisie, nê. Ek dink ek het in twee van hulle het ek gesê ek kan nie kom nie, want my man is 'n akademikus, wat hulle gesê het, ek moenie *worry* nie – hulle sal plek maak vir hom ook op die staf. Maar by al vier moes ek nee sê, as gevolg van my gesin...As ek 'n meer dink ek assertiewe, feministiese vrou was, sou ek miskien vir die familie gesê het...Ek dink wat 'n mens doen, is jy maak 'n lysie van die *pro's* en die *con's*, en jy besluit, OK. En dan my geslag - jy moet onthou, ek is nou 62 – my geslag het nie eintlik grootgeword dat 'n getroude vrou so assertief kan wees nie. Alhoewel ek grootgeword het in 'n gesin met 'n baie sterk ma, want my ma was op 'n stadium Suid-Afrikaanse president van [‘n nasionale vereniging] en vise-president van die Afrikagroep. My ma en pa het baie - ek onthou hier in die sestigerjare – baie oorsee gegaan en so aan. En sy's 'n hoogs intelligente vrou. Maar ten spyte daarvan, was daar een baas in die huis, nê. Ek dink 'n mens het nou maar so grootgeword. Dis miskien ook die rede hoekom ek nie vreeslike feministiese bakleiery op die kampus ook aan die gang gesit het nie - net stilgebly en my *job* gedoen.

1.5.4.3 *Hanteringsmeganismes*

[My man] en ek [het] vyftig-vyftig na die kinders gekyk. Ons het van die begin af 'n ooreenkoms gehad...Dit is 'n *partnership*.

Ons was vreeslik gelukkig: ons bly binne loopafstand van die kampus; ons bly tussen die universiteit en [‘n hoërskool]. Die kinders kon skool toe loop en universiteit toe loop; ons loop altwee werk toe. Ons en die kinders kon altyd etenstyd middagete almal huis toe kom en om 'n tafel sit en lekker gesels en so.

Weet jy, ek het altyd 'n goeie ousie gehad...Sy't verskriklik lank by my gewerk. Heerlik gekook. So, dit is hoekom ons altyd etenstyd kon huis toe gaan. Maar sy't haarself afgetree, en vir my 'n plaasvervanger gebring, en toe is sy – nie lank daarna – is sy oorlede.

1.5.4.4 *Moeilikste stadium*

Weet jy, ek wil nie sê dis **moeilik** nie, maar goed, my man het self gaan nagraadse studies, navorsing, doen in Europa, wat hy 'n lang ruk van die huis af weg was, wat ek alleen was. Ons het besluit dat ek en die kinders hier bly. Maar dit was nie rêrig moeilik nie. Maar, ek bedoel dit was meer ingewikkeld as gewoonlik. En miskien toe ek...terwyl ek besig was om proefskrif te skryf. Maar ek kan nie eintlik sê dit was moeilik nie – dat 'n mens net meer vas is, nê.

1.6 Linda

1.6.1 **Tendense in beroeps- of 'leef tyd' publikasierekord**

1.6.1.1 *Variasies oor tyd in uitsetvolume*

Dit hou baie direk verband met my gender, want kort nadat ek my [meestersgraad] gekry het, het ek dadelik begin werk as lektor, en ek het nooit opgehou nie. Ek het aangegaan, deurgaans terwyl ek my kinders gehad het...My kinders is gebore vroeg in die tagtigerjare, en daai stadium het ek ook nog gewerk aan my proefskrif, wat ek in [die laat tagtigerjare] klaargemaak het. So, dit hou direk daarmee verband: dat ek gewerk het aan die proefskrif, en dat ek klein kindertjies gehad het. Toe ek my proefskrif afgehandel het, toe kon ek begin, as't ware. So, daar was 'n tydperk wat ek nie gepubliseer het nie, om daai rede...Dit is baie duidelik, as ek nou kyk - want ek sien ook nou baie, uit die aard van my werk en so aan, sien ek baie ander CV's - en jy sien dit glad nie by mans nie. Ek het dit ook nie by my kollegas opgemerk nie. En die snaakse ding is dat...om een of ander rede slaag jy daarin om dan, as jy later dan nou wel begin - en jy het meer ruimte, en die aard van jou omstandighede is só dat jy meer kan werk - dat jy eintlik tog inhaal by hulle.

Ek dink een van die groot goed wat veroorsaak het dat ek byvoorbeeld nie gepubliseer het in daai tyd nie, is ook die werk aan die proefskrif. As jy met 'n proefskrif klaar is: dit het ook 'n baie groot effek. By my het die skryf van die proefskrif en my kinders se babadae saamgegaan, wat baie moeilik was by tye; dit is nogal uitputtend. Ek dink die oomblik wat jy klaar is met 'n proefskrif, en jy wil graag kinders hê, doen dit dan. Jy sal waarskynlik vind dat dit vir jou makliker is om dit te hanteer, al neem jou loopbaan 'n bietjie stadiger...trek hy stadiger weg, kan jy...jy bou 'n soort van 'n fondament waarop jy later, as jou kinders vryer is, baie sterker op kan bou. Ek het nooit eintlik 'n vreeslike soort van 'n wrok daaroor dat ek nie van die begin af soos my manlike kollegas kon aangaan nie – vir wie daar altyd 'n soort van 'n omgewing geskep is, waarin hulle op hulle beste kon funksioneer nie. Dit is vir my doodgewoon iets wat ek...dit is maar *how life is*...My man het ook opofferinge gemaak, sodat ons saam kan bly, en saam kan kinders hê. Ek het dit nie *unequitable* gevind - eintlik nie.

Ek het dit doodeenvoudig, wat die kinders en die proefskrif betref, so aanvaar dat ek maar vanaf die, sê nou maar 1989, '90, eintlik eers werklik kon begin om te bou aan my loopbaan.

1.6.1.2 *Voorkeur vir bepaalde tipes publikasie-uitsette*

- Seleksie van bepaalde publikasietipes

Ek spring nou so `n bietjie in die rigting van die soort publikasies wat `n mens doen, en die hele kwessie van die geld wat jy kan verdien met navorsingspublikasies; dat die navorsingskomitee jou nou in hierdie stadium R8 000 gee van die R70 000 wat hulle verdien; en dat jy dit kan verdien deur in geakkrediteerde tydskrifte te publiseer. My persoonlike opvatting daarvoor is dat: dit is redelik nuttig, maar dat dit nogal `n growwe instrument is. Dit is slégs geakkrediteerde tydskrifte. Hulle kyk nie na die gehalte - die relatiewe gehalte - van die tydskrifte nie. Hulle sal byvoorbeeld ook nie oorweeg opstelle, of artikels wat gepubliseer is in hierdie huldigingsbundels nie, of in boeke nie. Dit tel veel minder as die artikels, om een of ander rede. Ek dink dit is eintlik die patroon wat kom vanuit die natuurwetenskappe. As ek nou op daai navorsingskomitee sit, praat ek eintlik soveel as moontlik oor die feit dat `n mens daai instrument `n bietjie behoort te probeer verfyn, want veral in die geesteswetenskappe is publikasie in boeke - `n hoofstuk in `n boek - is nogal redelik belangrik, en partymaal belangriker as `n tydskrifartikel; of selfs die publikasie van `n boek, wat eintlik nie in die natuurwetenskappe `n vreeslike ding is nie. Dit nou alles gesê, voel ek uiteindelik dat op die ou end stel jy vir jousef `n standaard - aak nie saak of die Unversiteit, of die NRF, of wie ook al nou vir jou nou soveel geld of soveel erkenning, of wat ook al gee nie - jy stel vir jou `n soortvan `n persoonlike standaard en as jy nou sê, "Kyk, ek gaan nou in dié boek publiseer, ek weet ek gaan nie geld kry daarvoor nie, maar dit is vir my persoonlik belangrik - vir my persoonlike soortvan wetenskaplike integriteit; vir die handhawing van my eie soortvan standarde - dit is vir my belangrik". Ek voel `n mens moet ook daardie soortvan *flexibility* in jousef hê: jy moet maar die goed gebruik, soos hulle beskikbaar kom, maar ek dink nie jy moet jou absoluut laat lei daardeur nie, of laat *fool* ook daardeur nie, of laat mislei daardeur nie. Jy moet eintlik vir jousef `n soortvan `n instrument ontwikkel, wat jy weet, "Kyk, hier het ek nou regtig iets goed geskryf, en daar het ek iets minder goed geskryf. Maak nie saak wat wie daarvan sê nie". Ek dink daai ding - daai persoonlike waardestelsel wat jy vir jousef ontwikkel - is nogal `n baie belangrike een.

Ek dink deel van my vakgebied is eintlik iets soos [and publikasietipes] skryf as't ware alles voorstudies wat jy kan doen vir dinge wat jy later artikels, of meer wetenskaplike studies van kan maak. Dis ook deel van hoe jy eintlik jou hele reputasie...opbou. As jy gevra word vir [daardie publikasies], beteken dit daar word waarde geheg aan jou opinie, en so aan.

- Seleksie van vaktydskrifte waarin werk gepubliseer word

Daar is enkeles...wat baie intensief gebruik word. [Een plaaslike vaktydskrif] is die een wat `n baie konsekwente publikasiegeskiedenis het, wat vreeslik baie geraadpleeg word deur ander [vakspesialiste] en studente. Dan is daar ook [`n ander plaaslike vaktydskrif], waarin ek soms publiseer. Hy het `n bietjie van `n op-en-af geskiedenis; hy is nie so sistematies soos [eersgenoemde] nie. Dan is daar [nog `n plaaslike vaktydskrif]: hy het vir `n tyd lank gaan stilstaan, toe daar nou nie goed verskyn nie, en dan is daar [`n vierde plaaslike vaktydskrif]. So, daar is eintlik daai vier. En [eersgenoemde] is die een wat, soortvan die oomblik wat jy daarin skryf, dan weet jy almal het dit gelees...Dit is wel `n belangrike faktor: jou vakgenote en studente, en so aan, weet dan van die werk.

1.6.1.3 *Internasionale aard van publikasies*

Dit het baie te doen met die vak...dit het heelwat te doen met die vak in dié sin dat `n mens...jy is deur die...omgewing beperk. Wat ek eintlik vanaf die vroeë negentigers doen, is om na internasionale kongresse te gaan. My punt is dat `n mens binne die internasionale konteks kan jy heelwat...ek bedoel, daar is `n belangstelling in [spesifieke onderwerpe], ensovoorts. Vanaf die negentigerjare is daar `n soortvan `n baie breër belangstelling in [my vakgebied] in die breë. By die internasionale kongresse kan jy oor [`n verskeidenheid onderwerpe], of wat ook al, kan jy maar praat binne `n internasionale forum. En dit doen ek heelwat, en ek probeer dan ook publiseer daar. Maar nou het jy ook hierdie ander verantwoordelikheid binne die Afrikaanse konteks: as jy al jou werk net in Engels gaan publiseer in die buiteland, dan voer jy nie in in die Afrikaanse wetenskapsisteem. Veral in iets soos [my vakgebied] is dit nog meer belangrik om dit te doen as enigiets anders. So, daar sit `n mens met daardie soortvan kwessie, of `n keuse wat jy moet maak, en ek dink dikwels kies ek daarvoor om binne die Afrikaanse konteks, of selfs Suid-Afrikaanse Engels te publiseer, sodat die werk dan juis hiér bekend kan wees, waar dit die meeste impak het...Ek dink `n mens moet ook vir jou eintlik deur daardie soortvan faktore moet jy tog vir jou laat lei: waar wil jy hê dit moet impak hê. Dit lyk miskien nou vir die NRF mooier as dit in `n internasionale tydskrif is, maar ek plaas ook `n bietjie van `n vraagteken agter 'internasionaal', want as ek in `n Nederlandse tydskrif publiseer, is dit internasionaal? Of as ek in `n Zimbabwese tydskrif publiseer...dit is die term internasionaal...`n mens moet miskien kyk na wat is die soortvan verspreiding van `n tydskrif, voordat jy sê dit is internasionaal.

Ek het byvoorbeeld `n hele paar hoofstukke in boeke, wat sê nou maar oorsee verskyn, en dan weet mense nie eintlik van daai goed nie, want dis nie so op die *circuit* nie. Jy moet eintlik die hele tyd daai spel speel, daai balans probeer hou.

1.6.1.4 *Veelvoudige outeurskap: voorkeur vir solo-publikasies*

Dit het `n bietjie te doen met die dissipline, dit het `n bietjie te doen met die persoonlikheid, dit het `n bietjie te doen met `n keuse. En ek weet daar maak ek miskien `n fout. Daar was al heelwat publikasies gewees uit tesisse en proefskrifte wat ek gelei het, maar wat ek myself nie as `n mede-outeur aangee nie, omdat ek voel dat die werk wat daar gedoen word – die grootste deel van daai werk – is eintlik die persoon s`n. Ek sal byvoorbeeld ook nie iemand adviseer waar ek geweldig baie, soveel moes insit, dat ek voel dit is my werk, of soveel daarvan is my werk - ek sal nie so `n persoon adviseer om te publiseer nie, want dan is die tesis gewoonlik nie vir my so goed nie. Sodat dié wat wel publiseer...goed, ek het wel `n rol gespeel, en so aan, maar ek voel nie ek het dit geskrýf nie. En dit is miskien nou vir myself...ek kon nou meer publikasies op my kerfstok gehad het, maar dis nie vir my belangrik nie. So, dit is `n keuse wat ek maak – miskien nie `n goeie keuse nie – maar dit is een wat ek mee kan saamleef. Ek voel dat daardie mense behoort die volle krediet te kry vir wat hulle publiseer. En dié wat publiseer uit hulle proefskrifte, het gewoonlik dan tot op `n groot hoogte dit self gedoen. Maar dit is wel so dat daar in ons omgewing nie soveel spanwerk gedoen word nie, en dit is miskien `n tekortkoming waaraan ons kan werk...Dit is moeilik om te doen. Jy sal heel spesifieke soorte navorsing kan doen waarin jy miskien as `n span kan werk. Ek en [’n vroue-vakgenoot] het wel `n [versamelwerk] gedoen, waar twee mense se oordeel is `n baie goeie ding, as jy soortvan `n [versamelwerk] maak. In daai opsig is dit `n natuurlike, en is dit `n effektiewe ding. Ek weet nie of dit so effektief sal wees - die spanwerk - as ek die ander soort navorsing doen nie. Dit sal miskien die navorsing stadiger maak, of lomper. Ons vra gewoonlik kollegas om te lees wat jy geskryf het, daai soortvan ding: “Lees dit en lewer vir my kommentaar”. Dít doen ons heelwat vir mekaar, maar dan is jy nie `n *co-author* nie. Dit is `n bietjie van `n solo proses – meer so as by natuurwetenskappe.

1.6.2 **Sienings oor publikasie**

1.6.2.1 *Algemeen*

- **Wetenskaplike publikasie**

Ek dink vanuit `n institusionele oogpunt sou `n mens kon sê, dit mag wees dat vroue sê nou maar nie altyd sulke strategiese besluite neem nie, maar ek dink ook `n mens moet soortvan die institusies bevraagteken: die prosedure waarvolgens hulle jou waarde skat, en al daai soortvan goed. En dit is miskien iets wat `n mens in die geesteswetenskappe gemakliker doen as in die ander...`n Mens moet kyk na die prosedures waarmee hulle hierdie NRF graderings, daai soortvan goed...Dit is wat ek ook dink is belangrik vir `n wetenskaplike: waarmee as’t ware soortvan persoonlik vir jouself `n standaard – en ek dink, `n hoë standaard – moet probeer aankweek, sodat jy ook hierdie institusionele tel-instrumente, of meetinstrumente, kan bevraagteken. Dat jy nie moet dink jy’s wonderlik as jy `n gradering kry, of `n toekenning, of wat ook al nie. Jy moet die hele tyd ook daai goed - daai meganismes - bevraagteken. Vir my, persoonlik, as `n navorser: as ek myself nie tevrede stel nie, dan kan hulle maar vir my blomme gee, en hoedjies, en koek...Jou eie oordeel wat jy natuurlik ook aan jou *peers*...jy moet self krities bly. Absoluut.

- **‘Publish or perish’ in die Suid-Afrikaanse akademiese konteks**

Ek het nogal `n gevoel oor die hele akademiese beroep: dat die handhawing van `n sekere soortvan integriteit is eintlik belangriker as die getalle...`n soortvan `n integriteit en `n standaard wat jy eintlik vir jouself stel, wat vir jou persoonlik belangrik is...op die ou end stel jy vir jouself `n standaard.

1.6.2.2 *Sienings oor onderrig en publikasie*

- **Die verhouding tussen onderrig en navorsing**

Ek voel met daardie ding praat ek nogal baie by die navorsingsvergaderings – dis mos eindeloos - al hierdie byeenkomste. Een van die goed wat vir my problematies bly, is dat – en hulle probeer dit vir my verduidelik – sommige mense dink dat dié mense wat goeie navorsers is, moet toegelaat word om net navorsing te doen - meer navorsing te doen – en dié wat verkies om onderrig te doen, moet onderrig doen. My siening is dat...omdat navorsing so belangrik is vir jou akademiese loopbaan – vir bevordering, vir al die goed – voel ek dat almal `n gelyke geleentheid moet kry: dat daar `n soortvan `n regverdigheid moet wees, of `n regverdige verdeling moet wees, tussen navorsing en onderrig. Dit is veral die groot navorsers wat sê, “As daar mense is wat net wil onderrig doen, laat hulle dit doen”. My gevoel is dat `n akademiese pakket – of jou loopbaan – bestaan uit navorsing, onderrig en gemeenskapsdiens. Jy kan nie mense...en dis nou weer `n gevoel van regverdigheid, dit is miskien nie die manier waarop jy die maksimum geld uit jou mense kan haal nie – maar ek voel elkeen moet die geleentheid kry om genoeg navorsingsgeleentheid te kry, en dat hulle nie – en ek is al kwalik geneem omdat ek die woord gemarginaliseer gebruik het – maar hulle moenie gemarginaliseer word nie in die rigting van net onderrig nie. En daar gebruik ek die term “gemarginaliseer” in die sin dat, navorsing is beslis die ding wat by bevordering en aanstelling die grootste gewig tel. Oor en oor en oor sien ek dit.

Dit is iets waarmee jy worstel tot die dag wat jy aftree, en daarna, is hoeveel tyd moet jy aan wat bestee...dit vat `n tyd, voordat jy uiteindelik daai balans reg het. Jy kry eintlik dit nooit reg nie. Jy's die hele tyd besig daarmee.

- Mate waarin navorsing 'n invloed het op onderrig, en/of omgekeerd

Jy kan nie `n goeie navorsers wees sonder dat jy onderrig gee nie. En die navorsing doen ontsettend baie vir jou onderrig.

Ek besef dat ek uit die onderrig ook heelwat kry, wat my navorsing stimuleer.

Maar ook weer vind ek natuurlik dat al hierdie goed wat jy doen, werk saam. As jy eksaminering doen, dan leer jy nogal baie daaruit. Ek dink dit is baie belangrik om dit te doen, en die stof wat jy eksamineer: dit is dinge waaruit jy goed leer, en so aan.

- Vergelyking van eie onderrigglading met dié van ander kollegas

Daar was in die tagtigerjare was daar soortvan die neiging, en toe, toe ons – ek en van my ander kollegas; dit is ook nou manlik en vroulik – nog jonk was, het ons ons so `n bietjie laat intimideer om meer onderrig te doen. Ek het nog altyd `n redelike swaar las onderrig gedra.

- Mate waarin onderrigglading die gevolg is van eie keuse of voorkeur

Aan die een kant gee ek nie om [om `n redelike swaar onderriglas te dra] nie, want ek hou daarvan: dis vir my lekker om dit te doen, en ek besef dat ek uit die onderrig ook heelwat kry, wat my navorsing stimuleer. Maar by ons...daar was so `n stadium - dink ek hier in die laat tagtigs, begin negentigs - was daar so `n bietjie van `n paleisrevolusie, en van toe af is die benadering eintlik om dit so gelyk moontlik te verdeel: dat die een nie meer as die ander doen nie. Die probleem is net dat sommige van ons – ek en so een of twee ander – het baie nagraadse werk, en om dít gebalanseer te kry met die voorgaads: dis `n bietjie van `n probleem. Jy werk nou as't ware al die lesings uit tot by honneurs dat dit eweredig is, maar dan vergeet mense jy't nog al die...ek eksamineer baie. Hier is nou weer soortvan drie wat hier lê, en dis `n helse lot werk. Maar ook weer vind ek natuurlik dat al hierdie goed wat jy doen, werk saam.

1.6.3 Motivering vir publikasie

Dis baie moeilik eintlik om te sê of daar `n spesifieke...Ek dink dis eintlik `n persoonlike soortvan `n passie vir die vakgebied...Dit is miskien meer dít as enigiets...dis waarom ek ook nogal `n hoë waardering vir, of `n hoë waarde stel op persoonlike maatstawwe - of `n kritiese kyk na jouself, en `n kritiese kyk na die sisteem wat jou beloon of nie beloon nie - dat ek eintlik voel iets soos `n soortvan `n integriteit wat jy self handhaaf, is belangrik.

1.6.4 Hoofkategorie wat op publikasieproduktiwiteit ingewerk het

1.6.4.1 Algemene fasiliteerders

- Belangrikste bydraende faktore

Dit is omdat ek baie van die vak hou, en dit is my belangstelling en my stokperdjie- en ook my vak, gelukkig - eerder dat ek sê daar is `n spesifieke persoon, of `n institusionele faktor wat my gehelp het...Jy sou een of twee mense langs die pad kry. Ek het nie soveel gehad - persone. Dit is maar soortvan *peers* wat by ander universiteite is, of in jou vakgebied; nie seniors nie: meer jou *peers*, jou tydgenote met wie jy interessante gesprekke kon voer, of wat vir jou inspirerend was, of iets van die aard.

- Advies aan studente, of 'n nuwe personeellid, spesifiek in verband met publikasieproduktiwiteit

Die ding is dat: dit verg natuurlik meer van jou tyd om voor te berei vir onderrig as jy pas begin. As jy al twintig jaar klasgee, dan ken jy kortpaaie; jy het sekere ondervinding, en jy het sekere materiaal. [In my vakgebied] is dit `n bietjie moeiliker, omdat ons gedurig met nuwe [inhoud] werk. Maar ek dink jy moet as `n jong dosent jouself versoen daarmee dat jy nie onmiddellik die midde weg gaan vind nie. Dit is iets waarmee jy worstel tot die dag wat jy aftree, en daarna, is hoeveel tyd moet jy aan wat bestee. Maar ek dink daar kan `n mens jong dosente as't ware help, as jy as ouer dosent, of as daar `n *mentoring*-stelsel is, dan sal ek sê, "Hoor hierso, gaan na daai kongres toe. En berei jou nou voor daarop". Dat `n mens nie inglip in die modus dat jy net een van die twee doen nie – net navorsing of onderrig nie, of dat jy só konsentreer op jou onderrig, dat jy nooit by die navorsing uitkom nie. Ek dink daar moet soortvan aanmoedigings wees, en as jy `n mentor kan hê wat vir jou sê, "Kom, ons gaan nou na dié kongres toe. Gaan saam. En binne drie weke moet daai referaat klaar wees, so dan moet jy jou goed só balanseer, dat jy dit regkry". Ek dink jy moet vir jou maar versoen daarmee: dit vat `n tyd voordat jy uiteindelik daai balans reg het.

- Advies aan jong vroue personeellede in besonder, spesifiek in verband met publikasieproduktiwiteit

Ek dink die oomblik wat jy klaar is met `n proefskrif, en jy wil graag kinders hê, doen dit dan. Jy sal waarskynlik vind dat dit vir jou makliker is om dit te hanteer, al neem jou loopbaan `n bietjie stadiger...trek hy stadiger weg, kan jy...jy bou `n soortvan `n fondament waarop jy later, as jou kinders vryer is, baie sterker op kan bou.

1.6.4.2 Algemene hindernisse

Ek dink dit het te doen gehad met persoonlikhede, en met `n sekere soort atmosfeer wat in die tagtigs geheers het (wat jy nou nie sal ondervind nie). In die tagtigerjare was daar eintlik nie soveel aanmoediging vir jong dosente...of aanmoediging en ondersteuning vir jong dosente en jong navorsers nie. Ek het byvoorbeeld...in [my vakgebied] het ons professore gehad wat nie eintlik kongresse bygewoon het nie, of wat jou nooit aangemoedig het om dit te doen nie, of wat nie vir jou `n voorbeeld gestel in daai opsig nie. Ek dink net oor die algemeen in daardie jare – ek weet nie of dit in die ander vakke anders was nie...ek dink nie dit was net eie aan [die universiteit waar ek werksaam is] nie - jy's nie eintlik vreeslik gementor nie. Daar is nie vir jou as `n jong persoon gesê: “Dit sal goed wees om hierdie kongres by te woon, of daardie kongres by te woon” nie. Die internasionale kongresse, die internasionale forums, was natuurlik ook `n bietjie meer toe in die tagtigs. Dit het ook te doen met die politieke omstandighede van die tagtigs. So, vir my het daai goed saamgeval: `n akademiese *establishment* wat nie baie ingestel was op die ontwikkeling van jong dosente, of soveel daarop ingestel was as nou nie.

Dit is meer `n algemene soortvan `n gebrek aan akademiese leiding, of *mentoring*, aanmoediging, wat tipies was van die tagtigerjare. Jy moes maar jou eie ding doen; jy moes jou eie pad vind. In sekere opsigte is dit miskien goed:...*you become streetwise*, maar dit kan jou baie help as iemand jou lei. Dit het vir my saamgeval met die periode waar ek gewerk het aan my proefskrif, en waarin ek nou die klein kindertjies gehad het. Ek weet nou nie: miskien was dit positief.

Terugskouend sou ek sê dat ek tog wens dat ek sê nou maar in die tagtigerjare `n bietjie meer blootgestel is...of ingelig is, ingelei is, in die werkinge van `n akademiese loopbaan. Ons het eintlik geen inligting, geen toeligtig, voorligting, gekry nie. Dis doodgewoon: “Jy's `n dosent en gee klas en kry klaar. Doen jou proefskrif. Kry klaar”. En dit is `n proses waardeur jy self maar die ondersoek moet doen, of self moes uitvind wat jy moes doen. Meer ondersteuning in daardie opsig. Ek sê nie dat ek byvoorbeeld dan vroeër meer sal publiseer nie, maar miskien sou ek dan net miskien meer effektief kon wees toe ek begin het. Die feit dat jy self soek daarna, help wel, het tog `n voordeel, in die sin dat jy ontdek goed vir jousef, maar baie van hierdie goed kan iemand maar vir jou sê. En ek dink die atmosfeer word deesdae geskep dat mense meer ondersteun word. Maar in die tagtigerjare was dit nie daar nie. En ek dink dit sou tog vir my gehelp het. As ek terugdink daaraan, dink ek ek sou dit nogal waardeer.

1.6.4.3 Spesifieke faktore

- Sienings oor die kombineerbaarheid van die huwelik met `n navorsingsberoep

Wat ek wel wil sê, is dat ek dink deesdae is die situasie vir mans anders as wat dit in die tagtigerjare was, want van my kollegas, weet ek - wat net so oud soos ek was destyds - het vroue gehad wat by die huis gebly het en kinders opgepas het, en eintlik vir hulle in staat gestel het om produktief te wees. Ek bedoel, dit is daardie vroue se besluit, en...dis een of ander *trade-off*, waarskynlik, wat `n mens daar vind. Byvoorbeeld, vir my: my man het ook gewerk; vir hom:...ek dink sy omstandighede was ook beïnvloed deur die feit dat ek gewerk het. Maar ek het tog wel, sou ek sê, die groter deel van die kindersorg gedra, alhoewel hy het dit vir my baie maklik gemaak - toe hulle nou so vyf, ses jaar oud is - om toe te begin produktief raak. En ek dink dit het daarmee te doen as jy soortvan in `n verhouding is waar jy ruimte kry, en so aan...as jy stabiele omstandighede het, dan kan jy goed funksioneer; dan kan jy goed werk.

- Institusionele faktore

In die tagtigerjare, selfs die begin negentigerjare, was daar nie so `n akute bewustheid van publikasieproduktiwiteit nie - of nie van so `n aard, dat ek eintlik baie sterk bewus was daarvan nie. Dit het hier in die, sê nou maar so hier '92, '93 - dink ek - het dit binne die departement en ook binne die institusie soortvan `n prioriteit begin word, het ek gevoel (ek weet nie of ek dit verkeerd gelees het nie).

Dit is hoe ek dit ervaar het, en dat dit eintlik toegeneem het, en dat ek al hoe meer bewus raak daarvan, veral in die laaste paar jaar – vier, vyf jaar – dat hulle toenemend probeer om mense wat wil navorsing doen, te ondersteun. Die ondersteuning raak al hoe beter. Dit is natuurlik omdat hulle weet dat hulle kan geld maak daaruit; dit is doodgewoon omdat jy vir hulle met elke artikel soveel geld inbring.

Die institusioneel het **geleidelik** vir my meer ondersteuning begin gee, om te doen wat ek wil doen. Ek het so half die gevoel ek sal dit maar in elk geval doen - of hulle nou vir my wil help of nie. As jy soortvan `n plesier in jou vak het, doen jy dit in elk geval.

- Tydsbestuur

Dit is een van die moeilikste goed om reg te kry, veral as jy 'n voorsitter is. Ek is van einde verlede jaar af nie meer voorsitter nie. Ek het dit nou vir 'n driejaar-periode gedoen, en dit was vir my baie moeilik, omdat die voorsitterskap is geneig om - dit maak nie saak hoe jy jou tyd beplan nie - dit is net geneig om soortvan soos 'n amoeba te groei; dit groei en groei. En daar neem ek nogal die universiteit, en die bestuur van die universiteit, kwalik. Hulle is bestuurders, en hulle neem nie in ag dat departementele voorsitters is bestuurders én dosente én navorsers nie. So, hulle dink voorsitters het 24 uur van die dag tyd om te bestuur, terwyl jy kan nie. Jy moet 'n sekere periode van die dag moet jy daaraan wy, en dan moet jy ook onderrig gee – en ek het dieselfde onderriglas as al die ander gehad – en jy moet navorsing doen. En ek het gevind, as ek probeer om byvoorbeeld my dag in te deel, deur te sê, “Kyk, ek gaan tot 11 uur gaan ek net voorsitterswerk doen, en van 11 uur tot 3 uur gaan ek net onderrig gee, en van 3 uur tot 12 uur vannag navorsing”: dis te rigied. Jy moet baie meer *flexible* wees, en jy moet besluit: vandag het hierdie voorsitters-*job* nou ses ure nodig, en ek sal dit daaraan gee, maar dan gaan ek môre niks daaraan gee nie. Ek het net agtergekom dat dit is maar hoe dit vir my die beste werk: is dat jy jou laat lei deur deur die situasie, soos wat hy in daai stadium is. En as ek byvoorbeeld na 'n kongres toe moet gaan, en ek moet 'n referaat doen, dan skaal ek die voorsitterswerk af. En as daar dan iets bly lê: ek sal baie makliker iets as 'n voorsitter agterweë laat, as wat ek dit as 'n dosent, of as 'n navorser doen...Alhoewel, ek het soortvan daardie ou, Calvinistiese werksetiek: as dit gedoen moet word, dan moet dit gedoen word; veral: jy voel 'n verantwoordelikheid teenoor jou departement. Maar soms voel jy net: maar dit is die *limit*; hulle kan nie nog en nog nie. En al die voorsitters kla daarvoor. Dis baie steurend, dink ek, dat die universiteit so...ek dink óórgeburokratiseerd is...Dit is soortvan papierwerk en template...dit is heeltemal te veel, dink ek...oorgeadministreer.

- Gender-diskriminasie

Ek het dit nie spesifiek as gender-diskriminerend ervaar nie, maar ek weet van my kollegas in dieselfde departement by ['n ander] afdeling het dit wel so ervaar; het gedink dat die jong mans...daar is mans van my ouderdom wat die jong mans wel aangemoedig het, terwyl sy nie aangemoedig is nie. Dit was in sekere gevalle...in my geval dink ek dit was nie soseer die gender in die departement nie.

1.6.5 Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit

1.6.5.1 Die verenigbaarheid van ouerskap met 'n navorsingsberoep

Ek dink dit hang baie af van jou spesifieke omstandighede, van jou persoonlikheid seker; maar dit is wel moeilik – moeiliker vir 'n vrou as vir 'n man – in dié opsig dat daardie soortvan onderbreking kan sommige mense laat ophou, sodat hulle nie voortgaan nie. As jy die soort persoonlikheid het, en die soort omstandighede wat ná daardie onderbreking goed stabiliseer, of so, dan is dit eintlik vir jou maklik om dan voort te gaan.

Ek dink dit is waarskynlik vir die meeste dieselfde vir 'n baie groot verskeidenheid van beroepe. Ek weet eintlik van min beroepe wat dit nie, sê nou maar, nogal eise stel aan jou nie, want dit is doodgewoon baie dinge om gelyk te hanteer. Maar ek het tog gevind, en ek het dit al 'n keer hoor sê by mense wat navorsing doen oor hierdie soort goed - ek dink...Cheryl de la Rey het al daarvoor gepraat – dat sy gesê het dat die navorsing vind dit - en dit is vir hulle nog moeilik verklaarbaar - dat iemand wat wel in 'n soortvan 'n stabiele verhouding is, getroud met kinders, kry dit partymaal reg om meer produktief te wees as iemand wat nie in 'n stabiele verhouding is nie.

Wat ek wel byvoorbeeld ook ervaar het, is dat jy in daardie stadium [gedurende die tagtigerjare] durf jy nie byvoorbeeld jou vroulikheid...jy kon dit nie ophaal om te sê, “Kyk, ek kan nie dit doen nie, of ek kan nie dat doen nie, want ek het kinders, of ek het verpligtinge”. Dit was absoluut 'n *no-no*. Jy kon dit nie sê nie; waar dit nou, dink ek, makliker is; en waar ek nou selfs vir my manlike kollegas dit hoor sê - wat nou die aansprake maak oor kindersorg - wat in daai stadium byvoorbeeld skeef sou opkyk as ek gesê het, “Ek moet my kind gaan oplaai, ek moet nou dit doen, of dat doen”. Jy't dit nooit genoem nie. Maar dit pas ook by my persoonlikheid. Ek hou nie eintlik daarvan om vreeslik persoonlike goed by my werk te betrek nie. Dit is nie in my aard nie, maar dit was definitief 'n *no-no*; dit was 'n taboe, dat jy moes nie eintlik daai goed ophaal daar nie.

1.6.5.2 Inwerking van ouerskap op publikasieproduktiwiteit

Vir my gevoel was dit nooit eintlik 'n...dit het my nooit...gehinder nie. Jy't miskien minder tyd om te wy aan jou werk: 'n uur of twee of drie per dag minder as iemand anders. Maar as jy soortvan 'n stabiele roetine het, en dinge gaan goed, dan is dit eintlik 'n soortvan 'n omgewing wat nogal positief inwerk. Kinders lei 'n geroteneerde lewe: hulle gaan skool, hulle het dinge om te doen...Daardie soortvan roetine werk dan deur na jou...'n soortvan 'n burgerlike roetine, wat ook dan positief inwerk op jou werk. My situasie was só, dat ek tog wel, toe hulle nou begin skoolgaan, kon ek wel kongresse begin bywoon, en daardie soortvan goed.

1.6.5.3 *Hanteringsmeganismes*

Wat ook gehelp het, is dat: ek het aanvanklik in [‘n stad] gewoon...maar toe na [‘n universiteitsdorp] toe getrek, wat dit vir my makliker maak. Die logistiek was net eenvoudiger in [die dorp] met kinders. Wat nou veroorsaak het dat my man moet [stad] toe ry. Hy het nou daai opoffering gemaak, wat vir hom langer ure beteken het - en nogsteeds, eintlik. Hy moet vroeg in die oggend vertrek, en kom later terug. Om daardie rede het ek dan as’t ware die versorging van die kinders vir die grootste deel van die dag as’t ware op my geneem, omdat hy in [die stad] werk. Dit het dit vir my eenvoudiger gemaak, as jy in so ‘n kleiner opset soos [‘n dorp] werk:...jy kom gouer by die werk, jy kan vinniger jou kind gaan aflaai. So, dit help ook baie: dis soortvan ‘n kleiner, logisties minder ingewikkelde omgewing. En dan die soortvan roetine wat met familielewe saamgaan, is miskien ‘n positiewe ding vir werk. En dan ook: as jy dan die vryheid voel as jou *partner* bereid is om in te staan wanneer jy weg is, en die soortvan goed. Dit het ek gelukkig gehad, en van daai stadium af, het ek soveel as moontlik begin doen.

Daar is soortvan hulp, daar is ‘n soortvan ‘n netwerk gewees. My ma woon ook op [die dorp waarin ons woon]. Sy werk ook voltyds, van agt tot vyf. Sy is nou 78, en sy werk nogsteeds by [‘n ouditeursfirma]. Sy kon nie soortvan die daaglikse...maar sy was altyd soortvan beskikbaar, as daar probleme is, of as daar ‘n krisis is. En ek het in die beginstadium wel hulp in die huis gehad, wat ook maar soortvan...van agt tot een, of agt tot drie gewerk het. So, daardie goed het my gehelp.

1.6.5.4 *Moeilikste stadium*

By my het die skryf van die proefskrif en my kinders se babadae saamgegaan, wat baie moeilik was by tye; dis nogal uitputtend.

1.7 Sarah

1.7.1 **Trends in career or ‘lifetime’ publication record**

1.7.1.1 *Variations in output volume over time*

What I did with my career, is that it took rather a long time to get my basic degree...I spent a year in the States...as an exchange student. [The next few years] I did a BABS – I wasn’t qualified to register for a BSc, so I first did the BA, and then with some BSc subjects. And then I more or less straight away did an honours at Stellenbosch, and then I went back to UCT, did a masters. And then I decided what I really wanted to do was to work for society. So, I went off and volunteered on the “very splendid savings” that I had built up during my masters. And so, I was volunteering for two years in [a small South African town]...I did publish some stuff out of that eventually...And then I ran out of money, and the NRF gave me a bursary to start doctoral research at [a research station in another town]...and there I met someone I decided to marry. And so, I sort of threw that up and I...went and worked as a sign-writer, a secretary, and did other things. This explains the low productivity during that time.

From my marriage...we moved to a research station...which we were running. And from then on...straight to when I finished my doctorate [seven years later], it was an extremely productive time. During that time I was employed full-time - and so was my husband - to do research. So, I had absolutely no academic commitments. And that was really the best time for research, and I think I attribute my high productivity then to being able to do research full-time, and working with someone who was also doing research full-time.

After completing my masters, I volunteered for two and a half years. I did get four papers, or five papers out of that, and which I wrote up a couple of years later – it wasn’t suitable to write them up at the time – and then I also didn’t...wasn’t an academic at all [for three years in the eighties]: I was a secretary and private consultant...Well, I had been considering [a PhD] in 1982, but then when I met my husband, he decided to...go and build boats in [a South African town], having been an officer in charge of a nature reserve, and so I left the nature reserve to follow him down there, and then helped him in the boatyard with accounts, stuff like that. So, it wasn’t really an ideal environment for...I couldn’t continue the PhD I wanted to do in [one] province, ‘cause I was then living in [a town in another province]. So, although we both did publish during that period – and my husband has twice as many publications as I have; we both did publish then - it was only later, when R offered us the opportunity to run the field station, we both could work full-time on publishing...At that time [I did] some of my consulting work...and I got a number of papers out of that.

1.7.1.2 *Preference for certain types of publication outlets*

- Selection of particular publication outlets

Well, I only publish popular articles if I’ve already published it as a scientific article – so, it’s not an alternative. Conference proceeding papers: nearly all of them have been published formally – they’re just previews, really; they’re not an alternative to peer-reviewed publications.

- Selecting journals in which to publish work

I'm just competitive: I like to aim for the best journals I can, I suppose. I like to feel that if I've done the work, I might as well publish it in a good journal. And, of course, more recently, with ratings through the NRF and ratings of departments, and institutions have been pressured to do that. But, I find it quite fun to try anyhow.

It depends on the paper. Certain papers which are based on maybe a small dataset aren't suitable for top-ranked journals.

1.7.1.3 *Internationality of publications*

If it's something to do with...development of issues in science that also have, let's say, social or economic relevance in South Africa, then I would choose *South African Journal of Science*. For example, papers that deal with...slightly economic...issues [related to my field], people involvement issues - I think an interdisciplinary South African journal is the right sort of venue for that.

1.7.1.4 *Multiple authorship*

Well, I've tried as much as possible to publish with students. There are two ways of publishing with students: one is a whole class. If I did, for example, a one-week field project with a whole class of masters students – coursework students - then I set them an assignment based on the field project, and often I set the assignment in such a way that each student contributes an aspect of the assignment. And then I pool it, and make a paper out of it. And that seldom works - I've been teaching for a long time now – but some years it does come together. That's one way of doing it. And the other way, of course, is having masters students who write up their work, and you simply encourage them to write their work up. They don't have to publish with their supervisors, but often they need quite a lot of input, so they've decided the supervisor is not such a bad thing to go on a publication.

1.7.1.5 *Publications during graduate training*

After completing my masters, I volunteered for two and a half years. I did get four papers, or five papers out of that, and which I wrote up a couple of years later – it wasn't suitable to write them up at the time...at that time I did some of my consulting work...and I got a number of papers out of that. And of course I got a lot of papers from my masters; I think got six papers from my masters.

1.7.2 **Views on teaching and publication**

1.7.2.1 *The extent to which research informs teaching (or vice versa)*

My students have started publishing with me now, so it's much better.

Well, I've tried as much as possible to publish with students. There are two ways of publishing with students. One is a whole class. If I did, for example, a one-week field project with a whole class of masters students – coursework students - then I set them an assignment based on the field project, and often I set the assignment in such a way that each student contributes an aspect of the assignment. And then I pool it, and make a paper out of it. And that seldom works - I've been teaching for a long time now – but some years it does come together. That's one way of doing it. And the other way, of course, is having master's students who write up their work, and you simply encourage them to write their work up. They don't have to publish with their supervisors, but often they need quite a lot of input, so they've decided the supervisor is not such a bad thing to go on a publication.

1.7.2.2 *Where interests primarily reside (research or teaching)*

You can't really teach and be a researcher. I don't think it's possible to do both equally well, unless you're an exceptional person, which I'm not. So, I found I could either do one or the other, and at the moment I'm edging back towards research...Teaching I'm happy to do part-time. But if you do it as much as I've been doing it, especially the admin – not just the teaching; the departmental admin – it has **enormous** costs for research and research productivity. You can neither get into the field, nor do you have the time to write the papers.

1.7.4 **Major factors that have impacted on publication productivity**

1.7.4.1 *General facilitators*

I think I started my career doing a BA (English), and I wanted to be a wildlife journalist. And so, I've always enjoyed writing – that might have been a bit positive.

1.7.4.2 *General inhibitors*

- Constraints encountered

Because I was doing so much editorial work, that that also cut into my productivity. And I have ulterior motives for doing this, yes: it's that I can't afford the journals from a remote field station. So, I get the journals free if I'm an associate editor.

And the only negative thing I can possibly think of is the dreadful admin load at the university when you're back in a so-called academic job.

- Possible reasons why women publish less than men do

No, I don't know the reason. I've always thought that having kids made it quite difficult to publish, but if you tell me that American women with children publish more than those without, then I'm amazed.

I would like to say, however, that the particular marriage makes the difference. Every marriage is different. And I think if [someone in a particular field] marries a [person in the same field], and they work well together – that's going to increase the publication output of both the man and the woman. Where, if it doesn't work, or if a...woman [in a particular field] marries a man [who is not in that field], it could well have a very negative effect on publication output, because: what publishing means is not doing something in the social sense. It's a trade-off. And so, if the partner doesn't understand that, then I can't see it working.

1.7.4.3 *Specific factors*

- Views on combining marriage with a research career

Oh no, once I was married, that's when my research productivity really started, because I married a [person in the same field]: we nearly always work together. From my marriage...we moved to a research station...which we were running. And from then on...straight to when I finished my doctorate [seven years later], it was an extremely productive time. During that time I was employed full-time - and so was my husband - to do research. So, I had absolutely no academic commitments. And that was really the best time for research, and I think I attribute my high productivity then to being able to do research full-time, and working with someone who was also doing research full-time.

[It works] very well indeed...we enjoy doing sort of interactive projects. We don't overlap each other's focus area.

Neither of us are at the universities more days than we can actually help He's here [in a small town] about 360 days a year and I am away approximately five months a year, teaching at the three different universities.

- Institutional factors

I wasn't enjoying the admin at all, and now that I'm part-time – I'm part-time at [three South African universities] – and my students have started publishing with me now...it's much better.

But probably more important is the personality running a particular department or research institute. So, for example, [for eleven years] I was employed as a researcher – full-time – through [a research institute]. And that was run by [a] professor...who was...a liberal, actually, in a way with his staff, and incredibly demanding. He said we would never have to book for special holidays or anything – we could take as much time as we wanted. On the other hand, he wanted five peer-reviewed papers every year. And he didn't mind how we did it – we could go out all day and work all night. I never, ever went into the university: I worked 400 kilometers away. So, it was fantastic freedom. And he always provided any support that one needed, not necessarily a high salary – it wasn't high at all, that's why I eventually resigned – but...amazing encouragement, really.

- Integration into the academic research community

That's why I put my students into conferences or workshops from fourth year onwards. I think it's absolutely essential.

I think it depends very much on personality and circumstance.

I've had outstandingly good mentors, though.

[I had two mentors] sort of very informally, while I was concentrating doing a PhD...And they helped me a lot. I've always had outstanding supervisors.

I've enjoyed meeting some researchers – others not.

- Time management

I work at nights, and all week-end, every week-end...not really a fun sort of person.

- Gender discrimination

I never, personally, ever experienced [exclusion], except very early on in my career, and then late in my career. The two things: that actually had to do with [a South African university], unfortunately. I tried to apply for a degree [in a particular field] in 1969, and they didn't accept women at that time. And then again, when I joined as head of department in 1999...I was the only women head of department in [the faculty]. And I felt that people made no effort whatsoever to integrate me. And I didn't like the atmosphere whatsoever. And at that time...the Senate had very few women in it. It's changed amazingly in the last five years – both concerning the racial and gender profile. But in 1999 it hadn't changed that much and I didn't like that. But I could really, in my professional life - it's like: opportunities to go to conferences, to publish - ...do anything I wanted. Apart from getting a job at [a national board] in the seventies and eighties, I've never felt that.

In the past, you know, there was a sort of apartheid where women weren't even allowed to register for degrees in [certain fields].

1.7.5 Views on the effects of parenthood on publication productivity

I've never had children. That's one of the reasons I think why I managed to publish quite well.

1.8 Thandi

1.8.1 Trends in career or 'lifetime' publication record

1.8.1.1 *Variations in output volume over time*

The first article was an MSc article. Then I came back to [a southern African university] and taught for about a year. And then I went back to [an overseas country], so it was hard to settle down and publish. I was a student.

I began to get post-doctoral help. This is what I'm fighting for in our institutions, and in South African as a whole...They were very good, helping me with the students, and bringing in new ideas...Post-docs make a lot of difference.

1.8.1.2 *Selecting journals in which to publish work*

First of all, it depends how the readership is of a journal...I pick those journals where I feel there will be good readership, because what's the point of a paper if it is not going to be read by people in the field?

1.8.1.3 *Internationality of publications*

There are no people in my field directly in South Africa, so I just feel maybe [a paper in a local journal] is a lost publication.

1.8.1.4 *Multiple authorship*

- Preference for jointly authored publications

That's the norm for the natural sciences.

The student who does the work the most, their name would come first. The students are there in the lab, but you are there with them every day, directing them: "If that doesn't work, mix this". You think, you work out together.

- Preference for solo authored papers

I was on my own; before had students.

I don't know how other people feel, but I feel that I've gone through what I call "academic loneliness" before I had my colleagues overseas – those really are wonderful. But I have found (it could be the differences in discipline), you really just have no one to talk to. There is nobody when you are excited, when things are not going right...there's nobody! That's why I worked on my own, published on my own, without students.

1.8.1.5 *Publications during graduate training*

That's how I trained, and really, I'm doing exactly the same to my students: you publish as you go on. Otherwise, they're lost. Who wants you, when you are looking for a job, and you say, "OK, I'm waiting for my thesis, I'll only publish when I'm finished": you're just promising things that may not happen. Secondly, if you publish as you go on, you are already being examined as a student. You will get a lot more examination – a lot tougher examination – as you move on.

1.8.2 Views on publication

1.8.2.1 General

- Scientific publication

It's come to a point for me [that] publications maybe are not that important, to be honest. They could be important to the university in terms of the money that will come to the university, to the NRF in terms of the rating (I don't know if I'll get A - I'm B-rated now - I don't have dreams for that). It is no longer **that** important. But my students must publish. So I'm pushing for their sake now, because I want them to get good jobs.

- 'Publish or perish' in the South African academic context

It comes with money.

...if the department is not well managed. Again, the business of giving the most junior people to teach undergraduates means that senior people are busy pushing themselves, and it means that the junior people will then never get the publications that are needed. It can become selfish, because people are improving themselves.

1.8.2.2 Views on teaching and publication

- The relationship between teaching and research

We believe in the department as a whole that you cannot have a good postgraduate and publishing record, without having a good basis in undergraduate. And most of our students who end up doing PhDs come from undergraduate. So you have to have a good basis there. I don't think there is a way out of it.

- The extent to which research informs teaching (and/or vice versa)

First of all, you have to realise that in the sciences and in the arts or social sciences we don't really deal the same way. Our students are part of us, in the sense that the project that they do must be a project that I have funding for. So, the project is partly dictated. They can come to me, I can give them different ideas for the project, but they can't go too far beyond that, because I may not have the equipment to do that particular experiment, we may not have chemicals, I may not have the finances. They can't just go wild. When they publish, they are using your facilities, so we work together. They are using **everything** I've got, so we work together. Therefore, the publications that you can see are joint publications.

I just started a new course now with second years, and I gave them notes. I'm against giving notes, because I believe they should read a book, but I gave them notes. So, you give them notes, they just say, "OK, we are going to photocopy this. Come exam time, we'll vomit it into the paper". But I give them notes, and I explain to them why. I say, "My personal experience is there. You won't find it in books". So, being involved in research, you can bring personal experience into the lectures, which make them interesting. But, if you just deal with the textbooks, and just do ordinary teaching without doing research, you don't have that personal experience...If I didn't attend all these conferences and all these meetings, I wouldn't have been in the process, which is involved in [a particular issue]...and I wouldn't be in the forefront in South Africa to try to push to find out if there are problems here. So, that personal experience, that comes from travelling, from research, from being involved in international organisations. That they cannot get in the textbook.

- Where interests primarily reside (research or teaching)

(Let me close the door, because students will knock in no time). These days the NRF gives bursaries for third years. I get third year undergraduates into the lab. They first start off washing glassware, and then I give them simple experiments to do, and that really begins to excite them about research. We need to motivate the young people to love...they just don't understand research, unless they are in it. So I start that at undergraduate, and begin to give them a little bit here to do.

I think I have one colleague here who is male, who does a lot as far as the students are concerned. But, I think we [women] are more practical; I've just come to accept that I'm a practical person. I like to bring things to reality.

- Comparing teaching load with that of other colleagues

My undergraduate teaching load is very heavy. It is a load, but I have principles. First year: there are many, because it is a service course...you must do it to do any other sciences, generally...So it is a big class. It is a lot of work, but I insist that it must be taught by the most senior. I believe that those people are young, they really need experience, they need you to be relaxed when you're talking to them, and to make them love the subject. So, heavy as it is, I think we have to work hard in the undergraduate in order to finally have the postgraduate. Because the postgraduates are the ones that make us who we are, but the undergraduates: we must nurture them to get them into postgraduate.

I even insist on starting first years when they arrive – the very first time. I don't allow anybody to touch them - I give them a mother's touch.

The way we run it - even with first years – is: I'll take them for three weeks, somebody else comes for three, four weeks, and so on. We change along. So, we do bring junior staff in, but the majority of the people are the senior staff. So, the senior staff will maybe teach six lectures, and so on. But the same thing with second year: we change courses.

Basically, I think we try to balance it out. Everybody is busy at the end of the day. Those who are not doing research...- at the moment it is not even allowed any more: everybody must do research, but we still have those people who are now entering their sixties, who never really had a research programme (we have just one, actually, in our department) - those people you have to give them a little bit more teaching.

- Extent to which teaching load has this been the result of own choice or preference

Right now, I'm teaching. My priority is to get up in the morning and think about all my lectures, all my photocopies. We tend to teach in blocks, then stop. The time I'm teaching, teaching is a priority. All the papers must be set aside.

1.8.3 Motivation for publishing

Maybe I'm a workaholic. Maybe I don't have a life. I do work hard. Let me just think why I did this. I'm very frank, so...the media has all my stories, so it doesn't matter any more. When I arrived in [the early nineties], really, I was probably the first female working in the department; the first person who is not white, working in the department. There was something like, "Are you going to make it?" It was made very clear to me that, "you may not actually make it; we are not taking a chance; you are not really accepted fully". That is the honest truth, and I don't really care where it goes. So, to me when you put me like that, you actually make me work, because it was a challenge to me. That's how it started: it started as a challenge. Secondly, my students must publish. So I'm pushing for their sake now, because I want them to get good jobs.

1.8.4 Major factors that have impacted on publication productivity

1.8.4.1 General facilitators

- Most important contributing factors

On a personal note, what pushes me and keeps me going is that I did not fear rejection.

- Advice provided to students, or a new staff member, specifically in relation to publication productivity

I called some women, some young academics together (about last week). I said, "You **have** to not fear rejection. Don't be afraid to submit papers. You sit on it, you sit on it; you keep correcting it, correcting it, because you are afraid they'll tear you apart. Yes, they will tear you apart. In the process of tearing you apart, they will tell you where the problems are, and you learn from them". I've learnt from criticism.

- Advice provided to young women staff members in particular, specifically in relation to publication productivity

I think men have a bigger problem. That is what I was telling these [young academic] women. We don't have much egos: our egos are tiny. We wake up very quickly and go on. They shouldn't behave like men - that's exactly what I told them.

1.8.4.2 Possible reasons why women publish less than men do

Do they? It could be the support. One thing for sure that could have killed me here, is lack of support. And not getting money, and so on. Just emotional support; somebody that is talking to you like a human being. If you don't get support – somebody to keep encouraging you, saying, "OK, it's alright" – you can die.

1.8.4.3 Specific factors

- Views on combining marriage with a research career

It was hard, but the most times I was with [my husband], I was in [a southern African country], where there would be somebody else to help working, to take care of the meals, whatever. He never stopped me. He never discouraged me from going on.

- Institutional factors

The reason why I moved to [an overseas country] was that everything was done by technicians for us. The big equipment, the most expensive equipment, was dealt off by the technicians, and I felt I needed hands-on. So the advantage that I had by going to [an overseas university] where I ended up, was that I had hands-on...I feel as Africans we need to have hands-on, because we need to be able to build things ourselves, otherwise – particularly in the sciences – you are lacking, because there are not always technicians waiting to come and fix things.

The [southern African university where I worked previously], basically, is a teaching university. So they were not really equipped – not really equipped *per se* - but they did not have the processes needed for research. Like when before all these computers searches were on: the library needs to be ready to order a journal when you need it. There is a whole lot of things needed: an infrastructure that involves technicians being available; all kinds of people have to be ready to help you, when you are doing research. We have more technical staff than the normal staff in my department. And we fight all the time for that, because if I need things done and equipment breaks...it will take a long time for anybody to come from Johannesburg. We try to fix, I can try to fix, the technicians also try to fix – we fix a lot of things by ourselves.

Infrastructure: you need to be able to get general stuff. You need to get funding to do research. So, [the university where I am working at present] is different in that. I mean, they supported me financially immediately when I arrived; I didn't really have a problem with that. It wasn't enough, financially, but it was not zero, like I would get at the [southern African university where I worked previously]. NRF: that is a very good system. It has its problems, but when you've come from [a southern African university], like me, I appreciate everything. I never complain.

I love the block funding, but it is also dangerous, because I find that maybe one doesn't work as hard for the NRF. You don't go as much to the committees, because now you are a bit content. There is a bit of a danger to it.

- Integration into the academic research community

My collaborations involve students' travel. My students go to most of those countries. So, in their attitudes, in the way they begin not to feel sorry for themselves...When students are studying in South Africa, they sometimes believe that they are not getting a good education. These links make them travel three months, six months.

It helps probably in terms of the quality of the publications in a sense, because when you do work, and many of you are reading the same paper (because I'm here to read it with my colleagues overseas when we have a joint student), the quality improves, obviously...The quality is better if you have many people who can contribute different ideas.

In terms of productivity – maybe I'm a workaholic - I find when working by myself, with the students alone, we can actually produce a lot more very quickly, because there isn't too much to “nurse” - collaborations need nursing (not to offend anybody).

I don't know how other people feel, but I feel that I've gone through what I call “academic loneliness” before I had my colleagues overseas – those really are wonderful. But I have found (it could be the differences in discipline), you really just have no one to talk to. There is nobody when you are excited, when things are not going right...there's nobody! That's why I worked on my own, published on my own, without students.

I know I have friends over there. I know I can tell them, “This is not working, now what can I do?” E-mails: thank goodness for it. Part of the publication [productivity] was that...That drove [the publications].

- Time management

It is so important to have good time management skills. You have to prioritise, at the end of the day. Right now, I'm teaching. My priority is to get up in the morning and think about all my lectures, all my photocopies. We tend to teach in blocks, then stop. The time I'm teaching, teaching is a priority. All the papers must be set aside. The committees: I have really minimised them now. I have had to...I had to cut down on the committees. Actually, the NRF committees, and so on. The major problem if you live in the [South African province I do]: to go to the NRF takes two days. So I can't be doing those things any more. So, I tend to really prioritise what is more important; what is more of a priority at this particular moment.

- Gender discrimination

When I arrived in [the early nineties], really, I was probably the first female working in the department; the first person who is not white, working in the department. There was something like, “Are you going to make it?” It was made very clear to me that, “you may not actually make it; we are not taking a chance; you are not really accepted fully”. That is the honest truth, and I don't really care where it goes. So, to me when you put me like that, you actually make me work, because it was a challenge to me. That's how it started: it started as a challenge.

1.8.5 Views on the effects of parenthood on publication productivity

1.8.5.1 Views on combining parenthood with a research career

As a mother, you always feel you could have done better. I just feel [sigh]...oh, I don't know...I always feel like, “Have I done the best I could as a mother? Have I put my children second?” It's a motherly thing. You never really feel satisfied that you've done the best.

1.8.5.2 *Effects of parenthood on publication productivity*

Before I talk about the facilitators [of my publications productivity]: I have two children. It was hard, particularly when I was a student. It was hard [overseas]: I was very alone.

I would just feel that, maybe did I not neglect them while I was doing research? That is the only thing I could say.

1.8.5.3 *Coping mechanisms*

My husband was in [a southern African country] throughout the time I was studying, so I was on my own. It was very hard, but the school system...First of all, the little one could go...the university had a day care centre: very good. Actually, that is why I chose that university (in addition to other things). So, they can take the children from seven in the morning to seven in the evening. But I usually collected [them] at about five, to take them home. So, I was with them in the evening. And then there was a school right on the campus where we stayed. So they could walk to school after, when they were old enough to go to school. The school was next door; next to us on the campus. But then I still had conferences to attend and things like that. I'd leave them with friends. I would get a friend – one of the students – to stay with them, or something like that. So, I owe a lot of friends.

1.8.5.4 *Stage in career when work-family conflicts were most difficult to manage*

When I arrived [overseas, my children were] three and six. They were very young. We left when one of them was entering teenagerhood...it could have been beyond that. So, they were very, very young, and I had to look after them and do research for my PhD, and I had to work. I teach. I believed then I might have some miracle managerial feel. If I could survive that, nothing, **nothing** is difficult.

2 Male respondents

2.1 Bob

2.1.1 **Trends in career or 'lifetime' publication record**

2.1.1.1 *Reasons for variations in output volume over time*

For 1997, that's easy: I organised an international conference in 1996, and I took a lot of my students with me. Each presented a paper, and then we published them in [a] special issue. There were about eight papers in the one issue. It just happened to be that the conference provided a focus to which everybody kind of aimed, which led to the special issue.

What happened with the 2003 conference: all the papers were put onto the web, and so people had access to them, and many of them are not actually published in the normal literature. That didn't happen with the 1996 conference: there was more incentive to publish the papers. The fact that all of the material was put onto the web, and everybody had free access to that, made it actually harder to publish in the normal literature.

I went through a typical midlife crisis. I started through [a specific discipline] - in fact, most of my life I've been interested in getting into things more oriented [to another discipline] - but I was doing [the first discipline], and became a professor at the age of about forty, or something like that, which is what I always wanted to do as a little kid. And then I had kind of reached my goals, and was really running out of ideas for the stuff I was doing, and needed to make a change – I think which is absolutely typical of a midlife crisis. And I had [related] problems myself...so it was quite a personal thing...[it] has always been a problem for me, and when [the] department started, it was happening just at the time I was running out of my research ideas in my early forties. And I figured, gee, that would be interesting: maybe there's something that I can do in [that field], which brought together my interest in [various disciplines]. I was already in [a particular research] area, looking at issues of [various disciplines] – the whole mix of those things. And then, with my own...problems thrown in there, and while starting something, I thought: gee, maybe this is an opportunity to do something worthwhile. So, I just chucked up my old *ad hominen* professorate at [the university where I had been working], which is very...you know, it's the highest ranking professorship you can have...and I chucked it up – and of course everybody thought I'm totally crazy – and I became a student...at [another university]. I started over – completely over again. I was a full-time...student at forty-something...forty-two, I think. And I earned a little bit of pocket-money by doing some lecturing to the...students, and then later to my own...students, I would kind of be with them, and then go out and lecture to them in the lectures. So, I started totally over again.

Technically my PhD was about [a particular research topic]...I came back to South Africa [from an overseas institution] in 1970. There was no position for me in [that] sort of...area at all. So, I went back into my old...department...but I was on my own, no one really to talk to; no one interested in things I was doing. And eventually, by forty-two, my ideas were running out; I didn't have enough self-motivation without anyone to interact with. And, as I say, [a new field] starting, it provided the idea, and I moved there and started all over. But, it isn't

really a start all over, because I carried with me what I had accumulated [in various related fields]. So, the actual “jump” to an outsider may look much more than it really is.

2.1.1.2 *Preference for certain types of publication outlets*

- Preference for a particular publication type

The conference proceedings, firstly, are just local things, and generally people – other people – won’t have access to them, because the conference proceedings would be normally given only to the people attending them. So that’s not widespread, and they don’t really count as a publication - until the more recent electronic publishing - it’s the only way one would distribute what one is doing. And, of course, earning money for the institution via government subsidy, because...it’s now R95 000 a publication...At [this university] - I don’t know how it’s going to be now – but until the end of last year, the individual researchers ended up with about...it must have been about a quarter of the money in their own trust funds...However they do it, you become a credit to that institution - I think the figure is R95 000. You are now a valuable person if you publish a few papers. And they talk at [this university] now of some people simply being employed, and they pay their own salary, in effect, by publishing enough papers.

- Selecting journals in which to publish work

The only three that are approved for subsidy in [my field] – the only three in the world that are approved for subsidy. And I’m the person who actually got them approved for subsidy. And I’m involved in all three: on the editorial board, or directly. I have a heavy involvement with those three journals, over and above me as author. I do a lot of the reviewing of optical manuscripts for [one]; I’m actually on the editorial board for [another two]. So, I’m heavily involved in all three.

We are probably going to go back to writing the odd thing for *Nature*; we are planning an article sometime this year for *Nature*, but the sort of thing I’ve been doing over the last few years has, I think, not really...it’s been more directly concerned [with my field], but of minor scope. That is beginning to change. There’s material now that is of wider interest...and we’ve got some very...we think very exciting ideas here, which now are of course of much wider interest in the subject.

2.1.1.3 *Multiple authorship*

Almost all the co-authors – at least over the last ten or twenty years – have been my own postgrad students...in most cases. What is probably happening nowadays is that I’m actually turning to publish more on my own. My feeling is that it’s much easier to publish on one’s own. To write something jointly with someone else often takes a long time: one disagrees on things, and if you’re doing it on your own, then you’ve got only yourself to deal with. And so, it’s a bit of both. I’m now doing a bit of writing with a guy [overseas]...The knowledge that is common to him and me is actually quite small, but there it’s working well. He has no understanding of...the issues I work with, and I understand very little of [his subject]. And there we’re very complementary; we write well together. I think we’ve just submitted one paper now that was quick, and it was easy. He accepts the things that I say about my areas, and I accept what he says. Whereas in a lot of the other co-operative work, where two of us, or three of us are working, and have expertise with a large amount of overlap: then we’ll disagree on issues, and that’ll take time, be quite hard to publish.

2.1.2 **Views on publication**

2.1.2.1 *‘Publish or perish’ in the South African academic context*

It is like that, and I think that it’s going to get even more so. I think [my views on this] are mixed. I think...oh, there’d be several things. This whole idea of government subsidy for publications: also, my feelings are mixed. It certainly has highlighted the need for academics to publish, and to publish you’ve got to do research. So, it certainly puts pressure behind people to get involved in research, which is good. But it certainly has had its negative points, because one is inclined to submit shorter papers, or split papers in two, and also – to some extent – not co-operate with others, because if somebody comes to me and says, “Can they help me solve a problem?”, I might be inclined to say, “Are you going to make me a co-author? And if not, no”. And, I don’t know...I hope I don’t do that, but...

2.1.2.2 *Teaching and publication*

- The relationship between teaching and research

The lecturing, of course takes time; it takes time away from one’s research. But in the work that I do now, it’s been a plus, because...by lecturing, you can pick up potential postgraduate students. I lecture a class in second year, and all of the postgraduate students I’ve had are people I’ve spotted in second year, and essentially singled out...singled them out, and got them involved – from the second year. I don’t know how it works: it seemed to me to be a natural thing, because in my ordinary lecturing I would often make odd references to research, and then you’d get the odd student in the class that would make it known to you that they find that interesting, and they would come and chat;

or they would say, “Can we come to your seminar that you’re giving then?”, and I’d say yes. So, it would in a way just happen, but you could spot them.

- Comparison with teaching load of other colleagues

I’ve always, I think, been quite lucky. I never really had a high teaching load. When I was at [another South African university, my] lecturing load generally, by other standards, would have been considered low. And my load now is also considered low, although it’s the same as everyone else’s in the department...I’ve never been given off time from lecturing, and in departments I’ve been in, always the attitude has been: everybody does basically the same lecturing load.

2.1.3 Motivation for publishing

I...became a professor at the age of about forty, or something like that, which is what I always wanted to do as a little kid. And then, I had kind of reached my goals, and was really running out of ideas for the stuff I was doing, and needed to make a change...When the department started, it was happening just at the time I was running out of my research ideas in my early forties. And I figured, gee, that would be interesting: maybe there’s something that I can do in [that field], which brought together my interest in [various disciplines]. I was already in [a particular research] area, looking at issues of [various disciplines] – the whole mix of those things. And then, with my own [related] problems thrown in there, and while starting something, I thought: gee, maybe this is an opportunity to do something worthwhile...There was no position for me in [that] sort of...area at all. So, I went back into my old...department...but I was on my own, no one really to talk to; no one interested in things I was doing. And eventually, by forty-two, my ideas were running out; I didn’t have enough self-motivation without anyone to interact with.

[The field] just sounded – with my own [related] problems – sounded [like] an area which I could get involved in, and do something useful.

I actually just became increasingly depressed at the age of about forty, and unable to generate research interests, and I knew I had to do something. I **had** to make a change...my crisis of not having any ideas to do research on, having reached the professorship, which had always been a goal of mine - I got there, and now where do I go?

I don’t know. One would have to say these days, that the fact that there is R95 000 for the institution counts for a lot. But, when I first started publishing at [the university where I worked previously], that wasn’t a factor at all: there was no subsidy for publication. And I enjoyed doing it, and at the time, I was basically the only one at the...department at [that university] that was doing it. I think I’ve always been interested in writing. As a postgrad student at [an overseas university], we were encouraged to write articles, but I enjoyed doing that. And I think that...I suppose that back at [the South African university] at the...department no one was doing it; I did it, and it gave me some status, I suppose. But I guess I...I figure I enjoy doing it.

I think that it’s really got to come from inside; I think...research is something you got to need to do...I love doing it, I’m excited about ideas and exploration...to my mind all of my research has never been outcomes-based; I’d never said, “I’m going to discover a cure for cancer”, for example. I’ve said, “I’m going to explore in this direction, and just go”, and it’s exciting, and I can’t help doing it.

I don’t think it’s necessarily the publishing itself that I have a need for; I think...the ideal is spreading the ideas that I have.

2.1.4 Major factors that have impacted on publication productivity

2.1.4.1 General facilitators

- The most important contributing factors

I think it’s actually possibly the kind of work that I’ve done. If one is involved in [the kind of] material [that I am], I think it’s a lot easier. If you’ve got some good ideas, then you...can develop the right papers without having to buy equipment and do experimental measurements, or depend a lot on other people...as, for example, you have to do with all your interviewing, and so on. I think that the nature of my research just happens to have suited the conditions I’ve been in. I hadn’t needed money from the university to buy any equipment (apart from the odd computer, and so on)...I haven’t needed a laboratory. All I’ve needed is a desk and a salary. So, my work has allowed that: [my field] is kind of an underdeveloped field, and there’ve been opportunities there in an underdeveloped field; there’s been a need for the sorts of skills I have, and it hasn’t required any resources.

- Advice provided to students, or a new staff member, specifically to ensure a high level of publication productivity

Oh! I don't know. I think that it's really got to come from inside; I think it's...research is something you got to need to do. How do you acquire that need? I don't know...I love doing it; I'm excited about ideas and exploration. What I don't like: a lot of these ideas of outcome-based thinking, because to my mind all of my research has never been outcomes-based. I'd never said, "I'm going to discover a cure for cancer", for example. I've said, "I'm going to explore in this direction, and just go", and it's exciting, and I can't help doing it. And I think that, what I told students who come and work with me, is "Come and get involved, come and argue, come to seminars. Just come into our group and feel some of the excitement; and just get involved".

2.1.4.2 *General inhibitors*

- Constraints encountered

What happened with the 2003 conference: all the papers were put onto the web, and so people had access to them, and many of them are not actually published in the normal literature. That didn't happen with the 1996 conference: there was more incentive to publish the papers. The fact that all of the material was put onto the web, and everybody had free access to that, made it actually harder to publish in the normal literature.

Well, the only time I think was when I was back doing the [undergraduate degree]. I didn't really feel that I was missing out not writing. I, actually - when I went into [my field] - in a way I didn't miss not publishing. I think it's also because I didn't have any ideas. I don't think it's necessarily the publishing itself that I have a need for; I think...the ideal is spreading the ideas that I have. I had no ideas at the time to publish, so I suppose I didn't miss publishing itself.

- Possible reasons why women publish less than men do

I've had a few women postgrad students. They have not been the best of my students. One was potentially very good, and she is now in the States. But, my best postgraduate students, actually, have been males. I don't know the reason for that. I really don't know...probably slightly more than half my masters students have been women - I think - and yet, the very best ones of the postgrad students are...G - one who's just finished. He is a person who is going a very, very long way. He is highly exceptional, and he's one of those postgrad students that you really like to get, because they do all their own work; you don't need to do anything. If you can get a postgraduate student who's totally self-motivated, and all you do is sit back and sign occasionally some kind of document, and occasionally he puts your name on a paper [laughs] - well, you can't do better than that.

Gee, I don't know. You know, my interests have all been in this mathematical, geometrical thing, and if you believe the usual prejudice that three-dimensionality is a kind of male thing; if there is any truth in that - and also prejudices that women aren't as good at maths - if you believe any of that, then it might fit with my experience. I don't know...The best students I've had have been male, but there may be other reasons for that...the fact that I'm a male, for example. I don't know. But my interests have always been geometrical, mathematical and so on, and the people who've really taken to this, have tended to be more the male. The females who've done masters degrees with me have, I think, done the more mundane work. The sort of exciting cutting-edge - real 'going off in new directions' - are people like G, whereas the other ones tended to do what I've suggested they should do and no more, and have not progressed beyond masters degrees, whereas those who've gone into doctorates have been males...I've produced I think it's four doctorates, and they've all been males. And the two that are busy with it now, are also males. And yet, I think at least half of my masters degrees have been females, so they've gone as far as masters degrees, and then given up.

2.1.4.3 *Specific factors*

- Views on combining marriage with a research career

My wife was earning a salary then, and she was very understanding, and we could only do it because she was earning a reasonably good salary, and she was very understanding. She originally did a [science degree at a South African university], and was in computer programming, became a computer analyst, and so she was earning money. I actually just became increasingly depressed at the age of about forty, and unable to generate research interests, and I knew I had to do something. I **had** to make a change, and she knew that; she could see that.

I probably couldn't have done what I did, if she hadn't been as understanding...In a way, it's the other way around now, because now she doesn't work, and she does her hobbies. She is very much into quilting, which is her big thing, and I basically am the breadwinner now. So, I wouldn't have been able to somehow...I would really...not have survived somehow, if I stayed on doing...trying to do what I was doing. I don't know what would've happened. I was just completely running out of ideas. So, I **had** to make a change.

My wife has her own hobby and stuff too, so she works madly away at her quilting, and in the room right next door I'm madly working with my writing. So, it kind of works.

- Institutional factors

As a postgrad student at [an overseas university], we were encouraged to write articles.

I think that certainly around the 1970s there wasn't really much research being done in South Africa in universities – at least not in [the] departments that I was in. So, there was really no research culture - very little research culture in the department [where I worked] before the 70s in South Africa. So, I hadn't really been exposed to a research culture in the 60s. Then going to America, I was in a big and a good department – it was one of the leading departments [in my field] in the world, and there was a research culture, which appealed to me enormously, and I kind of feel that I brought it back with me, and contributed...starting it in [my original field] in South Africa, and have contributed to bringing it into [my new field] here.

I was a typical [member of an English university], and - with all the prejudices that everybody has – for me [the university I moved to] was a kind of foreign thing down the road, which really had nothing to do with [the university where I used to work]. And it was embarrassing to go there – and I'm being quite honest. To me, it was very sort of unlike [the university where I used to work], and I didn't go there by choice. I went there, because there was [a] department starting, and [the field] just sounded – with my own [related] problems – sounded an area which I could get involved in, and do something useful. So, I went there. In fact, it's a little bit more complicated, because at the time [my field] was taught at [a] technikon. In 1984, the technikon...programme was going to close, and it was going to open as a university programme: the English-speaking half at [the university where I was working at the time], and the Afrikaans-speaking half at [this university]. And my thinking was that [this university] got going sooner, and then the financial troubles, and then...this programme was never developed [at the university where I was working at the time]. I, in the back of my mind, had the idea that I would go, get involved in [this university], do the programme there, and then move back to [the university where I was working at the time], if they'll have me. And so, my idea always was to be at [the university where I was working at the time]. And I was going to [this university], because I happened to know...I spoke to the guy who was starting it at [this university]. He was very enthusiastic, he was English-speaking, and he was very enthusiastic to have me, and he essentially welcomed me...He's a totally sort of different person from myself, but he was very enthusiastic about my crazy move, and he made it possible, and he gave me odd jobs to do to make some money. So, you know, he made it possible for me to do that move. He essentially gave me a quiet corner somewhere, in which I could get on and do my own thing, finish the degree, and so on. So, my ideal was to go back to [the university where I used to work], but that never took place.

- Integration into the academic research community

There was no position for me in the sort of...area at all. So, I went back into my old...department...but I was on my own, no one really to talk to; no one interested in things I was doing. And eventually, by forty-two, my ideas were running out; I didn't have enough self-motivation without anyone to interact with.

I happened to know...I spoke to the guy who was starting it at [this university]. He was very enthusiastic, he was English-speaking, and he was very enthusiastic to have me, and he essentially welcomed me...He's a totally sort of different person from myself, but he was very enthusiastic about my crazy move, and he made it possible, and he gave me odd jobs to do to make some money. So, you know, he made it possible for me to do that move. He essentially gave me a quiet corner somewhere, in which I could get on and do my own thing, finish the degree, and so on.

Just key, accidental things: bumping into somebody at a conference - somebody who happens to be at your talk, and has been working on something totally different, but there is some idea, which suggests a new direction. It's happened to me very often that, totally out of the blue, [something] totally unexpected has brought in a key idea and made a big difference. One must expose oneself to these: one must go to conferences, must go and visit institutions, one must talk to people and write and communicate, because every now and again a key idea comes along out of that - which wouldn't have come otherwise - and makes a huge difference. Quite often I'll go to a conference...I went to a conference in December in America, and I got nothing out of it. But, it's still worth it, because every third conference I will meet somebody there, from which I get a huge amount. But I think one's got to be receptive to this, and...I think, because I've...got quite a big background in [various fields], maybe it gives me a link, or something in common with a greater variety.

- Time management

I really don't do much else but write: it's my hobby and my work; it's my life. My wife has her own hobby and stuff too, so she works madly away at her quilting, and in the room right next door I'm madly working with my writing. So, it kind of works.

- Views on gender discrimination

This male-female issue is not one I've really thought much about. Having come from [a male dominated field] background...I suppose, things have been much more male-oriented for me. Until more recently, when there are now in [my field] a lot more females. But in fact, the fact that there are four male doctorates is interesting, especially when you view the student body from which I could draw students, because we have probably about almost ninety percent female undergrads...maybe eighty-five percent, or something. Typically, the class that I will have in a second year will be a class of say, seventy students, and there'll be well under ten males. So, we're starting with...my interactions are with people now who are overwhelmingly female. And then you get the masters degree level, where it's about fifty percent female, and now you get the doctorate, and it's a hundred percent male...As I've said jokingly to the other staff, don't – because there's pressures on us to take more males as undergrads from the profession - and I've always argued: no, you just take the people on other criteria, and take females. I kind of like...I prefer the females...I think my prejudices, if they go any way, would be to take females rather than males. I've been trying not to do that, but I think that in my case...there would certainly not be any factors that would...prevent me from, or would discourage me from keep taking females. I suspect that it's the very reverse.

2.1.5 Views on the effects of parenthood on publication productivity

If I think through my own postgrad students: most of them...have been young and not had children. One: he's older - an older guy - he's had children. He finished his doctorate with me, I think in about 2000. He's the only one that I can think of who's had children.

The women I had as postgraduate students have all been single – young and single – and not very prolific at publishing. And I've had no married women...The married women in the...department: at the moment there's only one, I think, whose married – and she's not publishing; she's not doing research; she's not research-oriented at all. But if I think back at researchers that I know, the most productive women have been married – that I can think of. I can think of E...She's married, and a very prolific publisher. My own personal experience seems to fit...but I can't really give very much.

2.2 Charles

2.2.1 Trends in career or 'lifetime' publication record

2.2.1.1 *Reasons for variations in output volume over time*

I've been getting some decent research grants for one of the first times in my life. At the moment I have a SANPAD research grant, and I also got an NRF research grant running for about four, five years. It's been one of the first times that I've had some guaranteed funding. That has actually been very positive. Previous times one was working from hand to mouth from year to year, and now I've got guaranteed funding for about four years from the NRF and a couple of years on the SANPAD project.

I think sometimes these things just happen. You know, you get on a project and it just gets on a roll with publications. I suspect I'll go for a downturn very soon, because I am running out of a lot of steam. What I've been doing is a lot of work on [certain topics] and that is almost coming to an end. And I've got a sabbatical coming up, and I want to change direction a little bit in that sabbatical. And I am going to [be] doing quite a lot of reading, and just try to retool for a slightly different subject. I try to re-invent myself, particularly during sabbatical times, otherwise you just get bored.

I just had a momentum going. The momentum has really just grown. I've got a series of things that I could do, and I could bounce them off. I have a small number of things I have a strong level of confidence in, and I bounce them, and mix and match them.

2.2.1.2 *Publication outlet preferences*

- Preference for a particular publication type

I do not remember the last time I published in a non-refereed journal.

- Basis on which particular publication outlets are selected

One of the things which one is absolutely anchored to is what we have: a research incentive thing, where you get a certain amount of money for research purposes for publications in refereed journals. You get nothing for the non-accredited things. Clearly there is no point going for those journals (that are actually very good journals) that are not on the list.

The small number of monographs I have produced is probably one of the reasons why they clobbered me in terms of the NRF rating that I didn't get an A or anything like that (not that I expected to get an A). But: it is actually not really the thing which is encouraged by the system that we're in. We are encouraged to go for the research articles.

Five research articles might make a book, but it is much better to score the money, whatever, with the five research articles than it is to do the book. So what's the point of doing monographs? Again, I've reached a point in my career that I don't need to do that. So, I'm having a bit of fun at the moment, doing some edited books, which I'm very pleased with.

- Selecting journals in which to publish work

I go for whatever I think is appropriate. I actually go for journals that I read. There are some so-called 'top' journals in [my field] that I don't read, so I don't bother submitting to those. I happen to like [a particular South African] journal - it is a journal I read.

2.2.1.3 *Internationality of publications*

I try to get a couple of internationals every year, and then I get others which may be local on the basis of the fact that it generates some funds.

2.2.1.4 *Multiple authorship*

I haven't co-authored for years.

Most of the joint things are projects with someone that you are involved with. I've got a very close relationship to a guy at [another South African university] who I've been working with.

Other joint things are often with one's master's students or something like that. Our policy is very much to try and encourage students to publish by themselves, so they get the credit, but if we have a situation of good research which I've supervised, and the student is out of the loop and they're now working, I'll co-author something like that. But the first priority is to get the students to publish by themselves. We **definitely** do not agree with the system (and I know that happened in some other departments in this university) where students are almost sort of "signed up" with an agreement that, whatever they write the supervisor's name and the school's name is automatically put on it. Then you have seventeen authors and the poor student's name is stuck at the end, and most of the authors contributed absolutely nothing. We as a department (or school, or whatever we are at the moment) are totally opposed to that, although that is certainly a practice in certain parts of the university.

2.2.1.5 *Refereed articles during graduate training*

I was working in the department as a junior lecturer when I was doing my masters, and the department's policy was always to encourage people to publish. They would encourage you to go to conferences. So it is a very good sort of start in life...It was a generally supportive environment, an encouraging environment to "do the academic thing" – just to go to conferences, present papers and publish.

I did my PhD - the actually studying - while I also had a job. Really, I only had three years away, while I was doing coursework for the PhD and a bit of time in [an overseas country]. When I came back, I was offered a job again. So, basically all my degrees were done whilst I was in a job at the university, and I was often doing other research as well - the same that I am doing right now. That is why the PhD took a long time.

2.2.2 **Views on publication**

2.2.2.1 *'Publish or perish' in the South African academic context*

There is this long South African list, which has collected a lot of stuff that is rubbish. I think that local list should be axed entirely.

One has to look at the teaching portfolio.

2.2.2.2 *Views on teaching and publication*

- The relationship between teaching and research

We have the situation that we teach from our research. We've never had a tradition in this department (or school, or whatever it is called) of "you will teach this particular course". We have a situation that we teach from our strengths. In [my field] we cannot cover all areas of the discipline, so we don't even try to. We appoint people on the basis of their strengths, and then adjust our teaching programme accordingly.

- The extent to which research informs teaching, and/or vice versa

I'm increasingly taking the position that I do not want to supervise somebody who wants to do a topic which is outside my area of expertise, because I've had problems in terms of final completion of those students, because I'm not up to scratch in terms of the topic they're dealing with, and I don't have a research interest in some things. Those are the ones which tend to be problematic. So I actually block those before they start. I take on people who are working in a field in which I have the expertise to supervise and are relatively close to my research interests.

- Where interests predominantly reside (research or teaching)

I have a strong postgraduate teaching load at the moment. I don't do all that much undergraduate. I do three coursework programmes at masters – it is one of my major commitments – and I do a lot of supervision.

- Comparison of own teaching load with that of other colleagues

It depends on how you measure teaching loads, because: how do you measure postgraduate teaching loads - supervision of postgraduate students and an individual lecture sort of situation? If you count me on individual lectures, I'm down, but those people who do individual lectures are often not around doing research during the vacs, and my postgrad supervision runs throughout the year – 356 days a year.

2.2.3 Motivation for publishing

To me, writing is not a problem. I know some people battle to write. I mean, I can't fix a car; I'm completely hopeless with building, or something like that. You know, some people battle and battle and battle to write anything. For me it is not a problem. I also do not get upset when things get rejected. You have to have some sense of humour when you do these things. Ever so often you send something off to the wrong journal, or somebody will have a go at you for one reason or another. You just got to have some confidence in what you're doing, and roll with the flow.

2.2.4 Major factors that have impacted on publication productivity

2.2.4.1 General facilitators

- Most important contributing factors

Although one has many gripes one could air, I have been fortunate working in a university which has been relatively (although it could be much better) facilitating in terms of research. There has been financial funding, although certainly nothing as compared to my colleagues in the hard sciences. One looks with envy at the numbers that they play with on a daily basis. I've never been sort of **massively** funded – let's make that clear – a lot of it's all low-budget; certainly compared to the money that goes into the hard sciences. My colleagues in the hard sciences would be on NRF ratings a few years ago, where they would get a block of funding, and that funding would arrive each year. We've always been budgeting on a project-by-project basis – two-year projects, or something like that – and the amount of money you'd get from the old HSRC was small, compared to what the other people have. When we talk "well funded", let's put it in perspective.

I have a very positive synergy between work that I get asked to do as consulting, and publications: I turn the consulting work into publications. There is often a very bad attitude – certainly at [the university where I work] – towards consulting work, because there is the assumption that consulting work means that you are not doing research for publications. Effectively, consulting work in many cases is providing you with research funding that the University is not providing me with, and you can't get it from anywhere else. That is something which I think is a very positive synergy, and I think it is something which should be encouraged. I know that is going against the grain of what is certainly the view at the University, where there is this notion – certainly in the higher echelons – that anybody whose doing consulting is therefore not doing research, and therefore not publishing. That's rubbish.

- Advice provided to students, or a new staff member, specifically to ensure a high level of publication productivity

There are certain tricks of the trade that you have to learn. One of the things is you have to build confidence in your own ability, and that means, perhaps, that your initial publications maybe should be directed locally; they should be directed *not* at the top journals in the field, because those are the ones that are most likely to reject you, and shatter your ego.

Speaking of most of the masters, or graduate students: you could go after journals where you think there is a reasonable chance to get published. You don't start going for ridiculous journals; you go for something that's make-able. And learn the ropes in terms of the comments you get: you have to review it, revise it, that sort of thing. We try to encourage people that way.

2.2.4.2 General inhibitors

I honestly think that if the university were to pull the plug on the research incentive thing, that would have a dramatic impact, because already we have a situation where a lot of the money we earn is being shuffled off to pay for administration – there is a massive growth of administration at this university in terms of people shuffling paper, and harassing us on a daily basis with forms we are filling in for trying to access our own research grants, that sort of thing. If the trend were to reach a point where they'd say, "Well, we're actually not going to give you anything back for this whole thing", I think probably at that point we would punish them by switching into publishing in books, chapters - for which you get nothing - or publishing a book, which you could get a lot of personal kudos from, and the university gets nothing from.

2.2.4.3 *Specific factors*

- The impact of marriage on publication productivity

I do not think they are incompatible.

I married one of my ex-students. The joint publications came out of a project that we were asked to do jointly by the World Bank, and it was at a time when [my wife] was just having our first child. She could work on the stuff at home; she gave up her job.

She worked for a number of years in [a certain] industry. She was a masters graduate [in my field], and then she worked in [a particular] industry, and then gave up her job...and then spent a number of years at home, and then the consulting work came in. And it was on the basis of a quite large project, which we were asked to do by the World Bank, and another project...that these projects were done, and then we just chopped them up in a few papers.

She keeps me on my toes. She is now back in the research environment. She is now actually head of [a national association] – the national person doing [particular] research for the country – but that is her particular niche. It is not mine. But every so often I have to do stuff that relates to [a certain topic], and she knows what's happening on [her] side.

- Institutional factors

I'm initially from [an overseas country], and came to South Africa after finishing my first degree [there]. I came here initially on a short-term thing, and I enjoyed it, and then having finished the masters here, I decided that I'd go to [another overseas country], and started a PhD. After doing the coursework, the decision was taken that the research would actually be on Southern Africa. And so I cruised back here eventually, via [another overseas country], and then I got offered the job back here. When I came back it wasn't on a permanent stint; it eventually became permanent. I like this place; I like [the city I live in]. Not too many people say that, but I do like [it].

Most of my research and output has been during my teaching period as well. The sabbatical is just a normal thing everybody gets once in every seven years. They don't give it to you as a full year off. You basically get it in mid-year, so you end up for almost double your teaching load for one year and then go off for a year, and then collect a double load when you come back. We don't have teaching replacements.

- Career path

I usually re-invent myself every few years. In my list of publications, I change direction. I've done different things over time. Particularly at sabbatical time, I try to re-invent...It was in my last sabbatical that I did [a particular topic] for the first time, and that was six years ago. I'd never done anything on [that topic] before. So, I've suddenly been having great fun with [that topic] over the last six years. I'm going to continue with that, but I am going to dump some of the other stuff that I've been doing ever since two sabbaticals ago, on my next one. I'm going back into [another topic] – that's what I want to do. I've always had an interest in [that topic], but I've been doing other things, and I have been taken away from it; and a lot of things have happened in it, that I have not been keeping up to speed with. That is what I would like to get back to, and I'd like to de-emphasise some of the things which I think I'm running out of steam on in the next few years. I've been doing a lot of work on [a topic], and I honestly think I've written everything that I could possibly write on that (just about). And I feel that I'm writing the same thing for the umpteenth time now. It's time to get out, and do something different...I try to re-invent myself - particularly during sabbatical times - otherwise you just get bored.

I suspect I'll go for a downturn very soon, because I am running out of a lot of steam. What I've been doing is a lot of work on [certain subjects] and that is almost coming to an end. And I've got a sabbatical coming up, and I want to change direction a little bit in that sabbatical. And I am going to [be] doing quite a lot of reading, and just try to retool for a slightly different subject.

- Time management

I do work at week-ends, at times, and I do work during the holidays.

I think the most fortunate thing in life – although I can't fix a car – is that I can write. I don't know why – don't ask me for any deep, meaningful notions of that. One of the things in life that I can do, is I can just write. It flows, the words come easily, and I can conceptualise things very well in terms of writing an article. It's not a trauma. I know some of my colleagues battle and battle and battle to write something, and produce one article a year, and for them it is a major trauma. For me, I don't have stress and trauma doing what I do. I mean, I wouldn't do the topics I do on research if I didn't have an interest in them.

- Views on gender discrimination

My whole department changed in that is surrounded by women. There are not probably any white males in the department; we're a dying breed, of course.

2.3 Jacob

2.3.1 **Tendense in beroeps- of 'leef tyd' publikasierekord**

2.3.1.1 *Variasies in uitsetvolume*

U sal uit my CV sien daar was 'n tyd gewees, jare terug, wat ek geweldig betrokke was by die universiteitsadministrasie – op die senaat, en die raad, en al hierdie soortvan goeters. Weens regstellende aksie is ek in 2002 terug in die departement, waarvoor ek verskriklik bly was, want toe kon ek weer, so amper sê, negentig persent van my tyd aan navorsing spandeer en skryf, publiseer. Want dis my eerste liefde; dis hoekom ek die akademie gekies het, en u sal sien dat ek van 1970 af...al een of twee goed begin publiseer. Daar't ek begin skryf, geïnteresseerd gewees; en al die jare maar net volgehou. Daar was nie tye wat ek kan sê dat ek my belangstelling verloor het nie. Een van my voordele toe ek nou nie meer dekaan was nie, en terugkom na die departement toe, was juis die feit dat ek volgehou het met navorsing en publikasie terwyl ek in die administrasie was – miskien in 'n mindere mate as nou - maar altyd volgehou - veral ook met die handboeke, en dié goed op datum te hou, en reg te hou.

2.3.1.2 *Voorkeur vir bepaalde publikasie-uitsette*

- Voorkeur vir 'n bepaalde publikasietipe

Daar is twee belangrike redes [vir die publikasie van handboeke]. In die eerste plek is van die boeke voorgeskrewe boeke - nie net by ons nie, maar ook by ander universiteite. So, dit in die eerste plek: om 'n basiese teksboek vir studente te gee om uit te studeer. In die tweede plek, natuurlik, word [hierdie tipe] handboeke heelwat in die praktyk gebruik...Ons handboeke is eintlik baie belangrik in die praktyk, waar mense dan toegang tot daai bepaalde...gebied kan kry, en op daai manier ook kan soek vir antwoorde op die vrae wat hulle het.

Die hoofstukke in die boeke kom hoofsaaklik van...dis op uitnodiging wat 'n mens sê maar vir iemand 'n gedenk bundel, *Festschrift* of wat ook al, wat 'n mens skryf. En dan die ander klomp het veral te doen met daai [Europese navorsingsgroep] waarvan ek 'n lid was vir tien jaar...Die samesprekings het gekulmineer uiteindelik in op die oomblik sewe internasionale publikasies, en ek het natuurlik in elkeen van daardie publikasies die hoofstuk geskryf oor die Suid-Afrikaanse [situasie]. So, meerendeels *Festschrift*, en dan die [Europese navorsingsgroep] se publikasies.

- Seleksie van vaktydskrifte waarin werk gepubliseer word

Die meeste daarvan is in [’n Suid-Afrikaanse vaktydskrif]. Dit was omdat, by [die universiteit waar ek werksaam is] al die jare was die twee redakteurs hier...en toe later toe ek self redakteur word, dan moet 'n mens maar in 'n groot mate in jou eie tydskrif darem ook publiseer.

Hulle is almal geakkrediteerde tydskrifte, en as 'n mens publiseer, dan verwerf jy 'n...by ons universiteit kry jy 'n bepaalde bedrag wat betaal word, en daai geld kan dan gebruik word om oorsee te gaan.

2.3.1.3 *Internasionale aard van publikasies*

Die probleem met [my veld] is dat 'n totale...stelsel meestal net in een land geld. As ons oor Suid-Afrikaanse navorsing doen en skryf, dan is dit nie eintlik van belang vir mense in Europa of Amerika nie, want ons skryf oor ons eie [situasie]. Daar is sekere vakgebiede [wat] baie internasionale belangstelling [het]. Maar baie van ons gewone vakgebied - behalwe as jy aan 'n projek deelneem soos ek met die [Europese navorsingsgroep] - dan is dit nie so belangrik nie. Dis een van ons groot probleme in [my veld] om 'n hoë gradering te kry by die *NRF* . Dis omdat ons nie werklik internasionale bekendheid kry nie – en dis mos nou een van die groot faktore as jy [vanaf]’n B wil gaan, en in die A’s wil ingaan...Ek het darem 'n B gehaal, maar ook maar net-net.

2.3.1.4 *Veelvoudige outeurskap*

Ek werk alleen, maar ook samewerking. Die handboeke saam met P en V by [’n ander Suid-Afrikaanse universiteit] – ons werk al die jare saam tot by die vierde uitgawe nou al. Ek het 'n boek geskryf oor [’n bepaalde vakgebied], wat ek alleen geskryf het, maar dié twee kollegas het saam met my die Engelse vertaling gedoen, en gehelp, want ek het op daai stadium met my dekaanskap nie kans gehad en tyd gehad nie. So hulle het daar ook saamgewerk. Ek dan ek en J publiseer geweldig baie saam – korter goed nog.

Ek en J het vreeslik baie goed saam geskryf. Ons publiseer baie saam - dis vir ons baie lekker.

2.3.1.5 *Eweknie-beoordeelde artikels gepubliseer gedurende nagraadse opleiding*

Ek het, maar nie so baie nie, maar ek het inderdaad.

- Faktore waaraan dit toegeskryf word

Ek dink die mense het altyd die verskoning dat hulle besig is met die doktorsgraad. Ek was na 'n jaar en 'n half hierso was ek [oorsee], en 'n meestersgraad daar gedoen, en toe ek weer terugkom...ek sou 'n doktrale mondeling moes doen. En as jy 'n meestersgraad het, dan word jy vrygestel van 'n doktrale mondeling. En ek het vir die twee byvakke van my doktrale mondeling... 'n klomp navorsing gedoen. Toe ek terugkom, terwyl ek aan die proefskrif gewerk het, het ek daai navorsing in artikels verwerk, wat gepubliseer is voor die proefskrif nog klaar was. So, ek het inderdaad ook met publikasies so 'n bietjie aangegaan, totdat die proefskrif klaar was.

- Inwerking van 'n vroeë begin op latere publikasieproduktiwiteit

Professor J was my promotor. Ek het na hom toe gegaan. Hy't 'n boek vir homself oor ['n bepaalde vakgebied] geskrywe, wat eintlik net die ou – ek wil amper sê – belangrike eerste werk in Suid-Afrika is. En toe't hy ['n bepaalde navorsingsonderwerp] voorgestel, en ek het onmiddellik 'n belangstelling daarin gekry, begin werk daaraan. My verhandeling het gegaan oor 'n vergelyking tussen die Engelse en die Amerikaanse [situasie]. Toe ek nou terugkom, toe het ek daai verhandeling se Engels totaal verwerk in twee Afrikaanse hoofstukke vir my proefskrif...Daai tipe goed was fasiliteerders, wat geneig het dat 'n mens vinniger kon klaarkry, byvoorbeeld met die doktrale proefskrif.

2.3.2 **Sienings oor publikasie**

2.3.2.1 *'Publish or perish' in die Suid-Afrikaanse akademiese konteks*

Dit word 'n bietjie soos 'n fabriek, maar laat ek dit vir jou sê: ek self en J (jy sal sien ons het vreeslik baie goed saam geskryf; ons publiseer baie saam - dis vir ons baie lekker), ons het dit begin doen lank voor daar sprake was van *publish or perish*, en dat jy enige vergoeding kry wat jy vir navorsing kan gebruik.

Ek publiseer miskien nou 'n bietjie meer, omdat ek nie meer in die administratiewe goed betrokke is nie, maar ek dink dat ek dit nooit gedoen het om te *publish or perish* nie, maar omdat dit lekker was.

2.3.2.2 *Onderrig en publikasie*

By [die universiteit waar ek werksaam is] het ons mos nie regtig kontak met ons studente nie. Ons het 'n bietjie kontak; ons is nie in die klassituasie nie, en die bietjie kontak wat ek het, is vir my heeltemal lekker. So, ons is eintlik skrywers van studiemateriaal...ons het 'n bietjie navraag van studente. Maar ek het omtrent tien jaar agtermekaar by ['n ander universiteit] klasgegee, en dit baie geniet. Ek het ook by [nog 'n ander universiteit] klasgegee in my vakgebied, en dit baie geniet, en die terugvoering wat ek van studente gekry het, was ook dat hulle dit baie geniet het, en dat dit goed was. So, ek kan nie sê dat ek nie die dosering en onderrigtaak geniet nie, maar jy's heeltemal reg as jy sê dat my prioriteit is eintlik navorsing. Absoluut.

2.3.3 **Motivering vir publikasie**

Ek dink ek is in wese en in my bloed 'n akademikus...dis my eerste liefde. Dis hoekom ek die akademie gekies het, en u sal sien dat ek van 1970 af...het ek al een of twee goed begin publiseer. Daar't ek begin skryf, geïnteresseerd gewees; en al die jare maar net volgehou. Daar was nie tye wat ek kan sê dat ek my belangstelling verloor het nie.

So, ons het dit gedoen uit die liefde van die saak, en omdat dit vir ons lekker was...om 'n bydrae te lewer, en die navorsing te doen. My vrou was al kwaad vir my op my *sabbatical* – lang- en ontwikkelingsverlof – by die huis...ek kom omtrent nie uit daai studeerkamer nie; sy moet my daar kom uithaal vir etes. Dit is vir my baie lekker, eerlikwaar. Dit is vir my my eerste liefde, en ek geniet dit baie. Ek is eintlik baie bly dat ek die laaste klompie jare, terwyl ek nog werk in die akademie, dat ek meer tyd daaraan kan spandeer, as administratiewe goed.

Dit is, dink ek, die groot verskil tussen mense wat sê, “Ek moet nou maar my twee of drie publikasies 'n jaar doen, anders gaan die universiteit met my begin praat”. Dit is nie regtig akademiese nie. Dis mense wat regtig...jy kry natuurwetenskaplikes wat hul eksperimente...hulle gaan dae en nagte sonder slaap deur. In die sosiale wetenskappe waarin ons is, as jy regtig 'n akademikus is, dan is dit vir jou 'n eerste liefde.

2.3.4 Hooffaktore wat op publikasieproduktiwiteit ingewerk het

2.3.4.1 Algemene fasiliteerders

- Belangrikste bydraende faktore

Faktore was natuurlik [‘n] beurs wat ek gehad het vir ‘n jaar in [‘n oorsese land]. My vrou en die drie kleintjies was saam gewees; dit was ‘n wonderlike jaar, wat ‘n mens lekker kon werk, en ook lekker kon toer, Europa leer ken, en someer, wat ‘n fasiliterende invloed gehad het. En natuurlik hierdie [internasionale navorsingsgroep] later, dink ek het ook vir my baie gefasiliteer om kontakte maak met buitelandse kollegas, en saam met hulle te werk, en te sien dat ons [veld] op baie terreine voor die Europese [veld] is; dat ons niks hoef agter te staan vir hulle nie – ons is baie goed ontwikkel. So, dit is alles goed wat my baie lekker, en...wat vir my baie lekker ook was, was toe ek nou amper wou ek sê op die top van my akademiese loopbaan by [die universiteit waar is nou werksaam is] was, toe’t hierdie ander goed so half op my pad gekom. Ek het nie altyd gaan soek daarvoor nie. Dit was sommer J uit ‘n [oorsese] land wat, terwyl ek en my vrou daar rondgetoer het, ‘n afspraak sou maak en vra of ek nie lid wil word van die groep nie. Hierdie goed het alles maar so gebeur, en dis wonderlik dat dit gebeur het, want dit het my lewe daarna interessanter gemaak, en meer verryk nog.

Ek dink ek [is] ‘n baie - wel, kom ons gebruik maar die woord - ‘n geseënde mens wat my werk aanbetref, dat ek dit so geniet. En daar is baie mense wat sê hulle wens hulle was soos ek.

- Advies aan studente, of ‘n nuwe personeellid, spesifiek om ‘n hoë publikasieproduktiwiteitsvlak te verseker

As jy nie lief is vir navorsing nie, dan hoort ‘n mens nie dalk eintlik nie in die akademie nie. Ek dink regtig daai ingeboude liefde...om navorsing te doen.

Ek is ‘n bietjie skepties...veral in die huidige tyd kry jy dat...die mense moet publiseer, moet publiseer, moet publiseer, alhoewel hulle nie eintlik baie daarvan hou nie, en dan word dit naderhand ‘n groot las vir hulle: daai mense wat in die akademie sit, wat eintlik maar ‘n bietjie onderrig wil doen – dalk so ‘n bietjie navorsing om net darem hul vakgebied redelik op datum te hou, [maar] nie belangstelling en ure [wil] insit nie. My raad sal wees: ken jousef; weet of jy lief is vir navorsing, vir die akademie, en dan is dit die plek vir jou. Ek dink regtig, as dit vir ‘n mens ‘n las is om te gaan sit en werk en navorsing te doen, dan kan jy sommer maar vroeg ophou en eers iets anders doen.

2.3.4.2 Algemene hindernisse

- Beperkinge teëgekrom

Ek publiseer miskien nou ‘n bietjie meer, omdat ek nie meer in die administratiewe goed betrokke is nie...In dié sin dat ‘n mens net eenvoudig nie meer die tyd gehad het, om in só ‘n mate te werk nie. Dis regtig die rede. Maar as jy na my publikasielys kyk, dan sal jy sien ek het selfs dwarsdeur daai tye...maar altyd nog gepubliseer.

- Moontlike redes waarom vroue minder as mans publiseer

Ons eerste vroueprofessor by ons regs fakulteit...sy het nooit kinders gehad nie, en sy het baie goed met haar lewe aangegaan; sy was...ook eers [in die praktyk] [ge]wees.

En...in die gang is daar baie van ons senior vroueprofessore wat kinders het en baie goed publiseer. So ek moet sê ek kan nie...ek is nou regtig verras, omdat ek weet nie hoekom vroue wat nie ‘n probleem met kinders het nie, nie baie sou kon publiseer nie. Dis vir my nogal...dis snaaks.

2.3.4.3 Spesifieke faktore

- Sienings oor die kombineerbaarheid van die huwelik met ‘n navorsingsberoep

My vrou was al kwaad vir my op my *sabbatical* – lang- en ontwikkelingsverlof – by die huis...ek kom omtrent nie uit daai studeerkamer nie; sy moet my daar kom uithaal vir etes.

My vrou het my al die jare baie ondersteun. Al wat sy eis is dat, as ek op studieverlof is, dan moet ek darem af en toe afkom en in die tuin werk, en aan die kinders aandag gee, en so aan. Want ek is nogal geneig om heeltemal net te wil aanhou werk en werk en werk.

- Institusionele faktore

By [die universiteit waar ek werksaam is] het ons mos nie regtig kontak met ons studente nie. Ons het ‘n bietjie kontak; ons is nie in die klassituasie nie...ons is eintlik skrywers van studiemateriaal...Dit is beslis ‘n fasiliteerder.

Ons het ‘n baie goeie regs biblioteek - uitstekend om goed van die buiteland af te bestel, en dies meer. Ek dink dit help ‘n mens ook as jy daai navorsingsfasiliteite het. En dan word ons baie deur die universiteit ondersteun, veral as

jy nou 'n goeie navorser is, en veral die mense wat *NRF* gradering het, kry maklik geld om buiteland toe te gaan en navorsing te doen, ensovoorts. In daardie opsig fasiliteer dit 'n mens baie...Ek kan nie dink aan iets negatiefs nie.

- Integrasie in die akademiese navorsingsgemeenskap

Ek was 'n lid van ['n internasionale navorsingsgroep] vir tien jaar...Die samesprekings het gekulmineer uiteindelik in op die oomblik sewe internasionale publikasies, en ek het natuurlik in elkeen van daardie publikasies die hoofstuk geskryf oor die Suid-Afrikaanse [situasie]...Dit was 'n wonderlike verrykende ervaring. Dit kom nou ongelukkig tot 'n einde nou in Mei, en ek en my vrou gaan...[na 'n Europese stad] toe om dit af te sluit, en ek is 'n voorsitter by een van daai sessies; en dan word die beginsels wat oor tien jaar [ontwikkel is], in die openbaar bekend gestel. Dit was 'n goeie tydperk.

[Samewerking] is nie vir my moeilik nie; maar ek en J het so 'n lekker verhouding; ons is sulke goeie ou vriende...Voor die rekenaar tik hy baie vinniger as ek. Ek sit met die klomp boeke hier om my, en dan begin ons te skrywe. En dit is nou omtrent dertig jaar wat ons so lekker saamwerk.

Ek dink dis baie goed. Ek dink dat 'n mens nie net jou eie moontlikhede vir verdere navorsing bevorder nie, maar veral ook jou kollegas - die jonger kollegas. Ek het byvoorbeeld 'n jong kollega - ek was 'n promotor vir sy proefskrif - ek het vir hom geleenthede geskep deur hierdie [internasionale navorsingsgroep], dat hy byvoorbeeld 'n *research fellow* kan word, en op dié manier by navorsingsprojekte betrokke raak.

Ek dink regtig 'n mens se betrokkenheid is nie net verrykend vir jouself nie, maar skep ook baie, baie moontlikhede vir ander mense ook...ook buitelandse kontakte, soos ['n] professor wat nou hier was...Ek het hom nou aan 'n klomp mense hier voorgestel, en seer sekerlik gaan hulle - al is dit nou net deur e-pos - met hom in verbinding kom om sekere inligting te kry, of uit te ruil, of wat ook al. Dit is baie goed. In die geheel dink ek is dit uitstekend as mense nie net eng in hul ivoortoring sit nie, maar ook 'n bietjie uitreik, betrokke raak, en...ag, 'n bietjie ook die kennis wat 'n mens oor baie jare opgedoen het, kan jy nou ook gebruik om ander mense te verryk ook. Ek sou nie maklik, sê maar, 'n versoek van ['n vaktydskrif] om nou 'n lid van die redaksiekomitee te word, van die hand wys nie, want ek [het] in 'n sekere sin 'n bietjie van 'n verantwoordelike sin om ook vir hulle te help en leiding te gee. Ek was elf jaar redakteur van ['n Suid-Afrikaanse vaktydskrif], en dan kan 'n mens op dié manier weer vir hulle help met goed.

Professor J was my promotor. Ek het na hom toe gegaan. Hy't 'n boek vir homself oor ['n bepaalde vakgebied] geskrywe, wat eintlik net die ou - ek wil amper sê - belangrike eerste werk in Suid-Afrika is. En toe't hy ['n bepaalde navorsingsonderwerp] voorgestel, en ek het onmiddellik 'n belangstelling daarin gekry, begin werk daaraan.

Hy was 'n goeie taalpuris, wat 'n mens geleer het om goed te skryf ook. As jy deur 'n proefskrif gewerk het met iemand wat jou taal behoorlik onder die oë neem, en laat oorskryf en oorskryf, dan leer 'n mens goed skryf. En ek moet sê, ek skryf ook dikwels en baie in Engels die laaste tyd, maar ek skryf verreweg die lekkerste in Afrikaans, omdat ek Afrikaans baie goed magtig is, en ek dink 'n mens druk jou gedagtes net makliker uit - gebruik meer presiese en beter woorde as jy daarin skryf. Ek is amper sê *ge-train* deur my promotor daarmee - daai tyd moes ons mos nog ons proefskrifte in Afrikaans geskryf het.

- Tydsbestuur

Om redakteur van ['n Suid-Afrikaanse vaktydskrif te wees] was nogal...wel...ek het dit geniet; maar dis 'n ongelooflike besighoudende werk, as ek die woord kan gebruik. Daai tyd was dit vier uitgawes 'n jaar, en as jy klaar is met die een, en hy verskyn, begin jy die volgende een. So werk 'n mens dwarsdeur die jaar. Ek was vir elf jaar redakteur, en in daai elf jaar het jy baie selde 'n vrye tyd wat jy nie op een of ander manier met die tydskrif besig is nie. Dis nogal baie omvangryke werk. Dis verantwoordelik werk, in die sin dat 'n mens baie goed moet kyk na die standaard van die publikasies, en dan die redaksionele versorging daarvan. En dat 'n mens wou gehad het dat die tydskrif - wat die tweede oudste tydskrif [in die veld] in Suid-Afrika is...- dat dit 'n bepaalde standaard moes handhaaf. Toe was ek ook redakteur vir die dekaan gewees, en toe het ek na 'n ruk besluit ek kan nie...dit raak net eenvoudig te veel goed. Toe besluit ek ek gaan nou maar die redakteurskap bedank. Ek is nog betrokke by tydskrifte se bestuursliggame, en so, maar ek is nou - wel, dank Vader! - nie soseer by redaksionele werk betrokke nie. Hier lê vanoggend weer 'n paar vir ['n vaktydskrif] wat my gevra het om lid te wees van hulle redaksiekomitee, so ek sal maar daar nog 'n bietjie...maar dit is meer vergaderings oor beleidsake, en so.

Ek dink dat 'n mens werklikwaar moeite doen om die tyd te kry. Ek werk baie aande, nou nog baie keer naweke; en nie omdat dit vir my 'n las is nie, maar omdat dit vir my lekker is. Dit is, dink ek, die groot verskil tussen mense wat sê, "Ek moet nou maar my twee of drie publikasies 'n jaar doen, anders gaan die universiteit met my begin praat". Dit is nie regtig akademiese nie. Dis mense wat regtig...jy kry natuurwetenskaplikes wat hul eksperimente...hulle gaan dae en nagte sonder slaap deur. In die sosiale wetenskappe waarin ons is, as jy regtig 'n akademikus is, dan is dit vir jou 'n eerste liefde. En tyd is nie so 'n probleem nie. 'n Mens rig tyd vir ander goed ook in, maar dan gebruik jy die res van die tyd om te skryf en navorsing te doen.

- Sienings oor gender-diskriminasie

In ons fakulteit is daar al meer vroulike professore as mans, en twee-derdes van die fakulteit is vroue, en ons is net 'n derde...Ons is eintlik nou 'n bedreigde spesie...met die regstellende aksie.

[Ons dekaan] het ook gesê (...sy's nou al jare in die fakulteit ook, en het redelik vroeg 'n professor geword) dat [hierdie fakulteit] is werklik een van dié plekke en instellings, wat sy nog nooit ervaar het dat daar teen 'n vrou gediskrimineer word, of dat 'n mens nie kennis neem van die feit dat die persoon 'n vrou is, of 'n man is nie. Jy kyk na die meriete van die aansoek, en op daai basis word 'n persoon aangestel en bevorder. Nog nooit het geslag 'n rol gespeel nie. Dit was regtig my ervaring by ons fakulteit.

Eerlikwaar, in ons fakulteit dink ek nie daar's 'n onderskeid tussen mans en vroue nie. Ek het byvoorbeeld 'n kollega...wat van die begin af 'n akademikus was: haar proefskrif gou klaargemaak het, baie gepubliseer het, net soos ek heelwat in die buiteland kom, by baie goed betrokke is. So, as ek my met haar vergelyk, dan is ons twee op dieselfde vlak; ons het dieselfde gesindheid; ons hou daarvan om navorsing te doen en te publiseer. En so kan ek'n paar ander kollegas ook vir jou noem.

2.3.5 Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit

2.3.5.1 Die verenigbaarheid van ouerskap met 'n navorsingsberoep

[Kraamverlof] het 'n bietjie 'n negatiewe impak op [vroue], want dit maak dat hulle agterraak by die mans. Dit maak dat hulle langer vat om 'n proefskrif klaar te maak. Ek weet van een kollega wat tien jaar geneem het, maar sy't in daai tien jaar drie kleintjies grootgemaak. Dit maak dit moeiliker. Haar man is 'n mediese dokter - hy kan ook nie eintlik veel help by die huis nie. En dan het dit nogal 'n impak, en lei tot frustrasies, en someer, want kollegas wat - ek wil amper sê - agter in die tou staan, begin hulle verbystee, en dan veroorsaak dit 'n bietjie frustasie. Maar daar's ander wat, ten spyte van die kinders, ook amper net soos die mans presteer. Maar ek dink tog dat dit iets is wat mense so 'n bietjie terughou. Die *Alexander von Humboldt* Stigting – die bekende stigting - hulle voeg twee jaar by vir elke kind. Die afsnypunt is mos veertig, en as jy drie kinders gehad het, dan sê hulle 46 is so goed soos 40. Hulle neem dit in ag dat 'n mens nie die kanse gehad het om voluit te kon werk in daai tyd nie...Ek dink dis goed, dis reg. 'n Mens moet ook prakties en pragmaties wees. 'n Mens moet sê, “Goed, hier is 'n situasie wat veroorsaak dat vroue, as hulle kinders het, dit nie kan doen nie, en daarom moet 'n mens meer toeskietlik wees”. En ek dink dis reg.

2.3.5.2 Inwerking van ouerskap op publikasieproduktiwiteit

Nee wat, nie [’n negatiewe impak] op my nie. My vrou het my sommige kere so 'n bietjie kwalik geneem dat ek nie meer aan hulle aandag gee nie, maar nou ja, dinge het gelukkig darem alles baie goed uitgewerk.

2.4 Jacques

2.4.1 Tendense in beroeps- of 'leef tyd' publikasierekord

2.4.1.1 Redes vir variasies oor tyd in uitsetvolume

Jy begin natuurlik stadig ook. Hoe kan jy nou vinnig begin?

In die begin natuurlik is jy jonk, jy't min studente gehad.

2.4.1.2 Voorkeur vir bepaalde publikasie-uitsette

- Seleksie van 'n bepaalde publikasie-tipe

Nee, 'n verslag is niks werd nie. Dis mos nou sommer – ek kan nou vir jou 'n mooi woord gebruik, maar – dit is nou sommer *bullshit*. Dis nou waar hulle altyd sê, “Ek moes 'n verslag skryf”. Wel, as jy 'n verslag skryf, kan jy netsowel 'n artikel skryf, want dit dien ook as 'n verslag. Jy verstaan wat ek bedoel? So, ek skryf nie verslae nie; ek skryf glad nie verslae nie, en as jy my vra om een te skryf, sal ek vir jou sê, “Nee, baie dankie, ek stel nie belang nie”.

- Seleksie van 'n vaktydskrif waarin werk gepubliseer word

[’n Suid-Afrikaanse vaktydskrif], waarvan ek dan ook die *editor* is. In die *South African Journal of Science* het ons ook 'n paar artikels. Dis al twee wat vir ons van belang is; daar's nou nie ander waarin ons publiseer nie.

2.4.1.3 Internasionale aard van publikasies

Kyk, baie kollegas – dis waar die wetenskaplikes ook 'n fout maak – hulle degenerer die Suid-Afrikaanse tydskrifte self, omdat hulle nie daar publiseer nie. Ek publiseer op die oomblik baie in Suid-Afrikaanse tydskrifte, want as óns nie daar publiseer nie...as ek 'n top wetenskaplike is, en ek publiseer nie daar nie, watter voorbeeld stel ek dan aan my mense wat ek oplei? En ek sal vir jou sê, hulle publiseer net so baie nonsens in ons tydskrifte, en net so baie

nonsens in oorsese tydskrifte. Daar is werklik geen verskil nie. So, ek het al heelwat artikels wat hier by ons land verwerp is, net so gevat, [in] 'n ander tydskrif se formaat gesit, en dan het hulle dit vir jou gepubliseer. So, die mense is ook byterig hiero op mekaar: dis 'n klein landjie...Daar's baie probleme, maar ek reken, as ons nie ons Suid-Afrikaanse tydskrifte stoot nie, dan sal ons ook wragtig nooit nêrens bo uitkom nie.

2.4.1.4 *Veelvoudige outeurskap*

Ja, en tog staan ek by die universiteit bekend as die man wat met niemand saamwerk nie! Jy behoort darem slimmer as dít te wees. Maar dis wat hulle jou sal sê: ek werk met niemand saam nie. Maar daar's geeneen op hierdie universiteit wat soveel met ander mense publiseer nie, en met soveel oorsese mense saamwerk nie. Maar ek "werk met niemand saam nie". Dis maar hoofsaaklik jaloesie en naywer - dis al wat dit is. Die ander manne kom nie die mas op nie, dan moet daar mos 'n rede wees waarom hulle nie die mas opkom nie; hulle is só slim.

2.4.2 **Sienings oor publikasie**

2.4.2.1 *'Publish or perish' in die Suid-Afrikaanse akademiese konteks*

Die meeste [van my kollegas] doen nie die werk wat hulle moet doen nie. Negentig persent van die wetenskaplikes in hierdie land werk nie soos hulle moet werk nie. Ek is taamlik hard op hulle, want ek weet hoe bleddie lui hulle is. En dan altyd as iemand anders presteer, dan probeer hulle altyd afmaak dat jy gemors publiseer. Jy sien, dit is maar soos dit is. As iemand goed doen, dan wil hulle hom altyd aftrek tot...dit is maar die kreefsindroom: die kreef wat uit die warm water uitklim, moet jy aftrek. So, dit is maar so.

Ek het doodeenvoudig altyd net geglo dat, as jy werk gedoen het, dan moet jy dié werk vir 'n paar redes blootstel aan òf die publiek, òf die wetenskaplike gemeenskap, sodat mense dit kan lees, en hulle kan dit evalueer. Hulle evalueer op die ou end of jou goed die moeite werd is, of nie - nie jyself nie.

As jy 'n goeie wetenskaplike wil wees, dan moet jy jou resultate...vir geld wat jy kry, moet jy iets lewer. En resultate wat nie gepubliseer word nie, is waardeloos vir die land, is waardeloos vir almal; dis vir niemand iets werd nie.

Dis eenvoudig. Jy moet jou *sponsors*, soos hulle sê, moet jy tevrede stel. Hulle stel net basies na my mening in uitsette belang.

Die hele punt is, wat my satisfaksie gee, is om werk te doen wat deur ander mense geëvalueer word, en hulle besluit of dit goed of sleg is, en dan publiseer jy dit, en klaar. Dan kan ander mense dit lees, hulle kan dit toepas, en dies meer.

Ek is maar 'n baie siniese ou, seker...kan jy sê...nie sinies nie, maar ek glo daaraan 'n mens moet presteer. En as jy geld gevat het, [in die] vorme van beurse en so aan, dan moet jy...jou betaling is die publikasies wat jy lewer, wat weer vir jou land iets lewer. [Dit] mag nie dalk nou gebeur nie, maar [dit] mag in die toekoms wees - jy weet nooit.

2.4.2.2 *Onderrig en publikasie*

- Die verhouding tussen onderrig en navorsing

Jy móét goed klasgee as jy goeie studente wil trek. Jy verstaan? Dié storie dat, "O, ek gee te veel lesings, daarom het ek nie nagraadse...", dit is absoluut bog. As jy die voorgraadse studente mooi behandel, hulle leer, hulle entoesiasme aanwakker - werklik aan die gang kry - dan: al die goeie studente kom dan saam met jou werk. Jy hoef nie met hulle te sukkel nie – hulle sal kom. En dit is waar ons jongmense 'n fout maak: hulle kla hulle moet baie lesings gee. Nou ja, as jy nie lesings gee nie, kom jy nêrens nie; as jy nie publiseer nie, kom jy nêrens nie.

- Die mate waarin navorsing 'n invloed het op onderrig (en/of omgekeerd)

Die studente wat ek gehad het, het ek altyd baie goed gekies. Hulle kies eerstens vir my – ek maak aan geen student 'n aanbod nie; hoegenaamd nie. Ek beloof hom nie geld nie, ek koop hom nie. As ek hom kan help finansiëel, later, as ek 'n beurs kry en so, dan's dit goed so. Maar ek sal nie vir enige een geld aanbied om saam met my te kom werk nie. So, my studente is nie gekoopte studente nie...By meeste [universiteite], by meeste...ek sal dit maar daar laat...hulle gaan en hulle bied die studente geld aan. Nou, as jy 'n student gekoop het, [om] vir geld na jou toe kom, dan's hy wetenskaplik al klaar 'n minderwaardige student. En ander mense sal kla jy't hom by hulle afgekoop, afgerokkel, en dies meer, en dies meer. So, die mense wat by my werk, is uit en uit mense wat my genader het om hier te kom werk, en ek stel dan ook vir hulle dadelik baie eenvoudig dat: hulle moet hulle eie geld bring, hul eie beurse. Ek sal wel kyk of ek vir hulle beurse kan kry, maar ek koop hom nie reg in die begin nie. En hy moet self besluit waarop hy werk. So, hy kan nooit na my kant toe val en sê ek het hom soortvan omgekoop om hier te kom. En dan die ding wat daaruit volg: ek éis absolute lojaliteit van my studente. En as ek reken hulle het goeie resultate gelewer, dan éis ek dat daardie resultate opgeskryf word. Want deel van jou funksie as promotor is om studente te leer skryf – wetenskaplik te leer skryf – die etiek van wetenskap te leer, en dies meer, en dies meer. So, as dosente dit nie doen nie, dan faal hulle klaar.

- Vergelyking van eie onderrigglading met ander kollegas s'n

Ek is nie [by voorgraadse onderrig] betrokke nie, en ek wil ook nie wees nie. As jy my opinie wil hê, raak dit al hoe swakker by al die universiteite.

Deesdae is dit makliker om 'n akademikus te wees, as in die ou dae...ek het 24 lesings moes per week gegee het, en vier praktika per wêek. En dit het ek als gedoen in vier dae, want ek het Vrydag oopgehou om my MSc te doen...Ek was 22 jaar oud toe ek lektor geword het.

Die mense het altyd gekla...ek het meer klasse gegee...kyk, ek was ook hoof van [’n] departement gewees, en direkteur van die eenheid, en...twee jaar terug het ek vyf-en-dertig nagraadse studente gehad. Ek het nie nou meer soveel nie, maar dis nog ’n hele klompie.

2.4.3 Motivering vir publikasie

Jyself werk natuurlik na die beste van jou vermoë.

Die hele punt is, wat my satisfaksie gee, is om werk te doen wat deur ander mense geëvalueer word, en hulle besluit of dit goed of sleg is, en dan publiseer jy dit, en klaar. Dan kan ander mense dit lees, hulle kan dit toepas, en dies meer.

Ek geniet dit, dis al. Dis doodeenvoudig ’n stokperdjie, amper, en...So met die tyd skryf jy al hoe beter en al hoe beter en al hoe beter. En wat natuurlik ook baie belangrik is: ek glo aan *deadlines*. As dit die datum is, dan’s dit die datum - as jy ’n hoofstuk vir ’n boek skryf. En op die oomblik – ek wil dit afskaal, maar ek vind dit al hoe moeiliker – ek *referee* op die oomblik elke jaar vir 35 internasionale tydskrifte in gebiede wat ons Suid-Afrikaners nie as my gebied sou beskou nie, en tog oorsese ouens vra my om te *referee*. En hulle weet ook dat as hulle hom vir my hierdie week stuur, dan kry hulle hom volgende week terug. Jy doen nie so ’n werk, en dan sit jy [en] doodgaan daarop nie, want daar’s ’n ander wetenskaplike wat óók wag; hy moet ook iewers kom. Dit is nog ’n fout van baie Suid-Afrikaners, byvoorbeeld. Hulle neem werk aan, en hulle verstaan nie dat dit is ’n groot verantwoordelikheid: jy moet by jou *deadlines* hou. En my studente word dit geleer.

Ek is maar ’n baie siniese ou, seker...kan jy sê...nie sinies nie, maar ek glo daaraan ’n mens moet presteer. En as jy geld gevat het, [in die] vorme van beurse en so aan, dan moet jy...jou betaling is die publikasies wat jy lewer, wat weer vir jou land iets lewer. [Dit] mag nie dalk nou gebeur nie, maar [dit] mag in die toekoms wees - jy weet nooit.

2.4.4 Hooffaktore wat op publikasieproduktiwiteit ingewerk het

2.4.4.1 Algemene fasiliteerders

jy móét goed klasgee as jy goeie studente wil trek. Jy verstaan? Dié storie dat, “O, ek gee te veel lesings, daarom het ek nie nagraadse...”: dit is absoluut bog. As jy die voorgraadse studente mooi behandel, hulle leer, hulle entoesiasme aanwakker - werklik aan die gang kry - dan: al die goeie studente kom dan saam met jou werk. Jy hoef nie met hulle te sukkel nie – hulle sal kom. En dit is waar ons jongmense ’n fout maak: hulle kla hulle moet baie lesings gee. Nou ja, as jy nie lesings gee nie, kom jy nêrens nie; as jy nie publiseer nie, kom jy nêrens nie. En ek het maar in die begin baie min geld gekry. Die nuwe swartmense nou kry duisende rande meer as wat ek kry vir die navorsing, en kyk hoeveel studente het ek. Maar hulle pomp geld daarin. Daai geld gaan als in die rivier af – daar sal niks van kom nie. Hulle mors geld, eintlik. Maar, elk geval.

2.4.4.2 Algemene hindernisse

- Beperinge teëgekomp

Nee, ek het meer moeilikheid gehad as enige ander wetenskaplike in hierdie land. Almal rol net klippe in my pad; gedurig – tot nou nog. Dit het nog nooit verander nie. Maar nou’s ek taamlik harregat. En dit is: as jy ’n klip in my pad rol, dan gaan ek hom òf stukkend slaan, òf ek gaan hom uit die pad uit rol. En hoe meer jy my kwaad maak, hoe meer gedetermineerd raak ek om daai klip iewers op jou kop te laat val. So, ek glo daaraan: my kollegas het my eintlik baie gunse gedoen - kort en klaar - deurdat hulle *vindictive* is, deurdat hulle altyd jou verkleineer, ensovoorts, ensovoorts. En inderwaarheid kry ek ook baie minder geld as die meeste wetenskaplikes deesdae kry. So, kort en saaklik.

Die ding wat my die meeste teruggesit het, was eintlik die ANC, want daar was in die sewentigerjare...is ek baiekeer nie toegelaat om na konferensies toe te gaan nie; het die konferensiebestuurders my uitgegooi. En ek het die ander dag ’n ding geskryf – ek weet nie waar hulle...of hulle dit gepubliseer het nie – dat ek net soveel *ge-disadvantage* is, soos die kastige swart ouens; indien nie meer nie. Daar is ’n hele paar van ons wat in dié tipe toestand sit. Ons kon nie konferensies toe gaan nie; ons kon – ons het die geld gehad – maar hulle het jou geweier om jou te registreer. En die punt is: dit het eintlik ’n negatiewe invloed, maar ook ’n geweldige positiewe invloed, want jy spoeg hulle in die oog weer, agterna.

- Moontlike redes waarom vroue minder as mans publiseer

Ek sou u sê wat die geval is: die meeste van my studente is vroumense, en my familie is ook almal vroumense. So, die probleem is... 'n vroumense is 'n snaakse ding. Hulle sal baie, baie hard vir jou werk – en myne het almal hard gewerk – maar hulle wil die erkenning hê. En baie vrouens maak deesdae die fout: hulle kla omdat hulle vrouens is, pleks dat hulle sê, dankie hulle is anders. Dit is waar die eerste probleem inkom. Dis nie my skuld as 'n vrou baba's het nie. Verstaan? Dis nie my skuld... hulle moet dan nie kom kla hulle het nie tyd nie. Jy moet maar besluit wat jou funksies in die lewe is; dis nie 'n verskoning nie. U moenie altyd 'n verskoning soek nie. Maar vrouens wat by my opgelei is, sal nie 'n verskoning soek nie. Hulle is geleer hoe om op te tree in sulke situasies. Maar dan kry jy baie keer, "O wel, ek is 'n vrou, en ek is dit en ek is dat". Nou, as jy die swakkere geslag is, moet dan nie die sterkere geslag wees in sommige dinge nie. Maak vrede met jou lewe, en gaan aan. En gelukkig dié wat saam met my gewerk het, hulle doen almal baie, baie goed.

Meeste van daai mense in die publikasies: as jy hulle nou voor jou het - net laasjaar s'n – nou wil ek vir jou sê, "Vrou of man?", dan kan jy uitwerk hoeveel van hulle is, want jy kan nie. Gewoonlik gebruik ek nie voorname nie (dit hang nou maar af hoe die tydskrif jou druk, maar anders...). Maar die meeste van hulle is vrouens.

2.4.4.3 Spesifieke faktore

- Institusionele faktore

Soms ja, en soms nee. Toe ek in die jare hier gekom het, was ek Afrikaans-sprekend – wel, ek is 'n Afrikaner – met die gevolg daar's teen my gediskrimineer hier. Dis maar soos dit gaan. Maar ek het maar net dit afgegee en so aan, en my eie gang gegaan, en ek gaan nou nog maar my eie gang, so...

Die universiteit probeer kort-kort van my ontslae raak, maar hulle sal maar baie dom wees, jy weet. Hulle behoort eintlik ons ouens hier aan te hou, al is dit ook selfs teen 'n klein salaris – wat huidiglik my geval is: ek kry nie 'n professor se salaris nie... Die professor van Plantkunde is nou iemand anders. Maar ek is natuurlik emeritus professor, en ook ereprofessor.

Ek is byvoorbeeld by ['n Suid-Afrikaanse universiteit] weg – nou sal jy dit nie glo nie, maar die rede hoekom ek hiernatoe gekom het, is [in die] eerste instansie: ek het by ['n ander Suid-Afrikaanse universiteit] aansoek gedoen vir 'n pos, maar by [daardie universiteit] nooit gereken as goed genoeg nie – tot die Here vandag toe nog nie. Die ander kant van die saak, is dat: ek het 24 lesings moes per week gegee het, en vier praktika per week... En ek het maar in die begin baie min geld gekry. Die nuwe swartmense nou kry duisende rande meer as wat ek kry vir die navorsing, en kyk hoeveel studente het ek. Maar hulle pomp geld daarin. Daai geld gaan als in die rivier af – daar sal niks van kom nie. Hulle mors geld, eintlik. Maar, elk geval.

- Integrasie in die akademiese navorsingsgemeenskap

Ek werk baie goed met mense, maar die lyne is baie duidelik: as jy jou toon daarvoor sit, dan's hy af.

Daar's geeneen op hierdie universiteit wat soveel met ander mense publiseer nie, en met soveel oorsese mense saamwerk nie.

Dit is belangrik vir uitsette, dis belangrik vir idees wissel, ensovoorts, ensovoorts. Ja nee, dis baie belangrik. Ek het altyd daaraan geglo – ek meen, ek het baie oorsee gewerk, in baie lande ook. Ek het heelwat ooreenkomste met baie lande, en... ja... ek het nie 'n probleem daarmee om met mense saam te werk nie. Maar as jy saam met my werk, moet jy nie dink jy's 'n passiewe nie – jy moet jou kant bring. As jy nie jou kant bring nie, dan val jy van die wa af. Of ek stoot jou af.

Ek sal net sê ek het op Stellenbosch studeer. En ek het as MSc student werk gedoen, wat nou nog *novel* is, soos hulle sê. Ek het 'n artikel... ek het daai tye maar swak geskryf. Ek het altyd geweier om in Afrikaans te skryf. En uit die aard van die saak het ek gedink dat die leserspubliek is Engels - jy moet maar jouself nie daarvoor *bluff* nie. En die eerste artikel wat ek geskryf het uit my MSc uit, het ek vir my promotor gegee, en tot vandag toe het ek hom nog nie teruggekry nie. Sulke promotors het jy nie nodig nie. Verstaan? As die student 'n poging aanwend - en ek het nou hier baie wat Franssprekend is, wat hier uit Afrika uit kom, en so – as hy 'n poging aanwend om daai resulate bymekaar te sit, dan is dit my werk, of my funksie, om hom te help om dit aanmekaar te timmer, en hom te leer hoe om dit aanmekaar te timmer, en wat nie reg is nie, en so aan. Met ander woorde, dis 'n leerproses.

- Tydsbestuur

Baie mense vra dit. Ek weet nie. Dit is maar 'n gawe wat ek het.

My deur is oop die hele dag. As dit nou só is dat ek vol is, dan moet hy maar die volgende dag probeer. Maar my deur is... ek werk op 'n oopdeurbeleid, en as 'n student my 'n maand of twee nie gesien het nie, dan wil ek hom sien; dan sal ek verseker dat ek hom sien. Maar, nou ja. En studente is 'n eenvoudige goed. Die mense maak altyd 'n fout met studente – hulle dink studente weet. In die meeste gevalle, as 'n student vir jou kom vra, dan weet hy eintlik. En as ek die antwoord geweet het, dan sou ek jou nie op die projek gesit het nie. Dan vertel ek hom dadelik hoe

onnoselik hy is, in die terme dat hy my dan nou so 'n onnoselike vraag kom vra. En dan sal ek vir hom sê, “Probeer altwee. Dié kant, of daai kant. Of jy probeer dit en dit”. Dit is al wat 'n student dadelik wil weet. En baie keer dan kan jy hom uit ondervinding natuurlik 'n bietjie raad gee, en dan kom hy reg. So, dit is maar soos dit gaan.

Ek is ook geseën daarmee dat ek baie vinniger 'n besluit neem – oombliklik, amper.

Wat natuurlik ook baie belangrik is: ek glo aan *deadlines*. As dit die datum is, dan's dit die datum - as jy 'n hoofstuk vir 'n boek skryf. En op die oomblik – ek wil dit afskaal, maar ek vind dit al hoe moeiliker – ek *referee* op die oomblik elke jaar vir 35 internasionale tydskrifte in gebiede wat ons Suid-Afrikaners nie as my gebied sou beskou nie, en tog oorsese ouens vra my om te *referee*. En hulle weet ook dat as hulle hom vir my hierdie week stuur, dan kry hulle hom volgende week terug. Jy doen nie so 'n werk, en dan sit jy doodgaan daarop nie, want daar's 'n ander wetenskaplike wat óók wag; hy moet ook iewers kom. Dit is nog 'n fout van baie Suid-Afrikaners, byvoorbeeld. Hulle neem werk aan, en hulle verstaan nie dat dit is 'n groot verantwoordelikheid: jy moet by jou *deadlines* hou. En my studente word dit geleer.

Ek het elke dag – ses dae, sewe dae van die week – sestien uur gewerk.

- **Sienings oor gender-diskriminasie**

Deesdae in die land is dit natuurlik 'n gemors, want dit hang af of jy wit of swart, of man of vrou is – 'n lot nonsens.

Toe ek in die jare hier gekom het, was ek Afrikaans-sprekend – wel, ek is 'n Afrikaner – met die gevolg daar's teen my gediskrimineer hier. Dis maar soos dit gaan. Maar ek het maar net dit afgegee en so aan, en my eie gang gegaan, en ek gaan nou nog maar my eie gang, so...

Jy kry twee soorte vrouens: jy kry...dié wat té vrygewig is, en dan kry jy wat my ma altyd genoem het, “die steekgatmiervrouens”. Dis die twee kategorieë. Nou, ek stel nie steekgatmiere aan nie – dis die eerste ding - en ek laat ook nie iemand die vrouens misbruik nie...Sê die gedistilleerde water is op - en daai bottel weeg 'n paar honderd kilo - as ek vind dat die vrouens daai ding dra, is die hel los. Want dan's daai mans...die mans daar in die omgewing is in die moeilikheid. Hulle moes dit gedoen het. Hulle moes aangebied het, ook. En verder ook die vrouens: as hulle so *stupid* is om hulleself te wil seermaak, dan is dit natuurlik hulle fout. Maar daar's sekere etiese dinge in my laboratorium wat net so gedoen word, en nie op 'n ander manier nie. Klaar. En gevolglik...die vrouens hier reken ek is baie tevrede. Wat ek vind 'n jammerte is, is dat ons te min geld het: beide om die vrouens en die mans 'n ordentlike salaris te betaal. Jy verstaan: ek het nie geld om hulle salarisse...groot salarisse te betaal nie. So, al wat hulle hier hou, is geluk en vrede waar hulle werk. En ek laat ook nie toe dat vroumense baklei nie. Laasjaar het ek hier 'n Amerikaner gehad, en met drie assistente as vrouens, en toe hy nou weggaan na drie maande, toe sê hy, hy weet wragtag nie hoe dit is nie, maar hy het nie één keer gesien dat daai drie in mekaar se hare vlieg, of dat hulle 'n lelike woord vir iemand sê, of met 'n lang gesig loop nie. Hy weet net nie hoe dit is nie. Wel, dit is baie eenvoudig: as ek dit raaksien, is jy *ge-fire*. Baie eenvoudig. Hulle werk ook so goed saam, want hulle werk as 'n span - dis spanwerk, dan het jy nie 'n probleem nie...Hy sê regtig, en hy kom nog van Salt Lake City, van Utah af. Hy's 'n mormoon, en hulle is nogal baie, baie gemoedelike mense. En hy kon dit nie glo nie.

In elk geval: ek voel nie daar is hier enige diskriminasie omdat jy 'n vrou is nie. Nie tussen my groep mense: ek verwag van die mans net soveel as van die vrouens.

Die hele ding is net: 'n vrou moet nooit verskoning vra omdat sy 'n vrou is nie; dit is die grootste fout wat 'n vrou-wetenskaplike kan maak. Sy is 'n vrou, en klaar. Sy hoef nie daarvoor om verskoning te vra nie. Sy moet nie daarom slegter behandel word nie, en sy moet ook nie beter behandel word nie – dan het jy moeilikheid; dis maar soos 'n witbroodjie hê, jy sien.

2.4.5 **Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit**

2.4.5.1 *Die verenigbaarheid van ouerskap met 'n navorsingsberoep*

Dis nie my skuld as 'n vrou babas het nie. Verstaan? Dis nie my skuld...hulle moet dan nie kom kla hulle het nie tyd nie. Jy moet maar besluit wat jou funksies in die lewe is; dis nie 'n verskoning nie. U moenie altyd 'n verskoning soek nie. Maar vrouens wat by my opgelei is, sal nie 'n verskoning soek nie. Hulle is geleer hoe om op te tree in sulke situasies. Maar dan kry jy baie keer, “O wel, ek is 'n vrou, en ek is dit en ek is dat”. Nou, as jy die swakkere geslag is, moet dan nie die sterkere geslag wees in sommige dinge nie. Maak vrede met jou lewe, en gaan aan. En gelukkig dié wat saam met my gewerk het, hulle doen almal baie, baie goed. Ek neem ook net vroumense in diens, wat vir jou ook maar interessant mag wees.

Nee, hulle sukkel nie. Ek weet nie of ek nou ander soort vrouemense hier het nie, maar ek gee hulle oombliklik ses maande af. Die universiteit sal hulle nie betaal nie, maar ek betaal hulle – die bietjie geld wat ek hulle buitendiën betaal...gee ek hulle ses maande af, wil ek hulle nie sien nie. En dan, daarna wil ek hulle sien. Dan moet hulle maar 'n plan maak met daardie baba...hulle is gewoonlik baie hoogs-gemotiveerd, en hulle wil so vinnig moontlik

terugkom, maar ek jaag hulle weg vir ses maande, dat hulle aandag gee aan daai baba, dat hy nou nie, of sy nie iets oorkom nie. Hier't tot by my al hier in die laboratoriums babas onder die banke geslaap.

2.4.5.2 *Inwerking van ouerskap op publikasieproduktiwiteit*

My kinders is goed opgelei, en ek het...nou onlangs met hulle gepraat. En eerste instansie het ek nie toegelaat dat my vrou werk nie. Dit was die eerste ding. Sy's ook baie goed opgelei, natuurlik, maar sy het kinders grootgemaak...As dit nie vir my vrou was nie, dan sou ek ook nie so goed klaargekom het nie, want ek het elke dag – ses dae, sewe dae van die week – sestien uur gewerk. My kinders het almal oorsee gegaan - 'n paar keer saam met my toe ons oorsee was - so, hulle het baie goed aangepas vir die lewe; hulle het baie ondervinding gehad, en meer gesien as meeste kinders. Twee van hulle het doktorsgrade...Ja, die negatiewe sy is miskien dat ek nie genoeg aandag aan hulle gegee het nie. Aan die ander kant het hulle my dit nog nooit verwyt nie. Hulle het nie gevoel dat hulle afgeskeep is nie. Ek het nie...ek sien nie eintlik daar...is daar nie 'n probleem nie.

2.5 Leon

2.5.1 **Tendense in beroep- of 'leef tyd' publikasierekord**

2.5.1.1 *Variasies in uitsetvolume*

Die goed waarin ek belangstel, het verband gehou met my belangstelling in wat aangaan in die land ook – 'n politieke belangstelling. Ek het baie daarvoor geskryf. Hier in 1990 toe die dinge natuurlik na 'n punt toe begin gaan, en in 1993 was ek betrokke by die skryf van x, en dit was vir my 'n ryk bron van publikasies daai, want ek het baie geskryf oor die proses. Ons het 'n boek geskryf – ek en een van my kollegas wat saam was - en 'n hele paar tydskrifartikels. So dit verklaar eintlik maar die opwaartse kurwe daar.

'n Ander ding wat bykom, behalwe die gewone faktore, [is] ek het natuurlik op 'n stadium verskriklik baie goed in koerante en in die pers en so geskryf...Ek het baie van daai tipe goed gedoen, wat gemaak het dat 'n mens tog 'n bietjie minder by jou navorsing uitkom.

My uitsette het rêrig die afgelope twee jaar –goed, ek gaan miskien maar 'n bietjie ook deur 'n...jy weet, 'n *writer's block*, of wat – maar my uitsette het die afgelope twee, drie jaar baie geduik.

Dit het my goed gedoen om weer 'n bietjie te praat oor my loopbaan; dalk kan ek hom nou weer voortsit.

2.5.1.2 *Voorkeur vir bepaalde tipes publikasie-uitsette*

- Voorkeur vir 'n bepaalde publikasietipe

Ek het natuurlik op 'n stadium verskriklik baie goed in koerante en in die pers en so geskryf. Ek was op 'n redelike jong ouderdom baie betrokke by... 'n tydskrif...Ons was so 'n bietjie krities gewees, maar nou nie op 'n radikale manier nie (as ek toe geweet het wat ek nou weet, sou ek meer radikaal gewees het). Maar ons het tog baie kritiese goed geskryf, en ek was hier van '81 af redakteur van die tydskrif, en ek het baie vir die tydskrif gedoen; baie geskryf, en dan het die koerante jou genader om te skryf.

- Die grondslag waarop bepaalde publikasietipes geselekteer word

Ek skryf nie graag oor goed wat nie aktueel is nie (wat aktueel is, lê seker nou maar in my beoordeling daarvan), maar dit moet iets wees wat 'n verskil kan maak. Soos byvoorbeeld, waaroor ek die afgelope tien jaar die meeste van my navorsing gedoen het, is oor ['n bepaalde navorsingsonderwerp]. Ek het lankal al daarin begin – my eerste boek ook daarvoor geskryf, en so aan – maar ek glo daar is 'n groot omwenteling besig daar om plaas te vind...en nou skryf ek daarvoor. Ek het die ervaring gehad (nou ja goed, dit klink nou vreeslik onbeskeie), maar ek het in '86 my boek oor die goed gepubliseer, waar my standpunte toe nog 'n bietjie anders was as wat dit nou is, en die boek het nie vreeslik opslae gemaak nie. Maar hier in 1994, toe ons nou oorgaan na 'n nuwe bedeling toe, toe soek almal my boek. Nou het ek weer 'n...ek het soort van 'n tweede uitgawe van die boek gepubliseer - ook half gedryf deur hierdie aktualiteitsbesef. Nou't ek maar weer dieselfde ervaring. Mense is half langtand daarvoor – ek sal seker maar eers afgetree wees die dag...

- Seleksie van vaktydskrifte waarin werk gepubliseer word

Ek sou eintlik nogal wou versprei sover ek kan...Nou ja, uiteraard voel 'n mens so half jy ondersteun jou eie tydskrif ook deur van jou beste bydraes liever vir hulle te gee as wat jy dit na 'n ander tydskrif toe sou stuur. Dit maak miskien dat jy nie heeltemal so wyd gelees word nie. Ek moet sê, dit het eintlik nooit vir my daarvoor gegaan dat jy by sekere tydskrifte makliker publiseer as ander nie. Van daai tydskrifte wat jy nou genoem het, is die een wat van die strengste keuringstandaarde het, een waarvoor meeste mense sal lag...wat eintlik 'n baie sterk...tydskrif is. Omdat ek soms oor filosofiese kwessies skryf, hou ek nogal daarvan om dit in [daardie tydskrif] te doen. En hulle vra my soms om artikels te skryf. Laat ek jou sê, daai klomp Calviniste is rêrig ook Calviniste as dit by keuring kom. As hulle vir jou sê jy moet *peer review* doen, dan doen hulle *peer review*. Dit is van die moeilikste goed om te

keur, want jy moet detail besonderhede gee. Die laaste ding wat ek nou vir 'n tydskrif gestuur het, is oor 'n onderwerp wat ek twintig jaar terug oor iets in die tydskrif gepubliseer het, en nou *revisit* ek dit. Nou maar goed, stuur dit dan vir dieselfde tydskrif. Maar baie maal ook – ek kan nou nie sê hoe baie maal nie – jy sal soms ook die redakteur van 'n tydskrif bel, en vir hom sê: “Ek het hierdie ding wat ek wil publiseer. Hoe lyk dit daar by jou?” Want by ons is, ek sou sê, die gemiddelde wagtyd omtrent 'n jaar. En soms het jy iets wat jy graag vinnig wil publiseer, omdat dit gaan oor 'n redelik aktuele kwessie. Dan gaan jy maar na die redakteurs toe, en jy sê: kyk wie kan dit die gouste publiseer.

2.5.1.3 *Internasionale aard van publikasies*

Jy't gewerk aan dinge wat jy gedink het relevant was plaaslik vir die ontwikkeling van 'n nuwe bestel in die land. Jy't gaan kers opsteek in die buiteland, maar jy't nie probeer om buitelanders te beïndruk nie.

2.5.1.4 *Veelvoudige outeurskap*

Ek sou seker meer kon doen saam met my studente, byvoorbeeld. Ek het darem 'n stuk of tien, twaalf studente gehad wat onder my gewerk het, maar dié wat rêrig aangaan en publiseer, moedig ek aan om dit liever op hul eie te doen.

2.5.1.5 *Eweknie-beoordeelde artikels geplubliseer gedurende nagraadse opleiding*

Kyk, 'n mens publiseer soms miskien 'n bietjie maklik, nê. Ek het grootgeword in 'n omgewing...en ek het nou saamgewerk met mense, wat vir jou baie duidelik die boodskap gegee het: publiseer, navorsing is deel van jou werk; dis nie 'n luukse wat agterna bykom nie. En my mentor publiseer ook baie. Party mense sal seker sê, te baie. Ek het nou al sy publikasielys gesien, en dis 'n taamlik indrukwekkende lys. So, jy kry daardie soortvan boodskap baie duidelik. En jy weet, ek koppel dit nou nog ook met my politieke belangstellings en die goed in die land wat ek gevoel het moet regkom, en dan voel jy jy't iets te sê, en jy wil dit sê. Miskien sê jy dit soms te maklik. Ek het ook, voor ek nog klaar was met my doktorsgraad, het ek goed wat ek in my doktorsgraad sou gebruik het, oor gepubliseer. Ek het nie net gepubliseer nadat my doktorsgraad klaar was nie.

2.5.2 **Sienings oor publikasie**

2.5.2.1 *Algemeen*

▪ Wetenskaplike publikasie

My belangstelling in aktuele goed en my akademiese werk het vir my saamgegaan. Dit benadeel jou natuurlik as dit by *ratings* kom, maar kom ons los dit maar eers. Ek dink die burokratiese element daarin is te sterk. Ek dink nie dit is op die ou end rêrig 'n *peer review* nie. Die *peers* moet so soortvan nou maar net die inligting insamel en 'n opinie gee wat die burokrate dan nou eintlik verwerk in 'n simbool. En daai simbool beteken natuurlik baie vir jou loopbaan. Ek dink nie daai proses is betroubaar nie. Punt nommer twee is: in 'n land soos Suid-Afrika word daar vir sekere goed, waar daar erkenning gegee behoort te word, word eintlik nie rêrig aan erkenning gegee vir die doeleindes van 'n *rating* nie. Byvoorbeeld, wat jy gedoen het in terme van kapasiteitsbou. Dit moet daar wees, maar dis dit: of jy nou twee doktorsgraadstudente in jou loopbaan gehad het, en of jy nou twintig gehad het, dit sal nie – dink ek – 'n verskil maak aan jou *rating* nie. Vir ons in die geesteswetenskappe – nou maar goed, dis nou baie persoonlik, want dit is negatief op my profiel – maar ons wat hierdie tipe werk gedoen het, wat jy in die land oor aktuele goed gewerk het, en nie jou buitelandse kontakte so versigtig gepleeg het nie...ek meen, my buitelandse kontakte wat ek het, is mense wat my pad gekruis het; ek het hulle nie gaan soek, en ek het nie vir my kontakte opgebou vir wie ek al my publikasies stuur, en so aan nie. Wat eintlik op die ou end deurslaggewend is vir 'n rêrige goeie *rating*, is dat mense in die buiteland moet sê jy's 'n wêreldleier op jou vakgebied. By my, eerlikwaar, het die NNS *rating* die effek gehad eerder om my half te ontmoedig om te publiseer, as my aan te moedig om te publiseer.

▪ 'Publish or perish' in die Suid-Afrikaanse akademiese konteks

Ek hou nie van die *publish or perish* nie. As jy publiseer, moet jy iets hê om te sê; want jy het iets wat die moeite werd is om te deel; jy moet nie net [publiseer] om nou maar 'n lang publikasielys op te bou nie. Nou goed, ons het almal so 'n bietjie *tricks* wat ons speel om nou maar die publikasielys – veral as dit gaan oor geakkrediteerde tydskrifte – so 'n bietjie te rek, omdat jy weet jy kry geld daarvoor. Ek sou byvoorbeeld (sonder om my gewete te verkrag): as ek nou internasionaal in Engels 'n hoofstuk in 'n boek publiseer; sou ek daai hoofstuk miskien so 'n bietjie verwerk, en dit dalk net in Afrikaans in Suid-Afrika publiseer in 'n subsidieënde tydskrif. Maar dit voel ek nog nie is *publish or perish* nie. Dis eintlik maar net dat jy ook 'n kanaal wil gebruik, wat jou toegang gee tot navorsingsmiddele, vir werk wat jy in elk geval gedoen het; jy't dit nie gedoen om te *publish* of te *perish* nie.

2.5.2.2 *Sienings oor onderrig en publikasie*

- Die mate waarin navorsing 'n invloed het op onderrig (en/of omgekeerd)

Onafskeidelik. Baie van my goed waaroor ek gepubliseer het, is vrae wat ontstaan het in die loop van my doseerwerk; sekere goed wat studente my selfs gevra het, en waaroor ek gedink het.

- Vergelyking met ander kollegas se onderriglading

Ek het tot voorverledejaar nog vir die eerstejaars klasgegee. Ek het dit darem nou gelos. Ek gee darem nou nog vir hulle so 'n deeltjie. Maar jy sal sien, een van my heel vroeë publikasies...ons was so vier outeurs – dit was nou bietjie 'n meer senior klas; 'n lekker klein klassie. Ons het gesels oor daai onderwerp, toe't hulle gesê, “Kom ons publiseer iets”, en daar't ons saamgewerk aan 'n ding.

Dit was altyd 'n bietjie swaarder gewees...nou dat ek minder met die eerstejaars te doen kry, is ek omtrent waar van my ander kollegas is, maar nog nie heeltemal nie.

Een rêrig problematiese [nagraadse student] is 'n Engelsman (uit Engeland), wat by my ingeskryf is. En toe hy nou begin wegtrek en skryf, toe kom ek agter die man kan nie skryf nie, en ek sien hom nie genoeg om iets te doen nie. Dit is nie eers 'n geval van iemand uit die aangewese groepe nie. Buiten daai...[het] ek op die oomblik relatief min studente in vergelyking met wat ek gewoonlik gehad het.

- Mate waarin onderriglading die gevolg is van eie keuse of voorkeur

Dis die las van 'n Calvinistiese werksetiek...Toe ek in die pylvlak was om my proefskrif klaar te maak, toe't my mentor, wat ook my departementele voorsitter was (ons was net 'n twee-persoon departement gewees op daai stadium),...bedank...hy het politieke probleme met die universiteit gekry. Hier in die laaste doodsnikke van my proefskrif, terwyl ek besig was om dit klaar te maak, het ek 29 periodes 'n week klasgegee...as my lesinglading...so 14, 15 periodes was 'n week die jaar, dan het ek dit as 'n redelike ligte lading beskou...Ek sal dit nie weer kan doen nie. Nou dat ek sukkel om goed te publiseer...ek weet nie of...as jy oud word, dat jy stadiger werk, of wat dit is nie, maar...ek het nog so bietjie gepraktiseer op daai tyd [ook].

2.5.3 **Motivering vir publikasie**

My liefde vir navorsing kom uit twee bronne uit. Een is: ek het goeie mentors gehad, goeie voorbeeld gehad. En die tweede is: die goed waarin ek belangstel, het verband gehou met my belangstelling in wat aangaan in die land ook – 'n politieke belangstelling. Ek het baie daarvoor geskryf.

My belangstelling in die aktuele sake om my. My oortuigings het oor die jare heelwat verander. Maar toe ek [by 'n Suid-Afrikaanse universiteit] 'n jong man was, was ek natuurlik 'n oortuigde Calvinis; daar was 'n tradisie van Christelike wetenskap, wat jy geglo het wetenskap is 'n roeping wat jy vervul. Ek dink ek het nou al die geloofparaferalia wat daarmee saamgaan, afgeskud, maar jy verloor nog nie daai werksetiek wat jy daar ophou nie. En ek sien dit by mense rondom my. As ek kyk: A kom uit dieselfde agtergrond; hy't ook min of meer sy sienings verander, maar daai werksetiek verloor hulle nie. Dit voel vir my dis die regte ding om te doen. Natuurlik, jy hou van erkenning – daar's niemand wat nie van erkenning hou nie – maar ek sou nie sê ek het nêr vir die erkenning gepubliseer nie. Ek het soms gepubliseer om moedswillig te wees, ook.

2.5.4 **Hooffaktore wat op publikasieproduktiwiteit ingewerk het**

2.5.4.1 *Algemene fasiliteerders*

- Advies aan studente, of 'n nuwe personeellid, spesifiek om 'n hoë publikasieproduktiwiteitsvlak te verseker

Moet nie probeer om elke publikasie 'n **groot** – sê nou maar as dit 'n artikel is – jou **groot** artikel te maak nie. Skryf so een, miskien twee groot 'n jaar - veral na jou proefskrif, wanneer jy baie produktief is, kan jy dit dalk doen. En ek sou sê, van die begin af moet jy vir soveel mense moontlik jou goed gee om te lees, en hulle vra om baie krities te wees; en gou 'n dik vel ontwikkel, maar nie só dik dat jy nie kan positief reageer op die kritiek nie, of konstruktief reageer op die kritiek nie. En probeer die goed wat jy instuur na tydskrifte, dat die manuskrip so goed as moontlik versorg is. Dit maak altyd 'n goeie indruk op 'n tydskrif, en op keurders...Op dié manier kan jy dan waarskynlik eers 'n bietjie selfvertroue opbou, deur goed nasionaal te publiseer, en dan kan jy vir internasionale tydskrifte begin stuur. Miskien sou ek sê: kry vir jou kontakte op jou gebied by die universiteite in Suid-Afrika, maar probeer ook internasionale kontakte te maak. En as jy nou geïnteresseerd is in goeie *NRF rating*, kry maar vir jou 'n poslysie van mense vir wie jy al jou *off-prints* stuur – dit het ek nooit gedoen nie. J en ek praat nou die dag...sy doen dit ook nie. Dit werk. Wel, ek sou nie sê dit **werk** nie - jy moet natuurlik goeie goed publiseer – maar [dit] maak dat die mense weet van jou; as jy rêrig goeie goed publiseer, laat dit onder hulle aandag kan kom. So, ek dink dis baie belangrik. Jy kan maar van vroeg af jou buitelandse kontakte regkry.

- Advies aan jong vrouepersoneellede in besonder, spesifiek om 'n hoë publikasieproduktiwiteitsvlak te verseker

Dis nou vir my as 'n man moeilik om te sê. Kom ek sê so: ek werk nie sagter met vrouens as wat ek met mans werk nie. Ek vermoed die meerderheid van my doktorsgraadstudente was vrouens – as ek so vinnig tel. En ek onthou nog goed my heel eerste doktorsgraadstudent...ek het haar goed vir haar gestuur (en dit was nou toe rekenaars nog net begin het; jy't nog nie *track and change* gehad nie), en daai goed het soos 'n slagveld gelyk. Haar reaksie was: sy't my gaan sit en vloek in die kantoor, en dan't sy dit gedoen. [Sy] is 'n baie knap navorsers vandag. So, ek het dit nooit ervaar dat daar 'n oorsensitiwiteit by vrouens was nie. Om die waarheid te sê, as ek so vinnig dink, die mense wat die mees oorsensitiwewe gereageer het op my kritiek, was mans gewees, wat weggeloop het na ander promotors toe, en net nie weer teruggekom het nie. So, ek dink die vrouens is nogal *tough*, maar nou kan ek ook verstaan dat as ek soms sien hoe mense en van my kollegas vrouens hanteer...ek dink dit gaan ook oor die manier waarop jy dit doen; jy weet, of jy dit doen op 'n neerbuigende manier, dat jy eintlik nou besig is om 'n soortvan 'n tweedeklas mens 'n guns te doen om haar promotor te wees, en haar dan so in die proses so 'n paar *swipes* gee - daarop sou enigiemand seker negatief reageer. Maar om *ge-challenge* te word het ek nou nog nooit gevind is rêrig 'n probleem by vrouens nie. Om streng behandel te word, het ek ook gevind is nie 'n probleem nie.

2.5.4.2 Algemene struikelblokke

- Beperkinge teëgekrom

By my, eerlikwaar, het die NNS *rating* die effek gehad eerder om my half te ontmoedig om te publiseer, as my aan te moedig om te publiseer.

Miskien kan jy my help: ek kom vroeg in die oggend in die kantoor, ek hou laat in die aand op werk, en my skeppende werk staan hier langs my: ek kom nie daarby uit nie. Ek antwoord *e-mails*, en ek berei voor vir klasse. Miskien kan jy vir my sê wat ek moet doen? Want ek het die groot fout gemaak om in te willig om nou weer redakteur van ons tydskrif te wees. Ek moes dit eintlik nie gedoen het nie; een van die jonger kollegas moes dit maar liever gedoen het.

- Moontlike redes waarom vroue minder as mans publiseer

Ek begin nou dink aan my vrouekollegas hier ook, soos J. Ek kan nie eintlik agterkom dat die feit dat hulle ma geword het, hulle teruggehou het wat publikasies betref nie. En ek moet darem sê, van die jonger vrouens het ook beter mans as wat ek was.

2.5.4.3 Spesifieke faktore

- Sienings oor die kombineerbaarheid van die huwelik met 'n navorsingsberoep

Baie tradisioneel. My vrou het op die stadium wat die kinders klein was, by die huis gebly. Ek het rondgery en loopbaan gebou. Sy het my natuurlik ondersteun, in die sin dat sy vir my geleentheid geskep het. En, ek dink wat ek reggekry het met die manier waarop dit gewerk het, en haar en die kinders verwaarloos het, is om van álmal van hulle verbete feministe te maak, wat waarskynlik 'n goeie ding is. Sy het so vir jare aangegaan...sy het 'n bietjie minder van my nonsens begin vat. Sy't gesê: basta nou, jy gaan tyd maak om dit en dit en dit te doen. Nou nog: sy gee my ruimte, maar hulle maak ook hulle aansprake. Maar ek kan nie kla dat met my gebeur het, wat gebeur met baie vrouens wat sou navorsingswerk wou doen, wat dan in die tradisionele rol van die vrou en moeder ingedruk word. Daai tipe beperkings het ek nie ervaar nie.

- Institusionele faktore

Mentorskap is ontsettend belangrik. Ek dink nie 'n mens kan 'n goeie publikasierekord opbou as jy inkom by 'n plek waar daar nie 'n tradisie van mentorskap is nie. Jy kan nou maar 'n bietjie kyk hier by die...fakulteit (en dit kan jy maar in die openbaar ook sê): ons is drie mense wat van ['n ander universiteit] af kom. So 'n bietjie drie geslagte: ek is die oudste een, en dan my kollega A (wat nou A *ge-rate* is, nê), en dan 'n jonger kollega vir wie ek nog klas gegee het my laaste jaar wat ek [by daardie universiteit] was: J. En as jy 'n bietjie gaan kyk in die...fakulteit se jaarlikse opgawes van publikasies, dan doen ons tussen die drie van ons - nou ja, ek wil nou nie oordrewe aansprake maak nie - maar ons doen ten minste 'n derde, indien nie meer, van die hele fakulteit se...Dit kom van mentorskap. Jy word net van die begin af, as jy jou voet in die fakulteit sit, aangemoedig, en eintlik half aangesê om te begin werk aan jou doktorsgraad, en so aan. [Hierdie universiteit] is heel anders. Hierso reken hulle: "Man, as jy *smart* genoeg is, sal jy aangaan met jou werk. Ons het jou aangestel omdat jy *smart* is, en jy is vry om 'n ding te doen op die manier wat jy goed dink. As jy nou 'n doktorsgraad wil doen, en wil publiseer - wel, ons sal jou 'n hand gee". Daai kultuur word nie eintlik by jou ingeskerp nie.

Ek kan nie kla oor [hierdie universiteit] se institusionele ondersteuning vir navorsing nie. Ons Afdeling Navorsingsontwikkeling: as jy jou kant bring, dan kry jy ondersteuning daar finansieel, en andersins, en so aan. Ek dink dis een van die pluspunte van [by hierdie universiteit] te werk, veral as jy bietjie as 'n senior persoon hier inkom. Soos ek sê, ek dink nie altyd al die jongmense wat hier begin, kry so 'n goeie *deal* nie – nie omdat daar min

van hulle gedink word nie, maar omdat, soos ek vir jou gesê het, jy's *smart* genoeg om hier `n pos te kry, dus los ons jou hier. Dit het ek `n bietjie [by hierdie universiteit] gekry, wat vir my nogal `n verrassing was, omdat ek was nie so gewoonnd daar [by die universiteit waar ek voorheen gewerk het] nie. Daar was baie sterk hierdie kultuur van mentorskap. Maar dit was ook maar nadat hulle van `n klompie ouhout ontslae geraak het, moet ek byvoeg. Teen die tyd dat ek daar begin werk het, was hierdie tradisie baie sterk besig om te vestig.

Ek was betrokke by doseerwerk [by 'n ander universiteit ook]. Dit was `n baie goeie tyd in my lewe, want vir die eerste keer het ek vir studente ['n vak] gedoseer, en studente wat gedink het dis hulle beste vak, hulle *nice*-ste vak. Terwyl hier by ons dink die studente dit is onprakties, en `n *schlepp*, en so aan. Nou ja goed, dit nou daar gelaat. Maar wat wel by [daardie universiteit] gebeur het, die oomblik toe ek bietjie `n voet daar in die deur begin kry, of my voet daar begin neersit - en ek het selfs op `n stadium `n aanstelling gehad daar as `n buitengewone professor - toe begin van die jongmense wat hulle doktorsgrade wil doen, begin toe na my toe kom. En hulle het my gevra of ek hulle nie leiding sal gee nie...So, my tyd daar het vier doktorsgraadstudente opgelewer.

- Integrasie in die akademiese navorsingsgemeenskap

Ons wat...in die land oor aktuele goed gewerk het, en nie jou buitelandse kontakte so versigtig gepleeg het nie. Ek meen, my buitelandse kontakte wat ek het, is mense wat my pad gekruis het; ek het hulle nie gaan soek, en ek het nie vir my kontakte opgebou vir wie ek al my publikasies stuur, en so aan nie.

Vir spanwerk het ek groot tyd; vir werkmotors en protegés saam het ek...ek het ook baie in my lewe probeer om geleentheid te skep vir mense...en as jy in daai konteks dan nou mede-outeur is, en jy het werk ingesit in `n publikasie, dan's dit seker OK. Maar as jy nou jou naam as mede-outeur opsit by publikasie net om so `n bietjie te *pad* aan jou publikasielys, nou ja...[lag]. Ek het al gesien van die Duitse professore...hul assistent skryf omtrent die artikel, en hulle *patch* die artikel so `n bietjie op, en dan sit hulle **net** hulle naam by die artikel.

Ek het aansoek gedoen vir ['n beurs]. Ek het net so voor ek veertig geword het, [na hierdie universiteit] toe gekom, en toe het ek nou gemis om voor veertig te kon aansoek doen vir [die beurs] (hoewel hulle kort van tevore nog vir mense wat oor die ouderdomsgrens was, die [beurs] gegee het, het hulle in my geval gesê nee)...en ek het `n paar maande in die buiteland gaan sit. Dis die eerste keer in my lewe wat ek toe begin Duits leer het, en maar `n bietjie oor my onderwerp materiaal bymekaargemaak, met kollegas gesels, en so aan. Dit het my `n goeie inspuiting gegee. Ek dink as jy my werk lees, sal jy sien ek het nogal taamlik invloed van sekere elemente van die Duitse vakliteratuur in my werk geinkorporeer; goeie vriende gemaak, en so aan...ek was verlede jaar weer daar. Deesdae soek `n ou maar net `n plek waar jy lekker kan sit en werk, en waar jy kollegas het met wie jy kan gesels as dit nodig is. Ek het nie eintlik meer `n spesifieke rede, wat ek sê, "Ek moet by daai biblioteek wees", byvoorbeeld nie. `n Mens wil natuurlik `n goeie biblioteek naby hê, maar ek het die geleentheid eintlik nogal meer gebruik om `n bietjie in `n ander kulture milieu te gaan werk.

A en ek het op `n stadium baie lekker saamgewerk, so in die vroeë negentigerjare. Maar nou goed, ons deel belangstellings, en ons deel sekere oortuigings oor goed, en so aan, wat maak dat `n mens lekker saamwerk.

- Tydsbestuur

Ek kom vroeg in die oggend in die kantoor; ek hou laat in die aand op werk.

- Sienings oor gender-diskriminasie

Met die mense met wie ek saamgewerk het - my studente en so aan - was my ervarings net positief gewees. Ek kan jou rêrig mooi stories vertel...jy weet, ek kan vir jou baie voorbeelde noem van diskriminasie teenoor vrouens hier in ons fakulteit - op hierdie dag en tyd wat vrouens anders behandel word as mans. Maar dis nou nie wat jy soek nie. Jy wil iets soek wat spesifiek `n impak sal hê op mense se vermoë om te publiseer. Ek het dit waarskynlik al gesien, maar dit is nie iets wat so `n groot indruk op my gemaak het, dat ek dit nou nog onthou nie...Jy kan dalk `n vrou kry wat vir jou sê ek het op een of ander stadium verskriklik teen haar gediskrimineer: `n Mens is nie altyd sensitief vir dié goed nie. Soos ek sê...die ervarings wat ek gehad het met vrouestudente, was oor die algemeen goed gewees. My een student is nou dekaan by ['n Suid-Afrikaanse universiteit] (my een doktorsgraadstudent), en sy't rêrig gekom van `n situasie waar sy nie baie goed geskryf het nie - ure lank gesit met haar goed - maar op die ou end, toe het sy `n proefskrif gelewer wat nou nie *great* werk was nie, maar ek het gedink dit was goed genoeg om deur te gaan. En toe't ek `n eksaminator gekry, wat op die gebied wat sy geskryf het...een van die top ekperts in die wêreld is, en hy was een van die eksaminatore gewees. Hy't haar ook deurgesit, maar hy't toe nou `n belangstelling ontwikkel in haar werk, en toe nou op `n stadium wat hy hier was, lank met haar gaan sit, en haar gehelp om die goed reg te kry, nie net vir die doeleindes van die aanvaarding van die proefskrif nie, maar as sy verder sou wou publiseer, ensovoorts, ensovoorts. Nou, daai tipe goed gebeur. Dít is meer my ervaring.

2.5.5 **Sienings oor die inwerking van ouerskap op publikasieproduktiwiteit**

2.5.5.1 *Die verenigbaarheid van ouerskap met 'n navorsingsberoep*

Ek weet nie in hoe 'n mate [A se] moederskap...sy't...nou nie óúd geword, voordat sy ma geword het nie, maar op 'n *crucial* stadium in haar loopbaan is sy ma. En ek kan nie eintlik rêrig sê hoe dit impakteer op hulle uitsette nie, maar jy kan seker ook sê dat as hulle nie daai rol gehad het om te speel nie, sou hulle nog meer kon gedoen het.

2.5.5.2 *Inwerking van ouerskap op publikasieproduktiwiteit*

Ek sal nou nie sê ek het my kinders heeltemal verwaarloos nie; daar was tye wat ek dit gedoen het: daai tyd wat ek jou vertel het van my doktorsgraad, dat ek in die oggend ingegaan het – toe dit vakansie was – ek het die oggend ingegaan kantoer toe ses-uur, en ek het die nag twee-uur teruggekom. En my een dogtertjie - my tweede-oudste dogter - het my eendag so gekyk, toe sy toevallig in my vasloop in die huis, en het toe gesê, “O, Pa, is jy nog daar?” Kyk, ek dink nie die kinders het noodwendig...ek meen, ek dink nie ek sou beter gedoen het, as ek nie kinders gehad het nie. Miskien sou ek. Ek weet nie. Ek dink nie dit het 'n negatiewe impak op my werksvermoë of my uitsette gehad nie. Toe my jongste dogter gebore is, onthou ek nog goed toe ek my vrou hospitaal toe vat, toe't ek 'n boek – 'n skryfboek – en 'n pen saamgevat (dit was nog net so voor die tyd van rekenaars) en terwyl ek daar gesit en wag het in die kraamsaal, het ek nog gewerk aan 'n artikel.

2.6 Martin

2.6.1 **Trends in career or 'lifetime' publication record**

2.6.1.1 *Reasons for variations in output volume over time*

When someone goes into the university environment, you get your first students - they're honours students, they don't publish anything; you're mentoring them up into a more self-managing, self-sustaining environment. And then your masters students start to produce stuff...I think my first PhDs were probably coming out then as well, so that would have had a big impact.

Probably there was a dip somewhere with the...move from [one South African university] to [another], and I would have thought the move to [another South African university]: there would have been a dip, and then a big increase. Because one is busy building buildings and looking after a national problem.

2.6.1.2 *Preference for certain types of publication outlets*

We have a rule in that we say that everything that we publish has to be in ISI-rated journals.

Those are the best journals we can publish in...Within our own field...the top journal...in terms of impact ratings...we'll go there, for those kinds of studies...I mean, absolutely. One **has** to publish your work in the best journals.

2.6.1.3 *Internationality of publications*

If you look at numbers...of papers...there are only two South African journals I suppose that I've published in, that I can think of...not a lot recently.

It's a complicated issue: [a local journal in my field] is not ISI-rated, which means that ultimately the government will not recognise it as a valid publication...All the measures and all the signals we're getting from the government is that [the DoE] list will be scrapped. And I think it's the right thing. The problem is that it will kill a number of local journals, which had a substantial value, because they're local. And that's a bad thing. So, we're not quite sure which way to move. When you publish in the [a local journal in my field], most people won't know...won't care very much what I put there, but it does bring an international flavour into that journal. And sometimes it's of local relevance – specific local relevance. *South African Journal of Science* is ISI-rated, and they're doing a good job, and we're trying to support them, but...For me [the audience I write for] is variable, because I cover a very broad field of interest. So, if it's the community of [scientists in my field] in South Africa – that's the South African...Journal; if it's the scientists of South Africa, it will be *South African Journal of Science*, I suppose. I've published an occasional paper in [another local journal], which is OK. But really, the peers are the [scientists in my field] of the world...I could write everything in a South African [journal]; [that's] the easiest to get quick points...I mean, the easiest for me to do is to publish everything in a South African journal - because there's not a tight peer review, because...you don't have the peers - and publish lots of little studies and there'll be lots of numbers. But, I mean, this just would not be strong international[ly]...So, what we try to do, is we try to play in the world arena: you want to be known in the world. People overseas would be interested in South African things, and because they're South African doesn't mean they're not of world class standards. As long as the techniques you use, the statistics you use, and the scientific procedure you use – or the research procedure – is world class. I mean, we would probably in the next year find a paper in *Nature*...[of] a student at [a South African] university. It's very exciting stuff. It's all on South

Africa, but the science is intriguing and it's just good science...But we want to be seen in the world – not only in our own backyard.

You see, people...my colleagues: they'll put together a paper, submit it to [an overseas journal] and it gets rejected, and they'll say, "Oh, then we'll just put it in the [a local journal]", or something. And this is such a negative attitude. I mean, you can play in the world arena. My programme is around the world – it's everywhere. We travel, we collaborate and we work in the world arena. It's actually not **that** difficult to do it, and it's actually a lot of fun, and it's incredibly rewarding, and it's great for our students, it's great for our country, and it's great for our university.

2.6.1.4 *Multiple authorship*

Again, I think it's a personality-driven issue. My colleagues only publish alone. They don't like people. Actually, they don't like students. They shouldn't be teaching. They just want to publish their paper. They want to do their work and...they're kind of loners. And you see them in science. I will occasionally write a paper on my own. But you know what I really enjoy? I enjoy the...I love people a lot – maybe I would've been a good social scientist – but I enjoy people; I really, really enjoy people. And I really enjoy the process. I mean, obviously science...I'm driven by these things; I'm passionate about them – but I really love the meetings, getting together. And I'm going to Indonesia in a couple of days' time, and by the time I come back, we will have formulated three or four - I will bring a student back from Indonesia - we will have formulated three or four really neat questions, and probably there'll be four or five authors...people from here and Indonesia and elsewhere, involved in doing what we want to do.

There's this whole thing with universities...where they have this thing about...points for publications, or something, and...if you're a single author at [a South African] university, you get one unit for you. My argument on that is: this is a stupid argument, this money for publications. It's peanuts money. The big money and the big opportunities is the world's money: the big contracts. Those are the exciting things. So, if somebody says, "Oh well, my technician would like to be an author on this paper, and they actually did quite a lot of work. What do you think?" I'd say, "Hey, sure". And I really, really am not interested in those silly things. I mean, I think that people that are involved, and seriously involved - and we have a little formula that we follow - you should have them as authors, and I'm very happy for multiple-authored papers.

2.6.1.5 *Refereed articles during graduate training*

I fell in love with research as an honours student, and I started doing science, and...I suppose I had the privilege to have some nice mentors to help me. I have PhD students here, who've published...who haven't finished PhDs, that have...I mean, [one PhD student] has – I don't know - twenty papers in already.

2.6.2 **Views on publication**

2.6.2.1 *'Publish or perish' in the South African academic context*

One of the great concerns at our university - and I'm sure at [your university as well] – is: the research output from the humanities departments is very poor. There's a huge concern about that...The trouble is...I sit on the Senate Research Committee, and it looks at these kind of things and we have the social scientists in the meetings, and it's actually a very complicated issue. You take a great social scientist like P. Now, he just writes a book once every four years, but a great book. And I think that's great. And that needs to be...but he's an A-rated scientist. The numbers of papers that come out of our humanities departments are the highest in this university – the numbers – but these are published in journals that, you know, sometimes the head of department does the sole editing. You know, some very strange stuff. And that's the problem: that there must be...we have a rule in that we say that everything that we publish has to be in ISI-rated journals. And there are equivalent measures in the social sciences. The social sciences need to...at least try to incorporate peer-review, and internationally, into what they're doing.

You get the silly NRF nonsense, and...I have big problems with that whole system anyway...It should not be that way – that's the sad part. Actually, what they could do could be so fantastic, but they have allowed politics to take over the system. And I'm not talking about apartheid / non-apartheid, black / white – that kind of politics. They've allowed the politics of science to take over; where you have a collegium of people who have C-ratings, or even lower ratings, making decisions. And they say, "Oh, they don't make the decisions", but they do. And I was there – I know exactly how the thing works. Sadly, they've allowed the system to degenerate into an absolute, absolute travesty. I mean, it's disgusting. R, one of the really great scientists of this country: she has been totally undervalued – totally, totally. She should be an A. P, who is her collaborator at Stellenbosch: he got devalued, when he's one of...This is not OK. I mean, if you get aberrations like that – occasional aberration's fine – but this is...[My wife's] rating has convinced me that I just don't want to have anything to do with them. The problem is, we're pretty much forced into tolerating them. I have moved from being a very strong supporter of the NRF ten years ago, to the last ten years just being absolutely disgusted with the way they operate.

2.6.2.2 *Teaching and publication*

- The relationship between teaching and research

When someone goes into the university environment, you get your first students - they're honours students, they don't publish anything; you're mentoring them up into a more self-managing, self-sustaining environment. And then your masters students start to produce stuff...I think my first PhDs were probably coming out then as well, so that would have had a big impact.

- Where interests (research or in teaching) reside

I love to teach. I love people.

- Comparison with teaching load of other colleagues

I first went to university in [a South African city]. I was with the government research institute before that, so I wouldn't have done any teaching until I went to [that university], which was 1988. And I had a full teaching load after that. And that lasted until 1998. And my current position as Director of the Institute is not a teaching position, because you can't do everything. So, I don't teach formally...I get invited to lecture. I'm not responsible for any courses, but I give a lot of lectures in courses. So, they'll invite me - you won't see a lot of it on my CV, because I just stopped: my CV's too fat, I can't put all the stuff on...In 1998 my position changed from having a formal teaching responsibility - a formal undergraduate teaching responsibility - to postgraduate students...But I do have a forty-hour a week administrative load. I run an institute of 150 people. I sign all of the leave forms, I sign all of the...

I think it depends. I mean, [my wife] has an equal teaching load to, say...her peer-group in her department. She doesn't have more, but she also doesn't have less. She takes it very seriously, but I actually believe they do as well...Brenda has a full undergraduate teaching load - obviously that influences her input as well.

2.6.3 **Motivation for publishing**

People say, "How many papers have you published?" I actually haven't the faintest idea how many. I don't know. I don't care about this stuff. I want to answer questions - I don't count publications. I take on research questions because I'm interested. And I love [my field], I love science, and I just do...OK, if I want to do something, then I try to answer it. But I have a question, I try to answer it. And that's all. So...my productivity is doing what I like to do. I don't count...I don't measure my productivity in terms of publications...I know I'm publishing. If I would, probably I'd be worried. But I do know I'm publishing, obviously: I'm working on papers all the time, and datasets, and interviews, and whatever I'm doing.

There's this whole thing with universities...where they have this thing about...points for publications, or something, and...if you're a single author at [a South African] university, you get one unit for you. My argument on that is: this is a stupid argument, this money for publications. It's peanuts money. The big money and the big opportunities is the world's money: the big contracts. Those are the exciting things...And I really, really am not interested in those silly things.

I fell in love with research as an honours student.

When I do research, it's like a holiday.

People say, "Well, you're a very unbalanced person". I say, "Well, I've a German background, so...". I had a crazy German grandfather, and he just did what he did all the time...I don't like half things. There are a lot of things I love that I would love to do, but I would not do everything sort of half, because that would make me completely crazy. Let's do this, and that's what I do.

2.6.4 **Major factors that have impacted on publication productivity**

2.6.4.1 *General facilitators*

- The most important contributing factors

For me, collaboration is a big one - international collaboration; national and international collaboration. National is hard, because there's usually not too many people around in those fields. Getting strong collaborative links - I mean, we have collaborations now with people everywhere... - obviously, that brings a huge amount of interaction and new ideas, and publications. I think in our field, facilities are quite important, as well. That's the only reason [we moved to the university where we are now].

- Advice provided to young women staff members in particular, specifically in relation to publication productivity

I don't agree with [name changes] at all. I mean, I encourage female students absolutely, absolutely not to change their name...I think it's the wiser thing to do. I mean, some people feel quite strongly about this. It's a personal decision, but for me, and the example I give: the biggest mistake we ever made was for [my wife] to take my name. Oh, for sure. This was a big mistake. Once you've done it, you can't get out of it. But when we got married, it was 1979...I had never ever, until I went to America, met anybody – any couple – with different names. In fact, the first time I met people, I'd..."Well, how did this really work. What name did the children get?", or something. But, really for us: I think it's done [my wife] harm; I think it's caused confusion in our scientific lives, and I wish she had her own name. And I think she wishes she had her own name. And I mean, I suppose about ten years ago we talked about this deeply, and then just decided, you know...it's been going on for so long, it would probably be more confusing to make a change in the middle, but...I think people that change their names make a mistake. But they do it, because it's very personal.

2.6.4.2 *Possible reasons why women publish less than men do*

Sometimes they don't study, because the work environment doesn't allow them to be able to deal with children and their studies. That's very bad, I mean: it's a serious problem - not only in this country. I mean, you've seen some of this stuff worldwide. There is a serious concern about a lack of women in the scientific environment...or let's just call it the academic environment in general...research environment - that could be social sciences...like the research you're doing.

It's horrible for me to answer, because I don't have...lots of data that I can think of quickly. I think women are...much better at criticism: they deal with criticism a lot better than men do. Men are pretty egotistical...and take criticism very badly. It's just the way we are, and I don't like the fact that we're like that, and I don't think I'm necessarily better or worse than others. But you go to Kruger Park and watch the bokkies, and you learn a lot about people. The males are always rucking and fighting with each other, and spend a lot of energy on ego stuff...That is...biologically there's a reason for it. I mean, it's not that they're being funny, but...I think women are a much more understanding of criticism...I haven't watched my female colleagues and my female staff [and] specifically measured how they respond to rejection or to criticism, so in terms of publication processes...it's not something that I have lots of comments or data about. But I look at my female colleagues when they get, say, an NRF rating that is not up to what they deserved, or what they feel they deserved. And often times they feel they deserved better - and they did deserve better, in my opinion. They're much less...they just get on with their job and kind of deal with it, not feel offended.

I think there are some women in that department who teach mostly and do very little research, but they seem to choose it that way as well; it fits in their lifestyles. What kind of men would only teach because they're not good researchers?

2.6.4.3 *Specific factors*

- Views on combining marriage with a research career

In a relationship, certainly, one partner is going to take a back chair to some extent. And there's no question about that. And you can call it discriminatory. I would like to think that we have an understanding about what has happened, but for sure [my wife] has not been able to travel as I've had, she's not been as integrated as I have. I mean, where is she now? I'm in my office; I will be here...typically I'm here until seven o'clock...Somebody has to get somebody at the gym, and somebody has to help a little bit with the homework. And I do it when I can, you know...tomorrow she's going to – I don't know what time – a meeting in Pietermaritzburg, so I'm doing some carrying around and some things. But there is no question at all that she has taken a side-step. There's no question. I mean, look: I spend eighty hours a week doing science and my job, and she maybe does sixty. And that's not because she would not wish to do what I'm doing - because our work and our hobby: it's all integrated. She is taking the bulk of the load of managing our home affairs with the children. And that's just the way it is. I mean, I think that perhaps because I got the first start: if she had gotten the first start, and she was better...than I was – early [on] – it would have turned out a little bit differently. We're also different people. But there are realities as well. I mean, there is a reality of what children do.

[My wife] is a very clever person. She's intellectually very, very bright. Secondly, our collaboration...the depth of the science that I do today is magnitudes deeper than it was say, ten or fifteen years ago. And a lot of that had to do with [the]...collaboration between us. She has a different area of expertise...and she's been able to bring [it] into my [fields]. So, there's no way that I could be publishing and doing what I do if that collaboration hadn't started. But I mean, she refused to collaborate with me until 1990...When I was a PhD student, I wanted to do something - really, really wanted to do a certain piece of work - and I persuaded her to spend her Christmas holiday with me and to help me. And we took on the study together. She'd had some experience in the techniques at that time. But really – I think it was 1990 – she went for a year's sabbatical in the US, and she came back and she said, "You know, I've

been thinking, and maybe we're wrong not to collaborate, because there are a lot of opportunities, and I had the skills that you said that you had wanted. Let's just start with one PhD student". She just thought that my shadow was too big, and she would get hidden. And she has got hidden to some extent. I mean, I remember one NRF rating of hers: they said, you know, "[Your husband] did this; the brains behind it". I mean, ironically: a lot of...more than half...a lot of the brains were her brains, but...she's sort of "riding". And I think she has been discriminated against quite strongly, because of our collaboration. What do you do about that? You can't...she can fight about it. I remember one of those NRF reviews: people being quite critical. The irony is, so much of the depth is her input, and...Recently she had a B, but there are certain categories in B, and she was just recently re-rated. And they brought her down a category – also in the B's. I thought she would become an A. In fact, I think the university thought she would become an A. And certainly...I mean, if you go into the *Web of Knowledge* and look: she is more cited than I am. She has a higher international profile than I do. But, you know, you get the silly NRF nonsense, and...I have big problems with that whole system anyway.

- Institutional factors

Often times I say to students – [when] they say that, "Maybe we should change" - and I say, "Well, you've got speed on your projects, you've done a masters degree, you're already getting known in a field that nobody else in the country...Probably, you would gain most by staying and finishing a PhD, and then maybe doing a post-doc in another place – moving a little then", which argues against an argument for change. On the other hand, I've gained a great deal by changing...I went to [an overseas university], because there was nobody in South Africa that really had the knowledge in the field that I wanted to work in. That's really the reason. I started...the fundamental background to what I do...So, there's a [variety of fields] kind of background there. And I owed money to the government - I'd had a bursary for R2 000 from them – and I was told I had to go and work for them. And they told me, this is what I had to do. And there was nobody working in the field, so...I guess I started my masters more or less on my own in getting advice from journalists here and there and everywhere, and then: everybody said, "You need to get overseas. You need to meet people that work in this field and understand it". That was the driving factor. And that, of course, was fabulous, and...there's no way I could be doing what I'm doing now, without having had that experience.

I think in our field facilities are quite important, as well. That's the only reason [we moved to another South African university]. We loved [the previous city]. We love the people, we lived well; we still love [the city]. Quality of life is higher in [that city] than in any other place in this country, as far as I'm concerned. Good schools are cheap – really good schools are cheap - it's easy to move, people are very nice, friendly – it's a very friendly environment. Everything is less expensive; lovely houses are cheap. There are lots of nice things about [that city]. But the kind of [research] we do is incredibly technologically demanding...I desperately wanted to get a [piece of equipment] in [the university I worked at previously]. When I got an A rating, I was actually given one by the...university bought one. I remember the vice-principal: he's a good friend of mine, very nice guy...came to me and he says, "You know, it's good that we got [that piece of equipment] when we did, because it would be very hard to buy now". And I got the fright of my life. I **really** got a fright, because I thought, "Hey, these things only last three or four years". And I was busy trying to make a decision as to move to [another South African university] at that time...I mean, those kind of things had a very, very significant influence...I will say we were ready for a change. After ten years, I think we were ready for a change. I think change is important; it's invigorating. But really, the thing that motivated the change was access to more students, better students, and knowing that there would be equipment. I mean, we bought a brand-new [piece of equipment] when we arrived here. We now have – I don't know - five? I mean, you know. And we use them every day...To really compete in the worldwide arena you really, really need to have the money - the support to be able to get the equipment and to do the work...We could not be doing what we're doing now [at the university I worked at previously]. There's no way - not even possibly. We would have had the same contracts from the same companies that support us, but we wouldn't be able to do the work we're doing.

- Integration into the academic research community

National [collaboration] is hard, because there's usually not too many people around in those fields. Getting strong collaborative links - I mean, we have collaborations now with people everywhere... - obviously, that brings a huge amount of interaction and new ideas, and publications.

I suppose I had the privilege to have some nice mentors to help me.

- Time management

I'm in my office; I will be here...typically I'm here until seven o'clock...I spend eighty hours a week doing science and my job.

Well, I only do what I do. People often say, "Well, how do you manage to do what you do?" But they take off when I don't take off. I might take off in my office, or in my office at home. I took a day off this week-end: it was the first day in three months. But, you know, when I do research, it's like holiday. It's just: I work eighty hours a week: forty hours I do administration, and forty hours I do research. So, I delegate very, very well. So people say, "Well, you're

very busy, because you don't delegate better than I do". I mean, I'd love to...I delegate...I think I delegate very well. It's a matter of hours. It's always like that...nothing comes free...People say, "Well, you're a very unbalanced person". I say, "Well, I've a German background, so...". I had a crazy German grandfather, and he just did what he did all the time...I don't like half things...And my spare time I spend...well, there's not very much of it, but we try to take a holiday every year for a couple of weeks and not do any work. But I guess we talk about work.

I travel a great deal...so I probably spend a hundred days a year out of the country, and never on trips for longer than ten days...I spend forty days a year more than my average colleagues in my office here. That already shows you some stuff. But when I travel, I work at airports, I work on the aeroplane; I do a huge...I mean, my students in my office today said, "Well, can we give you manuscripts to take with you? We know that that's when you get them done the best" - because, I don't sit in my hotel watching TV.

- **Views on gender discrimination**

That is actually a very hard one, because in my little circle that I live in...and I don't like discrimination of any type. I think we...almost operate on the other side of...the kind of extreme of the other side...if you come into this institute...there are thirty languages spoken here. There are Moslems and Jews and Christians and black and white and gay and straight. That's what, as a director of the institute - ...I started the institute - that's something we pushed very, very hard, because this must be a place for everybody. But I **do** believe there is discrimination in the bigger picture...gender discrimination. I think often times it's subconscious: a very, very hard thing to put a finger on. You know, you could say, "Well, why isn't there a woman rector of our university?" And, well, maybe there wasn't a good woman candidate, but maybe there was, you know.

[My wife] has got hidden to some extent. I mean, I remember one NRF rating of hers: they said, you know, "[Your husband] did this; the brains behind it". I mean, ironically: a lot of...more than half...a lot of the brains were her brains, but...she's sort of "riding". And I think she has been discriminated against quite strongly, because of our collaboration. What do you do about that? You can't...she can fight about it. I remember one of those NRF reviews: people being quite critical. The irony is: so much of the depth is her input...Recently she had a B, but there are certain categories in B, and she was just recently re-rated. And they brought her down a category - also in the B's. I thought she would become an A. In fact, I think the university thought she would become an A. And certainly...I mean, if you go into the *Web of Knowledge* and look: she is more cited than I am. She has a higher international profile than I do. But, you know, you get the silly NRF nonsense, and...I have big problems with that whole system anyway.

2.6.5 **Views on the effects of parenthood on publication productivity**

2.6.5.1 *Views on combining parenthood with a research career*

Somebody has to get somebody at the gym, and somebody has to help a little bit with the homework. And I do it when I can, you know. And...tomorrow she's going to - I don't know what time - a meeting in Pietermaritzburg, so I'm doing some carrying around and some things...There is a reality of what children do...as much as you say that a man and a woman can share the roles - and I think they can, and I think that we're actually quite good at both participating in the family building - you know, it simply might be that we're both not very good parents, because we spend our time doing a lot of other things. But our kids are actually quite nice...I mean, they occasionally say, well you know, "You guys are always working, you're never here; you only talk about work". But, I think they quite like us, and we like them. We actually have quite a nice relationship. Actually, we have a very nice relationship. But, when I look at my various colleagues: I think we're doing quite well with our children. For sure: [my wife] has played second fiddle...I [am] talking about the biology of the children. I just think when we first started with a family, we had discussed equal time, equal roles, that kind of stuff. And it's all very nice, but once the baby is there: this baby does not want to drink milk from me, I can tell you. For those first few years they are incredibly emotionally attached to the mother - as much as the father plays around there. It sounds kind of a bit sexist...well, my American colleagues would certainly say I don't try hard enough.

And the children...we travel, we have them with us, and give them some of our time...some of our focus time, and any spare time I have I try to spend with the children - ...around in the garden and see if they'll join us.

2.6.5.2 *Effects of parenthood on publication productivity*

[The children] have a serious impact.

We started later. I guess I was 38 or so when my second child was born. [My wife] is five years younger than I am, so...But there were times when I'd say, "Hell, it's a little bit much for us". You can say to your children, "I'm tired now, give me a break; you know, I'm old; you must understand that". And they'll say "No, you're not old: you're old when we say you're old". But they do keep you young.

2.7 Sean

2.7.1 **Trends in career or ‘lifetime’ publication record**

2.7.1.1 *Reasons for variations in output volume over time*

National service. I was a student until [the late eighties]. I taught a lot. I was a junior staff member, so when I started working in [the late eighties], the rest was PhD. Now, even the best PhD students I have typically are producing two to three papers a year. If they are really, really good. I started working in [the late eighties], and then I taught. Then I got called up. I couldn't avoid it any longer. If I had held out one more year, it could have disappeared.

I wasn't gone, because I cheated the system: I went and did basic training, and then I went back. They couldn't use me, because they thought I was a doctor. The medical services couldn't use me. So then I had myself transferred to [a government department]. They couldn't pay my salary, so I got the University to offer to pay my salary. They said fine, but they don't have space. So then I was transferred back to the university. So I did guard duty on weekends, for a year.

One grows from experience. End of '96 or '97 I went on sabbatical to [an overseas university]. That changed things a little bit, because I just learned to work in a slightly different way; also how to think in a slightly different way to what I've been doing; and I also learnt to be more strategic about what I was doing, so that increased the amount of time I devoted to research. And it became a bit easier to do some of the writing. 2001 and 2002 were just big years by accident. After that I wrote [a] book, so that took quite an amount of time. I wrote that book in 2001, 2002, 2003 - along with everything else.

2.7.1.2 *Preference for certain types of publication outlets*

I've done very, very few reports. Very few. And most of them have been for money. So, the [one] was a hugely well-paid contract. I charged them a vast amount of money to do that. I just put it in my research grant. So that was the contract. The other reports that I've done have either been favours, or there were papers that came out of them. But by and large [another] was a favour to someone in the NRF, the contract one...was a lot of money, the [third] one was a favour to [a colleague], who I worked with when we were [at a South African university].

The book I wrote because there wasn't a book in the field that suited my needs. I thought: well, here's a gap in the market.

2.7.1.3 *Internationality of publications*

Nobody will read your stuff published here. It's as simple as that. If you do work, and it's not published, it's not done. If you do work, and it's published locally, it's almost not done either, because it is really difficult to get hold of. You go to a foreign library, and ten to one they are not going to stock your journal. And we have some trade journals: especially with my students...when they are starting out...A lower-end international journal [is] fine for some of the things they're doing, because not all students are stars, so you can't expect them to have beautiful research results, because some are more interested and more active than others. So...a good, lower-tier journal [is] fine for them. Immediately, it also pushed them into the international scene, so their names are out there immediately.

2.7.1.4 *Multiple authorship*

Irrespective of whether [my students] do [a paper] properly or not, and I have to redo it, the students are always the first authors of papers that come out of their thesis, unless there's been a real shift in the words. Sometimes I have taken the work and said, "Well, you're not going to get very far writing about this", and then rewritten the whole thing, and they're still the authors. But there are very few of those as well.

I typically don't worry about how many authors are on a paper. Really, it's just: what are we aiming to do? And if we need to do a particular thing, and I need to go talk to somebody – even if I don't know them – because they've got the skills, I'll approach them, and say: do you want to work with us on this?

It is hugely important to have [collaborators], and I try and push my students into collaborations - way down. So they tend to collaborate with each other already, so that it is not so isolated; because they can do more if they work together. My students – often the good ones – work on a couple of things outside their thesis topics at the same time. So, for instance, [two current PhD students of mine are] working together on a project that is not going to be in any way related to their thesis. But they're both skilled, it's a question that needs answering, and it's a nice place to go to. So they said: we'll go.

2.7.2 Views on publication

2.7.2.1 General

- Scientific publication

If you don't publish your work, it's never been done. So why are you doing it? So, why are you doing this? Then it's better to do another job, which is more lucrative, much more lucrative for the number of hours that's expected for even an average academic to put in. If you're here just within the university hours – from eight in the morning till five in the afternoon – then you can do much better by doing a different job. Much better. Being a plumber: much better!

There's good research, and there's bad research. I don't distinguish between any of the other kinds. Whether you work on making more plums for the community, or you have some kind of stove that will improve rural communities, whatever: there's good research and bad research. If the research is good, it should be publishable, because there should be an interest in it. If it's bad, it isn't. If you say, Oh, we're doing government work, and therefore we only write reports – if you're sensible, the research you write in reports will also be published. So the [one] contract that I did...which I got a fortune for, is published in a paper (it's just been accepted; it's listed as "in press" in my CV)...I didn't even get my hands dirty. What I did do is find out about [a research topic] – incidentally, I did it in [in another area] as well, so I knew about [the topic] today. So, I don't think that people should say that government reports should count, because my experience often – I did a paper with a PhD student of mine – where we looked at [another research topic], much of it was in the grey literature, and it was rubbish. It's just rubbish. Some people would say, Oh, we know the effect of [y] is [x], and when we actually got the report: bad design; anything, because nobody's looking. These government institutions want an answer. They just want to know: should we, or shouldn't we? But all the detail behind [it] is just not there, because they don't have the experience to say what's a good sampling design, what's a good analytical design. Whereas you try that in the international literature...I'm helping a task team now, to draw up the regulations for [an] act...and even then...our deputy director, were both talking about...how can we...we're going to get something out of this, because it really informs the practice of [a field]. So, there's a paper to be written on it.

- 'Publish or perish' in the South African academic context

I actually think that in the past twenty years you wouldn't have perished. Do you know of a single academic at a South African university whose been fired for not publishing? I don't know why. Maybe now that the university is restructuring the academics, they'll fire a few people, or retrench them, because they are not publishing.

2.7.2.2 Teaching and publication

If you teach too much, it will kill you. You loose your enthusiasm, and you become useless for the students, because they pick it up. I also don't think that you should ever **not** teach undergraduates. That's why, at the Centre I've [kept on] teaching undergraduates, because if you don't teach them, you don't know what's going on, you don't know what they are thinking, you don't know what the quality is later on. So, you have to stay and see what the problems are with the undergraduates, and what the success is.

The workforce is the postgraduate students. I don't typically go out and collect all the data myself. I read the papers, see what they should be doing, and they do the work. Sometimes I can help them in the field – and I get in quite regularly – but often they collect the data

Without my students this wouldn't be possible.

I teach an honours module, and I teach a second-year...module. But even so, I've got very little teaching in that any more: it's split half-half with another staff member...The [second-year] course is an elective, so it is typically about 22 students that I am involved with. But I haven't taught first-years for years, for a long time. [At the university where I had worked previously] I did, but I haven't done those huge service courses for ages. I got involved here with seven lectures in [a course with] 200 students in the class, and I disliked it intensely. Not because they couldn't hear me, but because they couldn't hear each other. The students should hear each other. If you are going to have a discussion, and they can't hear each other, it just erupts into the lecturer controlling the class.

I've been in small departments. I've been in departments where there are three or four of us running the whole show, and those departments didn't have small student numbers. So, we had student numbers that were equivalent to this department. And we were participating in big service courses too.

2.7.3 Motivation for publishing

Because it's fun. I wouldn't do it if I wasn't enjoying it. I've always wanted to find the answer. And so, whatever we turn to – 'we' being the lab, because without my students this wouldn't be possible – then we work until we know the answer. Then we come up with something else.

2.7.4 Major factors that have impacted on publication productivity

2.7.4.1 General facilitators

- The most important contributing factors

I was taught the value of books from an early age, and reading. And so I read and read and read and read. Then, when I went to school, for the last three, four years of high-school, I had an English teacher equivalent of...did you see *A river runs through it*, or read the book? You know the guy who put a line through his son's essays all the time to make them shorter? I had an English teacher that did this. Exactly the same. So, I had an outstanding teacher. So, in consequence I don't have problems with comprehension of stuff I read, and I don't have problems in writing - at reasonably thrifty writing. Those are both skills that are essential for research. And then I'd stuffed around with electronics when I was a youngster, so I know how to put things together, and that's helpful for lab work. And I spent every waking moment that I wasn't in school, in the field - from about Standard 2 till about Standard 8.

- Advice provided to students, or a new staff member, specifically to ensure a high level of publication productivity

In this current South African situation, there's nothing for them if they aren't good. Now, you look at people who are being appointed as lecturers at [an overseas university]. Typically, they're looking at how many papers they've published in *Nature*. That's what the market is like there. So now, these students of mine are going to have to compete here. So, they'd better be very good. And if I want to send any of them for a post-doctoral to a lab abroad, they have to be very special.

Work strategically. Look around, look at what's happening. Choose your supervisor, don't choose your [research topic].

2.7.4.2 General inhibitors

- Constraints encountered

In the beginning it's hard; there are always ups and downs. You're not so experienced...lots of teaching, military service, and those things have a bigger effect than they should. Apart from that, there has not really been much of an inhibitor.

There are some inhibitors that come back to repeat themselves. So, [at the university where I had worked previously] there was [a] language policy, which is Afrikaans, which - from a science perspective - I thought was bad, because, students have to go into an international, **English** science market. I always say to people: this has nothing to do with Afrikaans. If you were speaking Estonian, or Spanish, or Japanese, or whatever, you're in the same bloody boat. And even the French now are publishing in English. And then at [the university where I'm working now] it's the same problem. And I don't understand it. And I really think it's an inhibitor to the university in transformation, in getting black graduate students, all of which now influence us. And in getting students *per se*, I think that it's a real inhibitor. I don't understand why they don't just build a bloody enormous Afrikaans language centre. Because I would go to it, because I like the language, I like the literature, I like the artists. And then have a resident singer, a resident bloody writer, and promote the language properly, instead of this underhanded *taalpolisie* they've got. It's silly, because it makes people anti. It's a lovely language - I grew up in Africa - it's the only European African language that there is.

That's a real inhibitor. It worries me not because I'm English-speaking. I grew up next to a little Afrikaner boy, and I played in Afrikaans my whole life when I was growing up, and I am at Afrikaans universities. I think the culture is an interesting culture, and it's...a huge, complicated issue...

Don't force it on people. In 1976 a whole bunch of people rioted because Afrikaans was forced on them.

I taught in Afrikaans for the first five years. When I was an undergraduate student I answered every examination in Afrikaans - every exam, all the way through to my third year - in Afrikaans, because my reasoning was that many of the lecturers were incompetent in English, and in consequence, I would do worse if I answered them in English than if I answered in Afrikaans.

- Possible reasons why women publish less than men do

I don't know enough about how society works to give you anything else than my own opinion. I actually prefer working with female students, because typically they're a little less flighty than the guys. Typically, now - knowing there's a lot of variation, and some have fallen off the bus; some of my female students go somewhere else and change their registration. It's a handful of people that maybe finish the course. That's how it works. Often you find that the female students are actually more conscientious than the guys. The guys have all sorts of outside interests. But then the flipside of that is that, when you get somebody who's hungry - who has the lean and hungry look, who knows where they want to go - usually the guys outperform the women...I don't know why. It's a boy thing. Drive

faster, whatever it is. I mean, that's a generalisation. I don't know how much that is because society expects them to be so, and it can change. But guys just seem to be so single-minded.

So, generally, female students in my experience are more reliable - they're here often, they think quite a lot. The guys: they're OK, but they've got a lot of outside interests.

I know lots of people who spend lots of time with their kids, love their kids, don't just have work. They're guys who don't just have work as the sole goal in their lives. And I know quite a few women who are absolutely driven to do their work.

2.7.4.3 *Specific factors*

- Views on combining marriage with a research career

I've of course thought about this quite a lot. There are advantages, and there are disadvantages. And the advantage, really, is that there's full understanding for what you're doing, which is a real difference. Much more difficult if I was married to - I think - married to somebody that was a vet, say. Vets are really busy. I've got quite a few friends from varsity, and [two of them] are both good vets, and they're really busy. But they have much more spare time. They are not as pushed towards working all the time...they'd go nuts...on the weekends I don't take bureaucracy home - I just do research. My wife is...sometimes we go and do things, but she's much more understanding, because she is in the same field. And often she's got to do the same. So, you know, we're quite happy. And from the research side, it's very advantageous, because she is [in a specific field]. So, I don't have to worry about any of that, any of that field. And that's why we have a research collaboration. So, I don't have to...those are all complicated issues, which I don't have to worry about. But that is actually, to some extent, true of all the other collaborators I have.

- Institutional factors

I moved [to an Afrikaans university], because [they] have a chip on their shoulder: they think they're bad at research. That's what [this university] thinks, and that's excellent, because that means people would put money into research. Somebody said, "You're going back twenty years", and I said, "That's exactly what I want". Not culturally - because I think that all sorts of things here suck - but because they're really keen on research. The way the university is being run: it's very, very fond of researchers, to support them. And that's what I like about it. And they have been supportive. It's the most supportive institution I've worked at.

I took a job at [the previous university where I worked], because there was a job open. Remember, in [the Apartheid days there were no post-docs; nobody wanted you abroad. In the eighties, when I applied for a job, there were no post-doc opportunities. I just got a job. There was one open [at that university], and I was finishing the previous on. So, I thought: take it.

- Integration into the academic research community

Ultimately there is probably only so many things you can do in a day, and some people are better at doing it than others. So, the collaborations just increase the amount of stuff you can get to. And the interest: the people bring so many strengths to it.

I don't know if I could ever call somebody a mentor in the sense that...I had a very close collaboration with K in the UK. And we're just friends now. I go visiting him over there. We really are friends...But J: when I was a junior graduate student, he really helped me. I appreciate it. He did.

- Time management

Aside from my diary - which alerts me if I turn the volume on (sometimes I turn the speakers off on my computer, and the diary just gives me an alert that comes up) - apart from that, there's no alerts to e-mails; there's nothing. And if I open an e-mail, I finish it. If I open a document on my desk, I finish it (unless it's a paper that'll take ages to write). I never do small things twice. Never.

I knew that from the beginning I would never jump out of the 'one paper 5000 lectures' box, unless I worked - nights, on the week-ends. So that's what I do.

Typically, I leave home at seven, and I'm home again at seven. And then I have dinner, play with the dog for five minutes, then I work again, and I work through until ten-thirty. And I work on Saturdays from usually about eight in the morning until three, and Sundays the same.

- Views on gender discrimination

I think there's blatant discrimination. I know...there are certain professors, if given the choice between a woman and a man would choose the man, just because they feel uncomfortable.

I think people are stupid if they think that the difference in the chromosomes we have is not going to make any difference to the way people function. Men versus women. Again, I speak distributions: there's plenty of overlap,

but certainly the means are different. And often society has encouraged men and women to grow up in different ways, and in consequence, when you get into a business situation or academic situation, there are big differences. So, take advantage of them, is what I say. There are lots of guys who won't do it in our field. And I think there is salary discrimination – I think it's rife. Look in this department. Look. Look at some of our people that were appointed: look at their CVs, and look at how they are appointed, and where they are. And this is recent – [the] last two or three years. And I think it's not restricted to the university. The whole country has still got to grow out of this stuff. And as for black society, I work on M, where we come into close contact with black society at a level that I wouldn't typically have, because of the years I grew up. And there's still lots of sexism in black society. Lots. And how are we going to grow out of that? Because now we're becoming more racially fine, but there is still all this cultural baggage. It's difficult.

2.7.5 **Views on combining parenthood with a research career**

I think that is a hugely difficult question to answer, because it all depends on who you're married to...doesn't it? S, my co-author on this book - if you want to talk about woman in science who've managed it – she's got a husband, she's got kids...she's fantastic, she's productive, she's the chair of a department. She's had her kids – they're hugely successful children – and everything's fine. She's a great person. I say to all my female students, "If you think it's tough, and you can't have babies and all the rest - a husband - then talk to S - she's done it all". Of course there are dips in your career, because you can't go and have kids - for the first little while - and not.

A is another person I collaborated with at [an overseas university]. She's got two kids, she's just had her appendix out, and there's an e-mail from her from home: "Oh, you know, G" (that's our joint PhD student), "Nice paper, you just need to change this. Unfortunately I can't do too much in the day, because I'm still hurting from my appendix. I have to crawl around on the ground looking after my kids, because I can't pick them up".

I don't think it's impossible, but the universities, or whoever your employer is, must also set realistic expectations. What I find is that too many institutions think that there's a golden standard, instead of realising (as you should if you're a scientist) that there's a frequency distribution of skills, abilities and outputs, and you need to look at the distribution and then you need to go with the distribution. You're always going to have some people who do a lot of something. The university works to norms, and I think as an individual, you should do what makes you happy. But, if that doesn't fit with your employer, then you must expect to be fired. I've always maintained this. I know amongst my students that: what am I going to get out of a masters or a PhD? Well, two to three papers (if I'm really lucky). Some would produce three in their first years, or four...but others will produce one or two. That's just the way it is. And you try and push the norm along - not only the numbers, but also the quality – because ultimately, your job is to improve **their** lives.

As for married women, I think their organisational skills are better, and they could probably teach the guys something about that. Because you have to. So far as I've seen, every person that's had children: they are supremely well-organised. Well, at least working. When I was on sabbatical [at an overseas university], I stayed for six months with a female...who was head of [a] department. She had two small boys. So, she would get up early in the morning, and she would prepare the kids for school, and then she would go to work. And then they had kind of a nanny who could look after the kids in the afternoon, because she and her husband were quite wealthy. But then she'd come back from work at six. Then she would spend from six to eight-thirty with David and Joseph. Uninterrupted. That's their time. And then she'd work from eight-thirty till midnight. She never worked on the week-ends; she just worked at night.

2.8 Ted

2.8.1 **Trends in career or 'lifetime' publication record**

2.8.1.1 *Reasons for variations in output volume over time*

You accumulate experience on how to write articles, you become a better researcher, and you have more students...and you have more fun. So, it's a progressive increase in skills, and also in what you need to do the research, whatever that then is – resources.

I was writing [a book] in 2001, 2002...[A dip then is] natural, because if you're writing a book, you just have to focus a hundred percent on the book...I write papers – like I'm writing one right now – in drabs. I'd be writing six or seven papers together at the same time. But if you're doing a book, you can't do that – you can't just stop everything and do that.

2.8.1.2 *Preference for certain types of publication outlets*

- Preference for a particular publication type

We get no credit at all [at the university where I work].

Journal articles] tell a story: if you follow the sequence in our research, there would be central themes, which you follow through, so you do another study every year or two. So, it's another step in the direction that you're planning to go. And books you write really to get a view of the whole landscape...you get a much better understanding. You can't really understand a problem until you write a book about it.

- Selecting journals in which to publish work

Our problem is that, because we have two controversial theories, and there is censorship in the international literature, and the censorship affects your choice of journal, because the censorship is enforced by editors who don't want...who don't believe your theory - which is not how science should be. Unfortunately, that happened with our [one theory], and also our [other] theory: they can't be published in certain journals. We go for certain journals, because we know that people who need to be influenced, are reading those journals. And unfortunately, these are usually American journals, but American journals are not democratic: they don't publish everything.

2.8.1.3 *Internationality of publications*

Unfortunately, we always were selected first in overseas journals, because we are writing for the international people. We're not writing for South Africans.

2.8.1.4 *Multiple authorship*

Our attitude is the opposite [of] the American attitude...I expect in some laboratories...that everyone works in isolation of each other. And that's a typical First World approach to anything: that you're in it for yourself. And I try to make sure that that doesn't happen here, and to make sure that everyone is benefiting from collaboration. So that's the focus. Many lay a focus on the individual and/or on the professor who is the head of the department, and I try not to do that. My job is to facilitate and teach these young kids to be good scientists, and to provide them with the necessary skills and resources that they need to be good scientists. That's my job - primary job. It's not to accumulate everything for myself.

Most [co-authored articles] are with postgraduate students.

2.8.1.5 *Refereed articles during graduate training*

I was very fortunate in many, many ways. And the one way I was fortunate, was I had just gotten involved in a field that was completely...it was really just developing in the...1960s, early seventies. That is point one: it was an unknown field. And [the modern version of my field] really started in 1968...of course, there were isolated pockets in the past...So, I got in in 1969. And secondly, I realised early on that you had to have the public on your side. So, I started writing for the public, educating the public. For me that is a central responsibility of a scientist.

2.8.2 **Views on publication**

2.8.2.1 *General*

- Scientific publication

For me, [educating the public] is a central responsibility of a scientist. And I cannot understand how people are funded up to the hilt doing HIV/AIDS research, and they're completely faceless. To me, that is a disgrace. They're living in a funny...it's not right. You have to give the public back, particularly if you are well funded. There's often arrogance among the South African scientists: they think that...people are too stupid to understand what they're doing, and [that] they're too clever. And I was fortunate that I was taught by L, who was a genius, but who could explain anything to anyone. And you're not a good scientist if you can't explain your work to a ten year- or six year-old. You're not a good scientist, and that's the problem. There's this group of scientists who believe that the more difficult they make it sound, the more clever they are, but it just proves how stupid they are.

- 'Publish or perish' in the South African academic context

Ultimately, it increases fraud, and it does everything wrong. It destroys the scientists; eventually it does. Science should be creatively driven. You should be so creative, that you want to work, not forced to do it. People who have to be forced to publish shouldn't be in the business. That's the problem. I'm reading a book called *American Mania* at the moment, and it shows where America lost the plot completely. And that's because it's become so competitive, and so individualistic. And people have lost their humanity for the other person, and they don't work in teams any more. And you can't do that; if everyone's for himself, it's a disaster. And that's what we will get if we push that.

2.8.2.2 *Teaching and publication*

We do a little bit [of undergraduate teaching]. I do less now than I used to do. I do some undergraduate teaching, but not that much any more...Postgraduate education is our main focus...I was very fortunate that I went straight into postgraduate teaching. So, I didn't do very much undergraduate teaching ever.

2.8.3 **Motivation for publishing**

Everyone who is successful is incredibly selfish. I'm an orphan immigrant, and that also, clearly, has other factors as well. What is interesting...I always think you have to look at the family relationships - at your own parental relationships. I come from an unusual family. My father didn't acknowledge me and my work until very late in my career - five years before he died - but before he died, he told everyone, he's so proud of me, but he never told me that, you see. I wrote [a book] for him; I wrote it to explain to him, that actually [that facet of my life] was important to **me**, and he should acknowledge that. So, there are all these extraneous factors. But I remain fundamentally driven, because I really enjoy science, and I enjoy the work I do.

2.8.4 **Major factors that have impacted on publication productivity**

2.8.4.1 *General facilitators*

Facilitators were other people overseas. There are many...I've had lots of heroes overseas. And I had lots of people I respect, and I still do. I look for heroes, great scientists. And I read their work; try to understand how they got around a problem that I might be facing.

You've got to read. And a lot of people say you shouldn't read too much in your own field. Now, I think that's true. I think you need to read broadly outside your field...I don't like to read too much about what other people are thinking, because it can often clutter you up, so you have too many facts, and you get confused...I read very widely, and a lot of it's actually not in my field. But the field I read in is very, very wide...

2.8.4.2 *General inhibitors*

- Constraints encountered

Oh, absolutely. When we started, we were called "mickey mouse" - one of them, the vice-chancellor of the university, said that. My salary was actually cut in 1984, because we were not teaching medical students in their clinical years, so therefore we weren't quite...it's not right for doctors not to teach [students] in their clinical years! Those who teach in the pre-clinical years are clearly inadequate and unimportant. And to be teaching a mickey-mouse topic like [my field]. I mean - please - where is a person's self-respect? But I just love that, because I say I'm going to disprove them in the long term. It's very funny, because...[laughs] in the end we out-sciented and out-published these rather self-important imposters.

- Possible reasons why women publish less than men do

I think it's very simple. I mean, I think women have many more...you know, they can't be as focused - they multi-task. When I'm writing, my wife's cooking - that's as simple as that: she's doing something else. If I didn't have such a selfless wife, there's no way I would have achieved what I did. And if you are the selfless wife, you're not gonna...you can't produce like I have. I've been incredibly selfish, and I think you need to make that point.

2.8.4.3 *Specific factors*

- Institutional factors

Completely unfacilitative. We got everything without any real help. I mean, we just provide...we're just a nice money source for them. If you're one of the...if you are successful, then you threaten other people. And even in high positions you stay threatening...I would never move. I'm very happy. I never needed these people, because I knew that the only way that I would ever succeed in doing what I wanted to do, would be to do it myself, because I knew that the committee are not going to help you unless you are yourself a member of that mediocrity. Universities are run by committee's, and committees produce donkeys, not racehorses.

In fact, there has been discrimination against us. The [Institute] has been actively discriminated against, because it's seen to be white elitist, which it isn't. But anyway. So there's definitely been discrimination there. Like, for example, it really is the university: when I won an award, they don't take any notice at all. When I got a DSc, which is quite an achievement...I think that's the university: they're not into recognising that.

- Impact of informal contact with colleagues (incl. mentors) within field

[L] was very important [as a mentor]. R, also at [the university where I work], was very important. And then, of course there are many negative influences: people you don't want to be like. And they are equally important because they amplify why you hold others in high regard. Because they do not have those inhibiting personal limitations.

- Time management

We'll, I'm a bit manic myself. I'm reading *American Mania* – I see the manic in myself. I'm very focused. When I get onto an airplane, I write; I don't do other things. And, if I'm at a meeting, and it's lunchtime, I'd start writing. My interest is that; it's not dealing with people I don't really like. So, I'm really happy to be with people who inspire me, but if they don't inspire me, I'd rather be by myself, doing my own thing. So, all my writing is done when other people are going to watch movies, and do other things. And when I'm traveling and so on, I make the most of the hours of the day.

- Views on gender discrimination

I am very fortunate: I've got many women in the department. In fact, we have far more women than men in the postgraduate group. But in the management level, we're mainly men; we don't have too many women. But that is rapidly changing.

As a white male myself [I have] definitely [experienced discrimination]. Had I been black I would have been far more acceptable in South Africa than I am to many different people. And in fact, there has been discrimination against us. The [Institute] has been actively discriminated against, because it's seen to be white and elitist, which it isn't. It is just a world class organization which is what everyone should be recognizing – not what it is not. But anyway. So there's definitely been discrimination there. Like, for example, it really is the university: when I won an award, they don't take any notice at all.

2.8.5 Views on the effects of parenthood on publication productivity

2.8.5.1 Views on combining parenthood with a research career

I am very fortunate: I've got many women in the department. In fact, we have far more women than men in the postgraduate group. But in the management level, we're mainly men; we don't have too many women. But this is changing. I think it's incredibly difficult. You see, my wife chose not to work: that is my bias. I think that there's a lot of benefit to the children to do that. So, I'm not going to preach anything, but I think the children do suffer a bit. That would be my concern. Again, *American Mania*: it focuses on a lot of women who eventually realise, "My God, it wasn't really worth it - what we've done; we've lost the intimacy of our families", which is actually – at my advanced age – really what everything's about. And I didn't understand that. I'm now beginning to understand it. It's the intimacy of relationships which are important. It's not the prestige, and the material wealth, and so on. I've met so many people now in their sixties, people who were outwardly considered to be very successful, who now realise that they should've done it differently.

2.8.5.2 Effects of parenthood on publication productivity

My wife just is a brilliant woman. She raised [our children] and made up for any failures on my part. What I mean: I don't know if she made up for them, but she covered for me if I was travelling, and so on. I do think maybe I should have spent more time with my family. I think probably that was an error, but I think they've come through pretty well. They actually can live with my status, and that's a huge issue for children...people who are in a high profile. And I think they've done very well. My daughter particularly, has said she just uses it to her advantage, because now she has an in...people say, "Are you so and so...?" I think it's difficult for children with someone in high profile, and I think my daughter certainly coped very well, and I think my son has done well too. So, the negative of that I wasn't always there when I should have been there, I think has...in a sense we got a bit of balance; they benefited...in other ways.

APPENDIX D

A summary of descriptive data on the sample of respondents

<i>Gender</i>	<i>Pseudonym</i>	<i>Race</i>	<i>Chronological age¹</i>	<i>Scientific domain²</i>	<i>NRF-rating</i>	<i>PhD institution</i>
<i>Men</i>	Sean	White	41	NS&E	A	South African
	Martin	White	51	NS&E	A	Overseas
	Charles	White	55	SS&H	B	Overseas
	Ted	White	56	M&HS	A	South African
	Leon	White	56	SS&H	B	South African
	Jacob	White	60	SS&H	B	South African
	Bob	White	64	NS&E	A	Overseas
	Jacques	White	66	NS&E	B	South African
	Average		56			
<i>Women</i>	Thandi	Black	54	NS&E	B	Overseas
	Linda	White	51	SS&H	B	South African
	Elmarie	White	62	M&HS	B	South African
	Adele	White	68	M&HS	B	South African
	Delia	White	44	NS&E	A	South African
	Beatrice	White	47	NS&E	B	South African
	Cecilia	White	54	M&HS	A	South African
	Sarah	White	53	NS&E	B	South African
	Average		54			

¹ At the end of 2005

² NS&E = National sciences and engineering; SS&H = social sciences and humanities; M&HS = medical and health sciences

<i>Gender</i>	<i>Pseudonym</i>	<i>Marital status</i> ³	<i>Partner's occupation</i>	<i>No. of co-authorships with partner</i>	<i>No. of children</i>
<i>Men</i>	Sean	Married	Academic	14	0
	Martin	Married	Academic	137	2
	Charles	Married	Non-academic	4	2
	Ted	Married	Non-academic	0	2
	Leon	Married	Non-academic	0	3
	Jacob	Married	Non-academic	0	4
	Bob	Married	Non-academic	0	0
	Jacques	Married	Non-academic	0	4
	Averages				2
<i>Women</i>	Thandi	Widow	Non-academic	0	2
	Linda	Married	Non-academic	0	2
	Elmarie	Married	Academic	0	2
	Adele	Married	Academic	2	4
	Delia	Married	Non-academic	0	2
	Beatrice	Married	Academic	137	2
	Cecilia	Divorced	Non-academic	0	2
	Sarah	Married	Academic	60	0
	Averages				2

³ At the time of the interview

<i>Gender</i>	<i>Pseudonym</i>	<i>Age at 1st degree</i>	<i>Age at M</i>	<i>Age at PhD</i>	<i>Career age⁴</i>	<i>No. of years between 1st degree & PhD</i>	<i>No. of years between M & PhD</i>	<i>No. of pre-PhD ACs⁵</i>	<i>Age at full Prof. rank</i>
<i>Men</i>	Sean	21	25	25	16	4	0 ⁶	2	33
	Martin	22	25	29	22	7	4	17	36
	Charles	21	25	33	23	12	8	29	Unknown
	Ted	25	32	33	24	8	1	22	40
	Leon	21	25	30	26	9	5	3	32
	Jacob	22	28	31	29	9	3	16	31
	Bob	Unknown	Unknown	29	35	Unknown	Unknown	0	39
	Jacques	21	25	31	35	10	6	10	47
	Averages	22	26	30	26	8	4	12	37
<i>Women</i>	Thandi	26	30	36	19	10	6	4	50
	Linda	21	25	34	17	13	9	3	45
	Elmarie	Unknown	35	44	18	Unknown	9	12	55
	Adele	20	35	27	28	7	5	0	57
	Delia	20	22	28	16	8	6	2	37
	Beatrice	20	26	31	16	11	5	6	40
	Cecilia	21	32	32	22	11	0	4	39
	Sarah	23	27	40	13	17	13	33	47
	Averages	20	29	33	20	10	6	5	46

⁴ At the end of 2005

⁵ Article counts, as recorded in respondents' CVs

⁶ In the case of Sean and Cecilia, the MSc was converted to a PhD

<i>Gender</i>	<i>Pseudonym</i>	<i>No. of AEs⁷</i>	<i>No. of ACs⁸</i>	<i>Average PE⁹</i>	<i>Average PEs p/y</i>	<i>Average PEs per active year</i>	<i>Average no. of authors</i>	<i>Max no. of co-authors</i>	<i>% of ACs solo authored</i>	<i>% of ACs in ISI / IBBS listed journals</i>
<i>Men</i>	Sean	58.37	131	3.7	32.2	34	2.7	9	8.4	100
	Martin	87.34	280	2.1	29.2	29.2	3.4	7	2.9	100
	Charles	65.25	71	11.2	66.3	70.9	1.2	3	78.3	99
	Ted	59.84	197	2.6	31	31	3.7	9	15.8	94
	Leon	53.00	58	14.9	42.5	53.6	1.2	3	82	12
	Jacob	57.50	76	4.9	19.5	21.8	1.4	1	58.1	7
	Bob	65.50	77	4.1	20.7	25	1.4	5	64.4	73
	Jacques	140.30	344	2.3	43.9	43.9	2.5	9	6.2	100
	Averages	73	154	5.7	36	39	2.2	6	40	73
<i>Women</i>	Thandi	39.09	78	3.1	12.2	16.8	2.5	6	12.6	99
	Linda	29.00	29	15.2	18	34.7	1	0	100	0
	Elmarie	25.22	83	1.8	11.4	11.9	4.5	11	8.4	63
	Adele	20.06	69	2.2	7.5	8.2	4	8	0.7	98
	Delia	9.30	31	3.1	6.8	7.6	3.6	5	0	100
	Beatrice	27.80	111	1.8	14	14.8	4.3	7	0.7	100
	Cecilia	10.40	17	7.0	9.2	13	2.1	6	31.1	65
	Sarah	36.88	80	4.3	19.9	22.8	2.7	6	21.6	100
	Averages	25	62	4.8	12	16	3.1	6	22	78

⁷ As recorded early 2005 in SA Knowledgebase

⁸ According to the respondents' CVs

⁹ The average length (in page numbers) of an article, weighted by number of authors, published by the respondent over his/her career

Gender	Pseudonym	Publications other than accredited journal articles			Gatekeeper roles		Postgraduate supervision ¹⁰	
		No. of mono-graphs / edited volumes ¹¹	No. of contributions to edited vol's ¹²	No. of non-refereed pubs ¹³	No. of editorships ¹⁴	No. of editorial board / committee memberships ¹⁵	No. of PhD students	No. of M students
Men	Sean	1	11	13	1	5	17	22
	Martin	5	54	17	0	5	55	48
	Charles	9	91	27	15	8	7	41
	Ted	11	50	0	1	13	22	13
	Leon	17	38	200	2	3	13	2
	Jacob	9	18	0	3	3	3	2
	Bob	0	18	57	1	1	4	8
	Jacques	0	30	0	5	10	79	72
	Averages	7	39	39	4	6	25	26
Women	Thandi	1	3	0	0	0	18	8
	Linda	2	18	136	4	1	9	20
	Elmarie	4	20	14	3	3	29	23
	Adele	0	6	0	0	0	15	12
	Delia	0	34	0	0	0	28	31
	Beatrice	0	9	0	2	0	36	31
	Cecilia	3	25	10	11	7	11	15
	Sarah	2	9	67	2	2	7	30
	Averages	2	16	28	3	2	19	21

¹⁰ Past and current; main and co-supervision

¹¹ Solo or co-authored, and including textbooks

¹² Including conference, symposium and workshop proceedings

¹³ Primarily popular articles, but also includes discussion papers and policy documents

¹⁴ Including co-, assistant, associate, guest, consultant, and advisor editorships

¹⁵ Including editorial review boards

APPENDIX E

Follow-up letter

1 English version

Dear Professor _____

Almost a year has passed since I conducted a telephonic interview with you on gender issues relating to academic publication productivity, in order to collect data for my doctoral research on the topic. The data have been analysed at last, and the first draft of the data analysis and interpretation has been favourably received by both my supervisors. My apologies for not getting back to you sooner - the interviews produced much more qualitative data than what was originally anticipated, and its analysis and interpretation has produced not one, but two chapters, totaling almost 150 pages of text. Instead of sending you this mass of information, I thought it would be more considerate to in future send you copies of journal articles in which I will be reporting my findings.

The high quantity - and quality - of the data can be directly attributed to the fact that you and the other fifteen respondents were willing to take the time to share so many of your personal experiences and views with me. Thank you again for contributing to the development of a better understanding of academic publication issues in South Africa.

Before I finalise the data analysis, I need to conduct what is known in qualitative research methodology as "member checks", i.e. going back to the respondents to check the raw data. I have therefore attached the verbatim transcription of our interview, and would appreciate it if you could scan it to confirm whether the transcription actually reflects what you said during the interview. The transcription has been organised according to various themes, but as the interviews were allowed to "flow", the data do not always perfectly fit the themes, and some overlap or repetition is inevitable.

Finally, to honour my promise of complete confidentiality in the reporting of the data, I would like to assure you that I refer to respondents only by means of pseudonyms. I have also removed any information from the transcription that might allow a reader to identify you. In some cases, specific information (e.g. place of employment, research field) was replaced by more general descriptions. These were placed within block parentheses [], as were my own words that (only in exceptional cases) I inserted for greater ease of reading, elucidation, etc. If you disagree with any of these insertions, or find any information in the transcription that you think might still reveal your identity, please let me know.

My request is not an urgent one, and if you have no problems with the transcription, you need not reply to this e-mail. However, if you want me to make any changes to the data before a final version of the analysis is sent to my supervisors and external examiner, I would appreciate your response before the end of March.

Kind regards

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2 Afrikaans version

Beste Professor _____

Dit is reeds bykans 'n jaar gelede dat ek 'n telefoniese onderhoud met jou gevoer het oor gender-kwessies met betrekking tot akademiese publikasieproduktiwiteit, met die doel om data in te samel vir my doktorsale navorsing oor die onderwerp. Die data is uiteindelik ontleed, en my promotors is beide gelukkig met die eerste "draft" van die data-ontleding en -interpretasie. Ek vra om verskoning dat ek nie reeds vroeër terugvoer gegee het nie - die onderhoude het baie meer kwalitatiewe data geproduseer, as wat aanvanklik verwag is, en die ontleding en interpretasie daarvan het nie net een, maar twee hoofstukke voortgebring - 'n totaal van amper 150 bladsye teks. In plaas daarvan om hierdie massas inligting vir jou te stuur, het ek gedink dit sou meer bedagsaam wees om vir jou later kopieë te stuur van vaktyskrifartikels waarin ek verslag sal lewer van my bevindinge.

Die hoë kwantiteit - en kwaliteit - van die data kan direk toegeskryf word aan die feit dat jy en die ander vyftien respondente gewillig was om die tyd te neem om soveel van julle persoonlike ervarings en sienings met my te deel. Weereens baie dankie vir die bydrae wat jy gelewer het om ons begrip van akademiese publikasiekwessies in Suid-Afrika uit te brei.

Voordat ek die data-ontleding finaliseer, moet ek onderneem wat bekend staan in kwalitatiewe navorsingsmetodologie as "member checks", d.w.s. ek moet teruggaan na die respondente om die rou data na te gaan. Ek het daarom die verbatim transkripsie van ons onderhoud aangeheg, en sal dit waardeer as jy dit onder oë kan neem, om te bevestig dat die transkripsie werklik dit wat jy gedurende die onderhoud gesê het, weerspieël. Die transkripsie is georganiseer volgens verskeie temas, maar aangesien die onderhoude toegelaat is om te "vloei", pas die data nie altyd perfek by die temas in nie, en 'n mate van oorvleueling en herhaling is onvermydelik.

Ten slotte, om my belofte van volledige vertroulikheid in die rapportering van die data na te kom, wil ek jou graag verseker dat ek na respondente verwys slegs deur middel van skuilname. Ek het ook enige inligting uit die transkripsie verwyder, wat 'n leser in staat sou kon stel om jou te identifiseer. In sommige gevalle is spesifieke inligting (bv. werkplek, navorsingsveld) vervang met meer algemene beskrywings. Dié is in blokhakies [] geplaas, asook my eie woorde wat ek (slegs in uitsonderlike gevalle) ingevoeg het vir beter leesbaarheid, toeligting, ens. As jy met enige van hierdie insetsels verskil, of enige inligting in die transkripsie vind wat jy dink nogsteeds jou identiteit sal onthul, laat my asseblief weet.

My versoek is nie 'n dringende een nie, en as jy geen probleme het met die transkripsie nie, hoef jy nie op hierdie e-pos te reageer nie. As jy egter wil hê dat ek enige veranderinge aan die data moet aanbring voordat 'n finale weergawe van die ontleding aan my promotors en eksterne eksamineerder gestuur word, sal ek dit waardeer indien jou respons my teen die einde van Maart kan bereik.

Vriendelike groete

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