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**How much do children really cost? Maternity benefits and  
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Mariaelisa Epifanio and Vera E. Troeger

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# **How much do children really cost? Maternity benefits and career opportunities of women in academia**

**Mariaelisa Epifanio and Vera E. Troeger**

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## **Abstract**

Motherhood and professional achievements appear as conflicting goals even for academic women. This project explores this tension by focusing on a set of provisions on parental and maternity leaves across 165 higher education institutions in the UK. Generous maternity provisions generate countervailing incentives for female academics. On the one hand, advantageous policies can foster women's productivity in terms of research outcomes allowing them to take time out of work without income and career break concerns. On the other hand, women can exploit generous provisions without generating returnable results for the academic institution. We argue that adverse selection problems lead universities to differentiate among academic staff by offering two different types of maternity provisions (more vs less generous maternity leaves) in order to "test" women's commitment and research ability before offering permanent contracts. Our results support this this line of argumentation. We also find that generous maternity leaves and childcare provisions positively affect the number of women at research and professorship levels.

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## **Introduction**

“May” children, holiday babies and post-tenure pregnancies: these are some of the labels attached to women’s choices of having children in an academic environment (Armenti 2003, Keher 1995). Academic women seem to share a common burden in scheduling their maternity plans: to survive in academia and advance through the faculty ranks, women tend either to give birth during vacation time or to postpone their motherhood status to the end of their probation period and the achievement of tenure (Wolfinger et al. 2008, McDowell et al. 1999, 1992). The end result is, generally, an underrepresentation of women in academic positions (Ginther and Kahn 2004, Hawkins 1994, Finch 2003, Steinpreis et a. 1999), lower salaries (Ward 2001, Bellas 1994), lower research outcomes and promotions (Euwals and Ward 2005, McDowell et al. 1999), lower fertility (Wolfinger et al. 2008), and higher rates of family dissolution (Probert 2005) – while family and children seem to have either no impact or even a positive effect on the patterns of men performances in academic ranks (Stack et al. 2004, van Anders 2004).

The vast majority of studies on gender and academic achievements point to lower women’s mobility (due to family responsibilities), child rearing burdens and women’s preferences for academic disciplines (such humanities) that have low publication records as possible explanations of gender differences in higher education systems (*inter alia* Ginther et al. 2003, 2004; Mason et al. 2002, 2004; Hamermesh 1988). Other studies (Euwals and Ward 2005) link the gender gap in academia to women’s “congenital” attitudes such as their propensity to choose teaching rather than research institutions.

Despite the huge insights advanced by these contributions, research on this field is usually confined within a few universities or is specifically concerned with the career path of women in specific disciplines such as economics and social sciences. In addition, a systematic analysis of family (un)friendly policies implemented across and within departments is missing in the literature.

In this project, we seek to fill this gap both theoretically and methodologically. We analyze 165 higher education institutions in the UK and their provisions on a number of leave arrangements.<sup>1</sup> We will examine the effect of such provisions on general hiring and firing policies across universities, arguing that the generosity of parental leave regulations affect both the decision of women to apply at certain institutions as well as hiring committees' decisions to offer relatively more fixed term contracts to female academics. Another aspect of this project is to assess the impact of maternity leave provisions on the job performance, especially research activity of women in academia. Furthermore we analyze the effect of parental leave regulations on career achievements of women, e.g. research vs. teaching positions, tenure, promotions and salaries. Finally, this project sheds light on the question how maternity and childcare facilities affects personal choices of female academics with respect to family planning, career decisions, personal wellbeing and job satisfaction. For this endeavor we will gather data through a representative survey of British academics.

This paper introduces the first of a series of manuscripts that attempt addressing the above questions. We discuss the state of the art of the relevant scholarly works and

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<sup>1</sup> So far, we have complete information on salary replacement for maternity leave, the amount of time mothers/fathers take off from work, the existence/absence of equal provisions for mothers and fathers (maternity leave vs. parental leave policies), childcare facilities and adoption leave across 118 (out of 165) UK universities.

present the data on maternity provisions across British HEIs. In addition, we offer a preliminary empirical evaluation of the impact of maternity provisions on promotions and hiring trends across UK universities.

### **Women in Academia: A Literature Review**

Despite the large supply of case studies and quantitative research on the determinants of women underachievement in academic fields, little research has been conducted on the effect of maternity leave provisions on academic performances. For example, a case study on pregnancy and parental leave arrangements in Canadian universities concludes that the major obstacle for women's academic career is the lack of consistency in maternity provisions over time, across departments and both between and for individuals (Weststar 2012) but the generalizability of this result is already dubious for the Canadian system (the author focuses on mid-sized universities only) and this research does not provide a theoretical framework for investigating, in an integrated fashion, maternity leave benefits in higher education systems. If we exclude (as we do) discursive analysis linking gender disparities in academia to "masculine appropriation of a universal ethics for academia" (Knights and Richards 2003:230) and malestream dominance in the social construction of gender roles in higher education systems (Knights 1997),<sup>2</sup> the contributions advanced by the literature on gender and academic disparities can be largely distinguished into three main strands of research. First, women tend to choose academic fields characterized by lower levels of publication records (such as history,

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<sup>2</sup> We do not deny that gender disparities are also a product of cultural and social perceptions of gender roles. However, our purpose here is to disentangle the possible barriers to gender equality through an empirical investigation of observable policies rather than engaging in a discursive assessment of socially constructed gender stereotypes.

linguistic, literature, for example) and the quality of their academic outcomes is less likely to enter in standard methods of research assessment (such as the Research Excellence Framework in the UK system).<sup>3</sup> In this respect, Ginther and Hayes (1999, 2003) notice that, compared to natural and social sciences, gender disparities in humanities are more likely to result from mechanisms of promotion rather than salary inequalities not only because there are more women in humanities but also because academics in this field are paid less than in other sciences and it is less costly for academic institutions to fill the gender pay gap (Ginther and Kahn 2004, Kahn 1993). Still, significant differences can be observed even in these disciplines<sup>4</sup> and a second research strand relates gender inequalities to lower levels of mobility among academic women – the so-called “loyal servant” hypothesis (Booth et al. 2000, Blackab 2005). The argument works as a self-fulfilling prophecy and goes like this: salary increases and academic promotions are partly dependent on outside offers. Women are less mobile than their male colleagues for personal and family constraints and they are perceived as such by heads of departments or faculty members in charge of career promotions. As a consequence, women are not only less likely to receive outside offers but they are also less likely to receive promotions from inside their departments (given the assumption that they are reluctant to move). This will therefore affect their negotiation power and in turn their salary and promotion paths (Blackab et al. 2005). Several reasons are usually

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<sup>3</sup> Yet, as Booth, Burton and Mumford (2000: 323) notice, REF methods should reduce eventual prejudices against women by making discrimination uneconomic for academic departments. Probably, the incidence of REF systems is more likely to hold for salary and pay scales for women rather than their levels of representation across faculties.

<sup>4</sup> See for example, Maliniak et al. (2013) who find that in the field of international relations women are systematically cited less than men after controlling for a large number of variables (publications, affiliations, tenure status and so on). Along similar lines, McDowell and Smith (1992) show a gender sorting effect on co-authorship, which contributes to lower article production for women.

advanced to explain the mobility differential between men and women: women are more risk adverse (Jianakoplos and Bernasek. 1998), they “don’t ask” for career advancements even when they are in a position of strength (Babcock and Laschever 2003, Solnick 2001)<sup>5</sup> and they are less likely to gain access to academic networks dominated by “old boys” (Blackaby et al. 2005: 97). Also, women are supposedly more likely (for “intrinsic” pastoral and caring attitudes) to invest on teaching rather than research activities and this affects not only their market value for research lead universities but also their patterns of promotions within their departmental environment (Monroe et al. 2008, Wyn et al. 2000, Park 1996, Singell 1996). More plausibly, the lower propensity to move depends on child bearing and family related tasks, which is what a third stream of research, contends (Gregg and Waldfogel 2005, Probert 2005, Deem 2003, Bailyn 2003, Burgess et al. 2002, Thornton 2003, Waldfogel 1998, Lyness et al. 1999). In a series of works, Mason and co-authors (2002, 2003, 2004) argue that children and maternity breaks and the lack of family friendly policies negatively affect the career path of women in academia. Compared to their male colleagues (who are more likely to benefit from family formation and fatherhood) women pay a huge prize for having children in academia in the form of lower promotion rates, higher exit patterns and personal vicissitudes (family dissolution and divorce). There is some evidence for these trends: in 1998, for the UK economics departments alone, female representation was 4% of professors, 11% of senior lecturers or readers, 17% of permanent lecturers, 28% of fixed term lecturers, and 33% of PhD/research students (Booth et al. 2000). Also, about 73% of

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<sup>5</sup> Notice that Mitchell and Hesli (2013) find that women bargain more frequently than men for a wide variety of resources. However, this research is confined to a 2009 APSA survey of political science faculty members and it does give information on the whether women have higher or lower success rates than men when bargaining.



female academics (at permanent lecturer levels) were likely to leave their department (while male exits amounted to 55%, *ibid*). Even in the USA, where affirmative actions are more pronounced, exit rates have comparable figures for lower-rank faculty women who also have a 144% greater probability of being divorced than ladder-rank men (Mason and Goulden 2004: 93, Perna 2005).<sup>6</sup> More generally, these trends suggest that the probability of exit from academia is higher for women at the early stage of their career (which usually coincides with their fertility age) while the lack of family oriented policies disproportionally disadvantage women's professional and personal conditions. Despite the cautious optimism of some scholars on future improvements of career paths for women (McDowell et al. 1999), all studies advance policy recommendations on more beneficial maternity leaves provisions and childcare facilities as necessary actions for reducing gender disparities in the academic environment. Yet, to date, we do not know whether the status of women academics has improved over the last years neither we have updated information on maternity and parental provisions for faculty members in the UK system. This is exactly where our research fits in. The next section will sketch possible lines of argumentation that link maternity leave provisions and benefits at HEIs to career choices and paths of women in academia.

### **Linking Maternity Leave Provisions to Career Paths**

A possible explanation for the paucity of women in academia can be related to the higher economic burdens that female academics impose on faculties. In these terms, the better women are 'treated' (i.e the higher the levels of maternity leave benefits), the more costly

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<sup>6</sup> This study uses data from the Survey of Doctorate Recipients as well as data from a 2002 to 2003 survey of the work and family issues facing ladder-rank faculty in the nine campuses of the University of California system.

they will be for academic departments and the lower the average pay that female academics will get for their work (since they get other endowments). As a consequence, if the relative costs of women increase, the supply would increase as well and the demand will decline. However, this could also work in the opposite direction: rewarding maternity provisions could positively affect women's productivity levels and their willingness to stay in academia. If women are entitled to take time off from working (without having to think about income), they are more likely to concentrate on their academic research, which in turn, might also reduce their chances of having a career break – while the tensions between family and work become more pronounced if maternity benefits are either underprovided or totally absent. Common clichés attribute to women multitasking skills but returning to work immediately after childbirths, carrying out teaching, research and admin tasks (while managing the new born), prove difficult even for the most talented woman and rarely leave time for the academic core activities of research and publishing. A fortiori, if maternity leaves are only nominally provided and women are coerced to choose between childrearing and profession, they might be more likely to quit academia or full time research positions thus jeopardizing their promotion to higher academic ranks in the best case scenario or abandoning their academic ambitions, in the worse case.

To sum up, the status of academic women is apparently affected by a set of statutory and discretionary policies that turn motherhood and professional achievements into conflicting objectives even in academic environments. The factual incidence of maternity provisions on women's career paths is still a contested issue and more research is needed to disentangle the likely determinants of the 'pipeline leak' across and within universities.

Our analysis contributes to this field of research by examining the actual policies on maternity leaves (and, more generally, family friendly benefits) implemented across English, Welsh, Scottish and Northern Ireland higher education institutions.

The following section connects these more general theoretical observations to variance in maternity benefits across UK universities and derives more specific possible causal mechanisms.

### *Maternity Policies at UK Universities*

In the UK, women employees are entitled to Statutory Maternity Pay (SMP) if they have worked for the same employer continuously for at least 26 weeks up to the 15th week before the expected week of childbirth and they earn on average at least £109 a week.

The women that qualify for the SMP are paid the 90% of the average weekly earnings (before tax) for the first 6 weeks and the lower of £136.78 or 90% of the average weekly earnings for the next 33 weeks (7 April 2013).

Most of the Universities provide an extra Occupational Maternity Pay (OMP) that tops up the SMP in the first 39 weeks of maternity leave. The eligibility criterion to access the OMP usually depends on the length of service and both the payments and the eligibility criteria may vary among the institutions. For example, the University of Liverpool's OMP, regardless of the length of service, pays full salary for the first 8 weeks, half salary plus the SMP rate for the next 16 weeks and only the SMP for the last 15 weeks of maternity ordinary leave. The London School of Economics and Political Science instead pays full salary replacement for the first 18 weeks and the SMP at the lowest rate for the last 21 weeks, if the woman has been employed for at least 26 continuous weeks before the expected date of childbirth. Others universities may offer different OMP payments

schemes that either may depend on the length of service of the employee (in such case the employee cannot choose the contract she prefers), or may not depend on eligibility criteria and the employee is free to choose between different salary schemes. For instance, at the University of Durham women can choose, if they satisfy the unique eligibility criterion, the salary scheme they prefer during the ordinary maternity leave period. There are two different contracts, the woman can choose either a contract granting full salary for the first 8 weeks, half pay (plus SMP) for the next 16 weeks and only the SMP rate for the last 15 weeks, or another type of leave scheme that pays full salary for the first 16 weeks and the SMP rate for the last 23 weeks.<sup>7</sup>

In general, there is considerable variation across UK HEIs. From 124 HEIs across England, Wales, Scotland and Northern Ireland for which data was available, 25 (ca. 20 %) offered different maternity packages that either required specific eligibility criteria or could be chosen among freely by mothers to be.

These examples allow differentiating between two types of maternity leave arrangements across UK universities. In the next section, we discuss the possible rationale behind the provision of these two typologies of contract. We will argue that the choice between the provided maternity schemes can be linked to adverse selection problems faced by academic institutions.

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<sup>7</sup> Along similar lines, at the Arts University College at Bournemouth women have the right to receive full salary for the first 6 weeks plus, depending on the length of services, they can be entitled either to other 12 weeks of half salary (plus SMP) and the last 21 weeks of only SMP if they have been working for at least 52 continuous weeks at the university, or to 33 weeks of SMP if they have been working for at least 26 weeks.

### *Adverse Selection in Universities' Maternity Benefits*

Universities seem to face adverse selection problems in granting maternity contracts. Extensive and favorable maternity coverage impose a cost on universities and hiring/promotion committees cannot know in advance whether the recipients are returnable for the department. It may be that generous provisions incentivize women to be more productive during their leave period thus reducing the probability of taking further time out of work (for example, sick leaves) and enhancing the returns (in terms of research assessment) for the academic institutions. In these cases, it would be more profitable for the university to invest on maternity benefits and retain their women employees. It may also be that favorable maternity remunerations dis-incentivize women's research investments (given that they can consider these benefits as granted) thus imposing an economic cost on departments, which is not counterbalanced by research outcomes. In these cases, universities would be better off in offering lower maternity schemes (or even definitely replace women while on leave and divert their previous academic activities to teaching and admin tasks once they are back from maternity).

Adverse selection problems are minimized if academic institutions are able to distinguish among maternity recipients by identifying "low" and "high" academic profiles. For example, given the high returns of high REF scores (in terms of funds allocation), universities can be incentivized to invest in research staff rather than teaching and admin personnel and they can thus offer different maternity allowances to researchers and teachers.

If we assume that 1) all higher education institutions are identical 2) all maternity recipients are also identical and 3) the proportion of “high” and “low” academic profiles is the same for each institution, all universities can either stipulate uniform contracts to all recipients (*pooling* contracts) or offer different typologies of maternity schemes and each recipient would choose the most suitable one (*separating* contracts).

Of course, the type of maternity provisions offered by universities will depend on specific characteristics of the institutions (for example, budget constraints, research/teaching priorities, proportion of high vs. low types of recipients, etc.) but while pooling contracts are always feasible options, separating contracts are not. If all universities were indeed identical, they would all offer the same type of contracts and the same maternity benefits. Given that academic institutions are not identical and the cost of maternity schemes is different across universities and within departments, we would expect to see different typologies of contracts among universities. More specifically, we would see similar separating contracts across similar academic institutions and dissimilar pooling contracts across different universities. In this latter case, universities with a higher proportion of “high” profile members may prefer pooling contracts granting maternity benefits (in terms of pay and leave) above the average (which, for the UK case is about 10 weeks) to reduce the women’s incentive to take further time out of work after the maternity deadline while institutions with higher levels of “low” profile staff would find more convenient to grant longer maternity leaves at lower pay rates (or probably hire new members to replace the academics on leave).

According to this line of argumentation, we would stipulate that *ceteris paribus*, and regardless of the rationale universities establish separating contracts (e.g. budget

constraints), these differential maternity leave provision give female academics a choice. Thus female members of staff who are inclined to doing research can take time off without reduction in income and do not have to top up with admin or teaching for a period long enough that allows not necessarily taking a career break.

#### *Generosity of maternity benefits and career paths*

Arguably the best indicator for the generosity of maternity benefits is the number of weeks full salary replacement is paid. On the one hand, if women can take more time out of work – without income cuts – they are certainly advantaged in terms of adapting to their motherhood status without being pressured by income concerns or the need to multitask administration, teaching and research tasks. This increases the probability that women return to their research position without having to take a career break and with possibly minor effects on research and publication activity. On the other hand, salary replacement represents the most costly part of maternity packages for universities.

Indeed looking at generosity of maternity pay across British HEIs reveals a large variance across universities which cannot only be explained by different financial constraints faced by the HEI. For example, the number of weeks for which full salary replacement is granted varies from 0 (e.g. Leeds Metropolitan University) to 26 weeks in HEIs such as Oxford, Manchester, Birkbeck College and the Royal College of Arts. The variance is large and clearly cannot just be attributed to financial status of the HEI or its research intensity. Places as diverse as Warwick, Essex, Bristol, Exeter, Kent, Bath, Leeds, Birmingham City, Bangor, Heriot-Watt, Strathclyde Universities or Goldsmith College only grant 8 weeks of fully paid maternity leave. While HEIs such as Keele University,

Heythrop College or Cambridge University pay mothers 18 weeks of full salary replacements. Table 1 gives a summary.

Table1: number of weeks of full salary replacement across British HEIs

weeks of full salary replacement	no. packages	Percent
0	7	4.64
4	29	19.21
6	17	11.26
8	32	21.19
9	4	2.65
12	3	1.99
13	7	4.64
14	2	1.32
16	13	8.61
17	1	0.66
18	29	19.21
19	1	0.66
20	1	0.66
26	5	3.31
Total	151	100

It seems obvious that these different provisions should affect career paths of young female academics differently. We argue that better maternity leave provisions, especially in form of salary replacement during the maternity leave, allows female academics to return to full time research and teaching positions earlier with a lower probability of taking a career break, moving into primarily teaching and/or administrative positions or leaving academia for good. This should partially explain the “leaking pipe” phenomenon that can be observed especially in research intense disciplines.

Undoubtedly, generous maternity pay is expensive for universities, yet, once a policy is implemented it is not easy to change. As consequence and despite equal opportunity regulations and efforts made by universities to increase the share of female academics,



expensive maternity packages generate countervailing incentives. This might be less pronounced in public institutions such as universities than small companies, for example where maternity leave of employees has direct consequences for the employer and functioning of the company. Still, these incentives exist and we expect them to have detectable effects on the contracts offered to female academics. Fixed term contracts, for example, can be used to a) test the women's suitability for a research position, b) make it more likely that women drop out of academia when they have to care for children, and c) also lowers the probability that a woman on a fixed term contract becomes eligible for the full maternity leave benefits. We thus expect that HEIs with more generous maternity packages are relatively more likely to offer limited, non-permanent or fixed term contracts to female academics.

One of the more debated issues, in the political as well as the academic arena, is the effect of childcare provisions on female productivity and career trajectories. It seems intuitive that easy access to childcare options close to one's workplace generates efficiency gains and thus opens up time for research activities beyond teaching and administrative tasks.

However, there is much variation across UK HEIs that cannot be explained by mere size of the institutions, research intensity or financial resources. From 131 UK HEIs about 56% offer childcare at the nursery and kindergarden level while 44% don't provide childcare facilities. To some extent childcare provisions should make a difference at the margin for career decisions and ability to perform of female academics.

The next section offers some very preliminary estimation results attempting a first cut at testing the above sketched lines of argument. We also point out the many caveats of this

preliminary empirical analysis and how we plan to solve the obvious endogeneity and identification issues.

### **Data and Preliminary Empirical Analysis**

The UK Higher education sector provides a useful start to empirically investigate the link between maternity provisions, productivity, career paths and hiring practices. Firstly, unlike in other countries (such as Germany, Norway, Sweden or Denmark), maternity policies vary greatly across UK HEIs because the statutory regulations a benchmark (minimum) standard of maternity benefits and universities usually top up these basic provisions to different degrees. In comparison, the German maternity benefits represent an upper ceiling, which companies and even public institutions cannot reduce because it would violate legal standards. Secondly, the university sector allows gathering very good data on hiring, promotion and career paths. In addition it is rather easy to define research productivity and performance by looking at number and quality of publications as well as number of citations – while it is rather difficult to get such clear cut individual level data in other sectors (either corporate or public or non-governmental).

We therefore focus on the UK HE sector despite the drawbacks that this selection choice might have for generalizability and external validity of our results.

To date, the UK HE sector counts 165 HEIs, 4 of these in Northern Ireland, 11 in Wales and 19 in Scotland. We collected data on parental leave regulations and childcare provisions for 131 institutions of which we could match 122 to data on composition of academic staff from the Higher Education Statistical Agency (HESA). For the time being, we only gathered current information on maternity provisions which is to date and thus

cross-sectional. These regulations were implemented at different points in time between 2002 and 2013 across UK HEIs.<sup>8</sup> We collected information for more than 50 different variables on maternity benefits, such as eligibility, length of leave, salary replacement, existence, eligibility and characteristics of different maternity packages, as well as additional paternity and parental leave provisions, childcare provisions and financial support for childcare.

For this preliminary analysis we use information on the number of weeks for which full salary replacement is granted. This variable is described above and highly correlates with other indicators for the generosity of maternity benefits, e.g. the overall length of salary replacement beyond SMP. In addition, and as argued above, we analyze the effect of different universities packages offered by different universities and their different eligibility criteria. Finally, we examine whether childcare directly provided by HEIs affects overall composition of staff.

The following analysis is, of course, a preliminary attempt to empirically investigate the effect of maternity leaves provisions on women's performances in academia. So far, to test the effects of maternity and childcare provisions, we can only use aggregate data on academic staff composition on the left-hand-side of our models. HESA provides yearly data for UK HEIs on the composition of academic (and other) staff. We use the most recent wave here. Our first dependent variable is a count variable of the number of female professors (given that professorship remains one of the most obvious promotion hurdles and career path indicators), we add the total number of staff to the right-hand-side of our

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<sup>8</sup> We are aware that not having information over time poses serious identification problems. We are currently collecting data on maternity provisions that were in place before the last round of revisions was implemented. Once we have the data, we can implement a difference-in-difference design because the implementation of better maternity provisions can be used as a discontinuity because it represents a natural experiment.

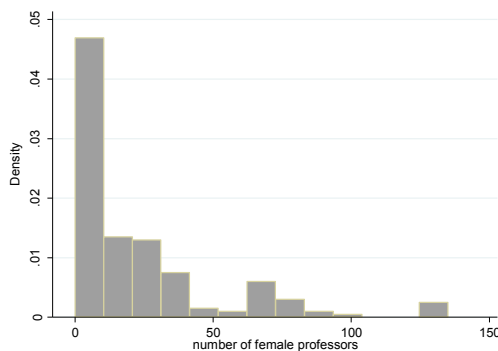
models to correct for the obvious size effects. The “leaking pipe” argument most obviously refers to the reduction in the female academics climbing up the academic career ladder. Full professors are at the top of this ladder and we should expect the strongest effect here.

As argued above the generosity of maternity benefits might implicitly affect the kind of contracts that is offered to female academics, we thus analyze the number of fixed-term female staff as compared to total staff. Finally, we also look at the share of female research staff (since we argued that woman take career breaks or move away from research into administration or teaching position).

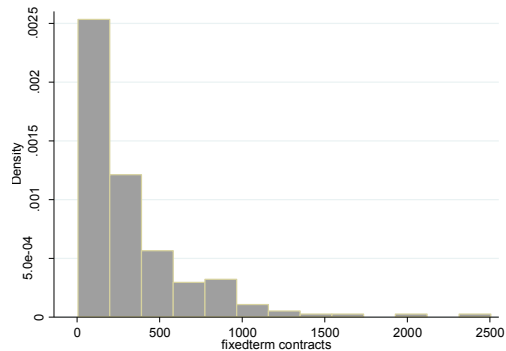
Since all three variables are count variables that display over-dispersion (as figures 1a-c show), we employ poisson and negative binomial estimations which we compare to linear OLS results.

Figure 1a-c: Histogram for number of female professors, female academics with fixed term contracts and women in research positions.

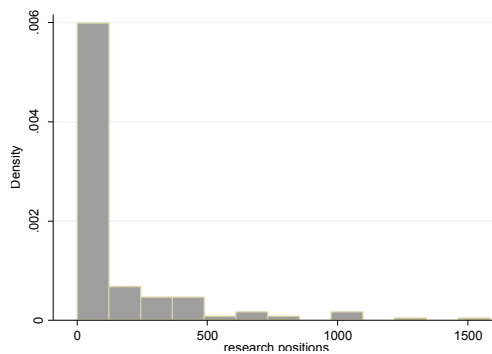
1a: number of female professors



1b: fixed term contracts



### 1c: women in research positions



### *Empirical Results*

We estimate three sets of models where we regress a) the number of female professors, b) the number of women in research positions, and c) the number of female academics with fixed term contracts on the number of weeks with full salary replacement, university provided childcare, different maternity packages, the total number of staff as well as dummies for Northern Ireland, Wales and Scotland to control for possible regional heterogeneity. All models include robust white standard errors to allow for arbitrary heteroskedasticity. Tables 2-4 depict the estimation results for the three operationalizations of the dependent variable separately.

We will discuss the caveats of the empirical analysis and future plans to solve these problems below in more detail. Yet, it seems clear that the presented results possibly suffer from endogeneity, reversed causality and identifications issues. Bearing this in mind we interpret the empirical results cautiously and see them as very preliminary evidence for the outlined arguments.

Table 2: Empirical results for the share of female professors

dependent variable:	OLS	Poisson	NegBin
no. of female professors nursery in institution?	2.492 (2.356)	0.310* (0.159)	0.368** (0.157)
no. of weeks with full salary replacement	0.732*** (0.234)	0.033*** (0.011)	0.032*** (0.012)
different packages?	7.118* (4.048)	0.326** (0.156)	0.300* (0.164)
total no. of staff	0.018*** (0.003)	0.000*** (0.000)	0.000*** (0.000)
northern ireland	1.613 (4.408)	0.002 (0.249)	-0.063 (0.370)
wales	-2.714 (2.28)	-0.21 (0.241)	-0.192 (0.267)
scotland	-1.901 (4.214)	-0.025 (0.187)	0.049 (0.178)
Intercept	-8.366** (3.664)	1.892*** (0.161)	1.935*** (0.188)
R <sup>2</sup> (adjusted – OLS, pseudo – Pois/NB)	0.7	0.525	0.099
Chi <sup>2</sup> (Pois./NB) F-statistic (OLS)	16.709	157.89	105.122
Chi <sup>2</sup> (alpha≠0 – overdispersion)			691.863
N	122	122	122

Robust White SEs in Parentheses, \*p<0.1, \*\*p<0.05, \*\*\*p<0.01

The findings in table 2 indicate that independent of the size of an institution (total number of staff) more generous maternity benefits, e.g. more week of fully paid maternity leave, are associated with a higher number of female professors which, apparently reduce the leakage and allow female academics to stay in the profession and climb up the promotion ladder. This notion is re-enforced by the positive impact of childcare provided by the university. It also seems plausible that allowing female academics to choose between shorter but fully paid provisions and longer but less well paid maternity leaves facilitate their early return to fulltime research position without taking a career break or dropping out of academia.

More substantively, if a university that provides for childcare facilities and offers different maternity packages changes its maternity pay from zero (the minimum) to 26 weeks (the maximum in our sample) the predicted number of female professors would more than double from 21 to 47. Similarly, a university that grants 8 weeks of full maternity pay without childcare provisions could induce a 50% increase in female professors (from 18 to 27) by building a nursery on campus.

Again these findings have to be taken with a grain of salt: it could well be that institutions with a larger body of female professors are forced to implement better maternity provisions due to lobby work and pressure exerted by less dependent female professors. We turn to these endogeneity issues in more detail below.

The finding in table 3 support the cautious interpretation of results in table 2: the generosity of the maternity pay positively affects the number of women in research positions supporting the notion that allowing women to take time off without worrying about income does have positive effects for their ability to engage in academic research.

Childcare provision by the university only turns out to have a significant impact in the negative binomial specification –which, given the distribution of the dependent variable, is, however, the most appropriate specification.

Table 3: Empirical results for the share of women in research positions

dependent variable:	OLS	Poisson	NegBin
No. of women in research positions			
nursery in institution?	-20.983 (23.06)	0.302 (0.275)	0.444** (0.213)
no. of weeks with full salary replacement	5.022*** (1.884)	0.040*** (0.013)	0.051*** (0.012)
different packages?	15.002 (31.048)	0.328* (0.191)	0.295 (0.189)
total no. of staff	0.207*** (0.024)	0.001*** (0.000)	0.001*** (0.000)
northern Ireland	-15.572 (76.769)	-0.101 (0.317)	-0.095 (0.334)
Wales	28.179 (23.631)	0.191 (0.197)	0.415** (0.189)
Scotland	7.262 (20.877)	0.205 (0.174)	0.389** (0.161)
Intercept	-165.848*** (28.579)	2.899*** (0.240)	2.668*** (0.219)
R <sup>2</sup> (adjusted – OLS, pseudo – Pois/NB)	0.79	0.765	0.106
Chi <sup>2</sup> (Pois./NB); F-statistic (OLS)	26.861	330.847	470.187
Chi <sup>2</sup> (alpha≠0 – overdispersion)			7035.077
N	122	122	122
Robust White SEs in Parentheses, *p<0.1, **p<0.05, ***p<0.01			

Finally, we examined the effect of maternity benefits and childcare provisions on the number of female academics on fixed term contracts. This operationalization of the dependent variable is a first attempt at capturing underlying incentives for hiring women in academia. The idea is that generous maternity packages are very costly and could incentivize universities to “test” women’s ability before offering permanent contracts. Results in table 4 offer some (cautious) support for this argument. Only the generosity of maternity pay exerts a significant effect on the number of fixed term contracts and it seems indeed to be the case that institutions with more generous pay packages also offer relatively more fixed term contracts to female academics.



Table 4: Empirical results for the share of female academics with fixed term contracts

dependent variable:	OLS	Poisson	NegBin
No. of female academics with fixed contracts			
nursery in institution?	-30.204 (34.369)	0.081 (0.128)	0.16 (0.129)
no. of weeks with full salary replacement	7.224** (3.107)	0.016* (0.009)	0.019** (0.008)
different packages?	-73.871 (65.392)	-0.069 (0.211)	-0.224 (0.242)
total no. of staff	0.306*** (0.054)	0.000*** (0.000)	0.000*** (0.000)
northern Ireland	-24.528 (39.369)	-0.047 (0.241)	-0.168 (0.398)
Wales	149.654*** (47.285)	0.402*** (0.139)	0.373** (0.165)
Scotland	-84.715 (60.339)	-0.214 (0.193)	-0.072 (0.19)
Intercept	-69.811 (48.489)	4.873*** (0.121)	4.914*** (0.135)
R <sup>2</sup> (adjusted – OLS, pseudo – Pois/NB)	0.696	0.638	0.059
Chi <sup>2</sup> (Pois./NB); F-statistic (OLS)	10.179	281.167	218.355
Chi <sup>2</sup> (alpha≠0 – overdispersion)			12708.15
N	122	122	122
Robust White SEs in Parentheses, *p<0.1, **p<0.05, ***p<0.01			

To sum up, even cautiously interpreted the preliminary empirical result appear to support the notion that maternity benefits and childcare provisions impact career paths of female academics as well as hiring decisions in HEIs.

As mentioned before, with a high probability, though, the empirical models suffer from endogeneity bias and identification issues. In a next step, we will collect data on maternity benefits in place before universities implemented the current maternity packages. Since time series data on composition of academic staff is available from the HESA we can exploit the change in maternity benefits in a difference-in-difference

approach. We also will treat the timing of the introduction of more generous maternity leave provisions across British HEIs as a quasi-natural experiment which will allow identifying the causal effect more cleanly.

The next steps of the project involve moving away from university specific aggregate data to individual data on career paths, productivity and performance as well as childrearing decisions and job satisfaction of female academics. We hope that richer information at the individual level will also solve possible problems of ecological fallacy and allow testing theoretical arguments more directly.

## **Conclusion**

Generous maternity schemes impose a cost on universities' budgetary allocation. The costly nature of maternity benefits induces academic institutions to differentiate between maternity recipients by offering two types of contracts: broadly speaking, women can choose between shorter but fully paid provisions and longer but less well paid maternity leaves. We have argued that the choice of either of the maternity arrangements signals the type of research commitment of academic women and (accordingly) affects their probability of getting fixed terms contracts rather than temporary positions. Our findings support these theoretical speculations. First, more generous maternity benefits are associated with a higher percentage of female professors (regardless of departmental sizes). Second, and accordingly, childcare provisions positively affect the number of women at professorship level. Finally, the generosity of maternity pay exerts a significant effect on the number of fixed term contracts suggesting that more generous pay packages also offer relatively more fixed term contracts to female academics. These are

preliminary findings and more research and data are required to solve probable endogeneity problems in the empirical analysis and to assess the impact of maternity provisions on career performances in the academic field – a task we will embark on in the next step of this research project.

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