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1 Introduction

Several studies exist of the academic publication patterns of economists. One set of such studies rank economics departments and faculty members according to their number of publications (see eg Conroy *et al* 1995, Dusansky and Vernon 1998, Harris 1990a, 1990b, Hartley and Robinson 1997, Sinha and Macri 2002). A second set of studies attempt to measure either the economic returns to publishing measured in terms of salary increments or the effect of academic publishing on job status (see eg Grimes and Register 1997, Sauer 1988). Other studies examine academic productivity within a lifecycle framework and/or the effect of individual characteristics on publication patterns. A few of the many factors that have been examined as possibly influencing publication rates include whether the individual attended a top-rated graduate school (Barbezat 1992) and field of dissertation (Fish and Gibbons, 1989).

This study contributes to this literature through examining the lifecycle productivity of a sample of full professors in Australian economics departments, based on a survey questionnaire, which was sent to all full professors in economics departments in May 2000. Apart from examining lifecycle productivity, the study also examines the effects of various individual characteristics on publication rates. These include

whether the professor obtained his/her Ph.D in Australia or overseas; whether the individual works for one of the top-rated economics departments in Australia and time allocated to administration, research and teaching. Foreshadowing the main findings of the paper, we find that research output of economics professors is characterized by the lifecycle model and that time allocated to administration, research and teaching affects research output. However, perhaps somewhat surprisingly, we find that professors who obtained their Ph.Ds from Australian universities have higher productivity than professors who obtained their Ph.D overseas. We also get mixed results on whether professors in departments in the top five have higher productivity than those who are not in top-five ranked economics departments. Generally, the differences between the top five and the rest are statistically insignificant, but these results depend, at least in part, on how the top five departments are defined.

The remainder of the paper is set out as follows. The next section provides a brief overview of the existing literature on the relationship between aging and productivity. Section 3 describes how the data were collected and provides some descriptive statistics for the sample. The effect of individual characteristics on research productivity are examined

within a lifecycle framework in section 4. The final section considers the study's limitations and offers suggestions for future research.

2 Previous Literature on Aging and Productivity

Lehman (1953) was the first to research the relationship between aging and productivity. Focusing primarily on mathematicians, Lehman (1953, pp. 3-21) argued that the productivity of scientists declines continuously after age 30. The view that productivity is inversely related to age was questioned in research published in the late 1970s and at the beginning of the 1980s (see Cole 1979, Stern 1978, Zuckerman 1977). Using both quality (citations received) and quantity (articles published) measures Cole (1979) argued that productivity is constant with respect to aging. Stern (1978) and Zuckerman (1977) reached a similar conclusion, focusing purely on a quantity measure of articles published. They found that the volume of publications is constant with respect to aging for various samples of academic scientists.

The main findings from these studies that productivity was constant with respect to aging sparked a substantial economics literature using a life cycle framework to investigate the relationship between aging and productivity. Since Cole's (1979) study, studies of the productivity of academics in a range of disciplines using a life cycle framework suggest

that an inverse relationship exists between productivity and aging. Levin and Stephan (1991) and Stephan and Levin (1992) analyze the productivity of several groups of physical scientists through regressing citation counts on quadratics of age and experience and various dummies to control for the characteristics of individual scholars. Their conclusion is that in general the decline of productivity with aging in the hard sciences is very pronounced. McDowell (1982) examines the relationship between aging and productivity amongst academics in the humanities and physical sciences. Similar to Stephan and Levin (1992), McDowell (1982) finds that productivity peaks relatively early in the hard sciences, while productivity peaks much later amongst English and History professors.

Diamond (1986) regressed citations on age and age squared for six samples of academics in different fields and at different universities. The sample consisted of Berkeley mathematicians, Berkeley physicists, Berkeley economists, Illinois mathematicians, Illinois physicists and Illinois chemists. Diamond (1986) found an inverse relationship between aging and productivity and that the mean peak age for the citation stock for the six samples was 59 years of age. This, however, masks considerable differences between the samples with the peak age for annual citations ranging from 39 for Berkeley physicists to 89 for Illinois

mathematicians. The peak age for Berkeley economists was 56, which is close to the average. Goodwin and Sauer (1995) and Oster & Hamermesh (1998) also find an inverse relationship between aging and productivity for academic economists. Their results suggest that, controlling for the status of the journal, productivity declines with age among academic economists at about the same rate that studies such as Levin and Stephan (1991) suggest is the case for academics in the physical sciences.

3 Database and Descriptive Statistics

We mailed a survey questionnaire to all full professors in 25 Australian economics departments in May 2000, which a preliminary search of departmental web sites identified as having at least one professor of economics.[1] This was a total of 58 professors. We defined "economics department" to include all departments or schools with economics in the title. Thus we included departments or schools of "economics and finance" or "economics and management". In these cases, though, we only sent questionnaires to professors who we identified as being professors of economics or at least as publishing a substantial proportion of their research output in economics journals. In defining economics departments, we only included teaching departments. Thus, professors working at research centres such as the research schools at the Australian National University were excluded. We also excluded professors

working in econometrics departments. Following a series of reminders we received 28 responses, but excluded two of these. Of the two responses which we excluded, one professor had published mainly in science rather than economics journals and the other professor was a recent Ph.D recipient. This gave us 26 usable responses, which is a response rate of 44.8 per cent. A full break down of the responses we received from each of the departments to which we sent questionnaires is given in table 1.

Table 2 presents statistics on the individual characteristics of the 26 respondents. Of the respondents 18 (or 69 per cent) received their Ph.D. from universities outside of Australia. Most of these obtained a Ph.D from universities in Canada, the United Kingdom or the United States. Eleven (or 42 per cent) were employed in the top five economics departments in Australia (ANU, Melbourne, Monash, UNSW and Sydney), based on publications in the leading group 1 and group 2 journals in economics according to Towe and Wright (1995).[2] At the time of the survey, 38 per cent of respondents spent more than 15 per cent of their normal working hours in teaching and 61 per cent of respondents spent more than 20 percent of their normal working hours on administrative duties. Over 70 per cent of respondents spent more than 20 per cent of their normal working hours on research. The average

length of time since the respondents commenced their academic career was 22 years.

To give a better picture of academic publishing patterns, we divide our sample into three Ph.D cohorts. Table 3 provides information on the number of professors in each cohort as well as average experience, defined as length of time since completing a Ph.D, and time taken from date of Ph.D to be appointed a professor. Cohort 1 (C1) consists of five professors who received their Ph.D between 1960 and 1970. Among these professors, the earliest to receive his/her Ph.D was 1962 and the latest was 1970. The average experience for this cohort is 33.4 years. Sixty per cent of the professors in this cohort have experience above the average. On average, it took members of this cohort 13.2 years to be appointed a professor from the date of receiving their Ph.D. Treating co-authored papers on a fractional basis, members of this cohort published, on average, 28.8 refereed journal articles prior to being appointed as a professor, and 44.4 refereed journal articles subsequent to being appointed as a professor.

Cohort 2 (C2) consists of 13 professors who received their Ph.D. between 1971 and 1980. The earliest professor to receive his/her Ph.D in this cohort was 1971 and the latest was 1980. The average experience for members of this cohort is 24.2 years and 61 percent of the professors in

this cohort have experience above the average. On average, it took 15.4 years for members of this cohort to be appointed a professor from the date of receiving their Ph.D. Treating co-authored papers on a fractional basis, members of this cohort published, on average, 13.89 refereed journal articles prior to being appointed a professor, and 11.1 refereed journal articles since becoming a professor. The third cohort (C3) consists of eight professors who received their Ph.D. between 1981 and 1999. The most experienced professor in this cohort received his/her Ph.D. in 1982 and the least experienced professor in this cohort received his/her Ph.D. in 1993. The average experience of this cohort is 12.5 years and 50 per cent of professors in the cohort have experience above the average. Treating co-authorship on a fractional basis, on average, members of this cohort published 26.2 articles before appointment and 7.1 refereed articles after being appointed a professor.

Table 3 also provides information on the average number of refereed journal articles in four groups of journals classified by EconLit as well as refereed journal articles in non-EconLit journals. The four groups of EconLit journals are the same as those used in Towe and Wright (1995). Group 1 consists of the 12 leading journals in economics according to Diamond (1989). Group 2 consists of 23 journals, which, when added to group 1, constitute the 27 core journals in economics according to

Diamond (1989) plus eight additional journals which were rated highly by Liebowitz and Palmer (1984). Group 3 consists of another 36 highly rated journals and group 4 consists of all other EconLit journals (see Towe and Wright 1995, pp. 9-11 for full details).

We focus exclusively on refereed journal articles as research output for three reasons. First, there is a view that "non-refereed journal articles or book chapters may not be the same quality as refereed journal articles" (Hartley *et al* 2001, p. 80). Reinforcing this view, Sauer (1988) found that returns from non-refereed publications, at least in terms of salary determination, are quite low. Second, Hill and Murphy (1994) identify journal publications as the major form of economics research outlet in Australia. Third, from a practical perspective, "the relative size differences between journal articles and books or monographs on the one side or short book reviews on the other side make comparisons difficult" (Hartley *et al* 2001, p. 80).

Table 3 suggests that for each cohort the average number of articles published in the leading journals (Group 1 and Group 2 journals) is relatively low. Not surprisingly, the first cohort, with the most experience, has the highest average number of publications in each of the four groups of EconLit journals and non-EconLit refereed journal articles,

but for G1 and G2 EconLit journals the difference is marginal. However, in order to compare "like with like" we compute the publication record of each of the three cohorts in the first 12 years following receipt of their Ph.D on the basis of publications in the four groups of EconLit journals. When we do this, the C3 cohort performs best in terms of publications in each group. Each professor in the C1 cohort published 2.1, 2.1, 8 and 18.4 articles in G1, G2, G3 and G4 journal categories during the first 12 years after receiving his/her Ph.D. For the C2 cohort, each professor published 1.07, 1.26, 4.61 and 8.85 articles in G1, G2, G3 and G4 journal categories in the first 12 years after receiving his/her Ph.D. For the C3 cohort, each professor published 3.37, 4.62, 11 and 24.75 articles in G1, G2, G3 and G4 journal categories in the first 12 years after receiving his/her Ph.D.

Table 4 gives the weighted number of pages published in each cohort in the four groups of EconLit journals. To adjust for different journal sizes, page counts were standardized by the number of characters published on one page of the *American Economic Review*. We used the conversion factors reported in Towe and Wright (1995, table 1). As in Towe and Wright (1995) we only standardized page counts for journals in the G1, G2 and G3 categories and thus we did not standardize page counts for G4 journals. Where there were n authors each author was apportioned $1/n$

pages. Table 4 shows that 80 per cent of professors in the C1 and C2 cohorts published 30 per cent of total pages published in G1 journals, while 75 per cent of professors from the C3 cohort published 31 per cent of total pages in the G1 category.

4 Model Specification, Estimation Technique and Results

To examine the effect of aging and various control variables on research productivity for professors in the sample we estimated the following empirical specification:

$$RESPROD = f(EXP, EXP^2, PHD, EMP, RES, TEACHAD) \quad (1)$$

The dependent variable (RESPROD) denotes research productivity. We use three alternative proxies for the dependent variable. First, CIT denotes the total number of citations for each professor as per the Social Science Citation Index after excluding self-citations. Adjusted citations are a measure of the influence or impact of each professor's work on the body of scholarship and therefore may be regarded as an imperfect proxy for the quality of research output. Second, PAGES denotes the number of standardized refereed journal pages published in EconLit journals. Third, PUB denotes the number of refereed journal articles published in EconLit journals, after adjusting for co-authorship. PAGES and PUB are alternative measures of the quantity of research output. There is a view that PUB is the better indicator than PAGES of research output on the

basis that being long-winded in lengthy articles should not be rewarded (see Leiter 2000). Having, said this, it seems reasonable that a full-length article should be given more weight than a comment or a note.

The life-cycle human capital model implies that research productivity should initially increase, reach a peak and then decline over time (Diamond, 1984,1986). The reason for this is that in the initial stages of one's career there is a learning effect where human capital is accumulated, while in the later stages of one's career investment in skills decline with age (McDowell, 1982, Diamond 1986). Previous econometric studies have examined research productivity over the life cycle using either quadratics of age or experience (Diamond, 1986, Levin and Stephan 1991). We used a quadratic of experience. In equation (1), EXP is experience defined as total number of working years since receipt of Ph.D and EXP^2 is defined as experience squared. The quadratic is used to empirically test the hump-shaped pattern and thus capture the hypothesized non-linear aging effect in productivity (Goodwin and Sauer, 1995).

If educational background, time available for research or some other relevant quality varies systematically across the sample professors, the coefficients for EXP and EXP^2 might be capturing these effects. To

address this issue we include a number of control dummies. PHD is a dummy variable set equal to one if the professor received his/her PhD from a university outside Australia, otherwise it is zero. EMP is a dummy variable, which is equal to one if the professor is employed in one of the top five economics departments in Australia based on publications in leading group 1 and group 2 economics journals, according to Towe and Wright (1995). RES and TEACHAD are dummies, which consider time allocated to research, teaching and administrative activities. RES equals one if the professor spends more than 20 per cent of his/her weekly working week on research otherwise it is zero. TEACHAD is equal to one if the professor spends at least 15 per cent of his/her weekly working week teaching and 20 per cent on administrative duties. The TEACHAD dummy variable does not include time allocated to editorial activities associated with journals.

Table 5 presents the findings for equation (1) for the full sample of respondents. Columns 1, 2 and 3 are regression results using CIT, PAGES and PUB as alternative indicators of the research productivity of professors. As there are a few outliers in the sample, in the presence of a thick-tailed distribution, the Ordinary Least Square (OLS) estimation technique may not provide an unbiased estimator, and conventional F-and t-tests on the coefficients could be misleading. Thus, following Judge *et*

al (1988, chapter 22) we use the robust estimation technique instead of the OLS technique. We used the Trimmed Least Squares method with SHAZAM Version 7.0 software.[3]

Consistent with the lifecycle hypothesis, in each column of table 5 EXP is statistically significant at 1 per cent with a positive sign and EXP^2 is statistically significant at 1 per cent with a negative sign. When CIT is the dependent variable, productivity peaks 30 years after the professor received his/her Ph.D. When PUB is the dependent variable, productivity peaks 31 years after the professor received his/her Ph.D. We did not ask respondents to indicate their age when they received their Ph.D. However, it is reasonable to assume that the average age at which the respondents received their Ph.D was in their mid-to-late twenties. This implies that the productivity of the professors in terms of citations received and journal publications peaked in their mid-to-late fifties. This result is consistent with Diamond's (1986) findings that the productivity of economists at Berkeley, measured in terms of citations, was 56 years of age. However, when productivity is measured in terms of pages published, productivity peaks 11 years after the professor received his/her Ph.D

The results for EXP and EXP^2 in table 5 are reflected at a micro-level in table 6. Table 6 depicts the distribution of the four groups of journals in

which the professors published over their life cycle. Table 6 shows that most of the professors published heavily within the first ten years of receiving their Ph.D in the G1, G2 and G3 categories. However, over their lifecycle, they only published 46 per cent of refereed articles in the G1, G2 and G3 categories (474 out of 1024). This suggests that as they have aged, their publication in the G4 category has increased. This result is consistent with the findings of studies such as Oster and Hammermesh (1998) that suggest that economists publish less in top journals as they age. One reason for this result could be that professors have less incentive to publish in top journals as they are already at the pinnacle of the profession. Another reason might be that as academic economists get older they spend more time publishing through other outlets such as book chapters or government reports. Hamermesh (1992, p. 174) speculates that academic economists with more experience have "increasing access to non-refereed outlets". Hartley *et al* (2001, p. 81) found that over a two-year period academic economists in the United States with more than 21 years of experience had 25 per cent more non-refereed journal articles, three times as many chapters in books and twice as many technical reports than economists with up to seven years of experience.

In table 5, RES and TEACHAD have the expected signs and are significant at the 1 per cent level when CIT and PUB are the dependent

variables and at 5 per cent and 10 per cent respectively when PAGES is the dependent variable. This suggests that more time spent on research and lower teaching hours and administration activities increases productivity for all three indicators.[4] PHD is statistically significant with a negative sign for all three indicators of productivity, which suggests that professors in the sample with a Ph.D from Australian universities are more productive than their colleagues with a foreign Ph.D. This result seems inconsistent with two pieces of anecdotal evidence. The first is that most of the best graduate students from Australian universities go to North America or the United Kingdom to do their Ph.D. The second is that most of the top economics departments in Australia prefer to hire graduates with a foreign Ph.D. However, the eight professors in the sample who received their Ph.D from Australian universities have on average 54.9 publications (adjusted for co-authorship), while the 18 professors in the sample with a foreign Ph.D have on average 25.9 publications (adjusted for co-authorship).

This significant difference in the number of publications between professors with an Australian and foreign Ph.D does not reflect differences in experience. The eight professors with a Ph.D from Australian universities have, on average, 19 years experience, while the 18 professors with a foreign Ph.D have, on average, 23 years experience.

Professors in the sample with a Ph.D from an Australian university have not only published more EconLit articles and pages than their colleagues with a foreign Ph.D in absolute terms, but have also published more at each stage of their lifecycle. This certainly suggests that professors with Australian Ph.Ds are doing well compared to those with foreign Ph.Ds, which has policy implications for future hiring.

EMP has a negative sign when CIT and PUB are the dependent variables, which is unexpected, although in neither of these cases is it significant. EMP has a positive sign and is significant at 5 per cent when PAGES is the dependent variable. We report the results using Towe and Wright's (1995) top five departments based on publications in G1 and G2 journals (ANU, Melbourne, Monash, UNSW and Sydney) for three reasons. First, these are also the top five departments according to Pomfret and Wang (2002), based on total publications in the top 88 EconLit journals over the period 1990-2001.[5] Second, at least three of these five universities are present at any one time in most of the alternative rankings presented in Towe and Wright (1995) and Sinha and Macri (2002). Third, for a few of the departments that are highly rated in some of the Towe and Wright (1995) and Sinha and Macri (2002) rankings such as Griffith, La Trobe and Tasmania, we do not have any professors in our sample.

We recognize, however, that ranking economics departments is controversial and that the composition of the top five economics departments depends on the definition of research output. For this reason, in regressions which are not reported we checked our results using a number of alternative compositions of the top five departments based on the rankings given in Towe and Wright (1995, table 2) and Sinha and Macri (2002, table 1). In almost all cases the signs and significance levels of the explanatory variables were robust to alternative compositions of the top five departments and EMP was generally insignificant. There were, though, three instances, where EMP was positive and significant. First, EMP was positive and significant when PAGES and PUB were the dependent variables and the top five departments were the Towe and Wright (1995) top five based on pages published in G1, G2 and G3 journals (Melbourne, UWA, Tasmania, Sydney and ANU). Second EMP was positive and significant for the Sinha and Macri (2002) top five based on pages published in G3 journals (Melbourne, UWA, Tasmania, ANU and La Trobe). Third, EMP was positive and significant for the Sinha and Macri (2002) top five based on pages published in G4 journals (Melbourne, Queensland, La Trobe, UWA and ANU).[6]

Table 7 provides a different perspective on the results for PHD and EMP. Table 7 provides a snapshot of the 10 most prolific publishers in the sample. The most prolific publisher in the sample provided more than one-fifth of the research output of the top 10 and the three most prolific publishers combined provided more than 50 per cent of the research output of the top 10. It is interesting to note that two of the three most prolific publishers and six of the top 10 publishers in the sample do not belong to the top five economics departments based on publications in G1 and G2 journals. Moreover, the three most prolific publishers in the sample all received their Ph.Ds from Australian universities which is consistent with the results for PHD.

The drawback of the results in table 5 is that we are treating all respondents the same irrespective of the stage in their lifecycle. Moreover, the time allocation decisions reflected in the dummies for RES and TEACHAD might not hold throughout the professor's entire lifecycle. To address this issue, we next consider only professors who have at least five years experience after their professorial appointments at the date of the survey. The number of observations is only 18, which did not allow us to run the robust estimation technique, which trims the outliers (or influential observations). Thus we use OLS instead and report the Jarque-Bera test that addresses the null hypothesis that the

residuals are normally distributed. The findings are presented in table 8. The specification estimated in table 8 is similar to equation (1), except that instead of EXP and EXP^2 we use variables denoting pre-professorial experience (PREPROFEXP) and post-professorial experience (POSTPROFEXP).

In each case PREPROFEXP has a positive and significant effect at 1 per cent on productivity. POSTPROFEXP has a positive sign and is significant at the 1 per cent level for PAGES and PUB, but is insignificant for CIT. PHD and EMP both have negative signs. PHD is significant for PAGES and PUB and EMP is significant for PAGES. RES and TEACHAD have expected signs and are significant in each case. The explanatory power of the model is higher using PAGES and PUB. The Jarque-Bera test fails to reject the null hypothesis that the residuals are normally distributed in each case, hence the distribution is normal with the usual properties.

Finally, in table 9 we consider regressions for the 18 professors with at least five years post-professorial experience focusing on what explains publications before and after the individual is appointed a professor. Here, PREPROFPUB and POSTPROFPUB are the dependent variables representing publications (adjusted for co-authorship) before and after the

individual is appointed a professor. First, for the specification with PREPROFPUB as the dependent variable, PREPROFEXP and PHD have the same signs as in the earlier regressions and are significant at the 1 and 5 per cent level respectively. We did not consider EMP RES and TEACHAD because these variables were not applicable (or might not have been applicable) for most of the professors prior to becoming professors. Several of the professors have moved between universities to take up professorships or at different stages of their career and, as discussed above, it is unlikely that the time allocation decisions which respondents indicated in the survey would be constant over the lifecycle. Instead, the time which respondents indicated that they allocated between administration, research and teaching is likely to be indicative of their time allocation decisions as professors.

The second column of table 9 presents regression results with POSTPROFPUB as the dependent variable. Both PREPROFEXP and POSTPROFEXP have positive signs and are significant. PHD is significant at the 1 per cent level with a negative sign. EMP has a negative sign, but is significant only at the 10 per cent level. RES is significant at the one-percent level with the expected sign. TEACHAD has an unexpected positive sign, but is insignificant. The explanatory power of the model is significantly higher with POSTPROFPUB as the

dependent variable. The Jarque-Bera test fails to reject the null hypothesis for both specifications in table 9, meaning that the residuals are normally distributed with the usual properties in each case.

5 Conclusions

The results are consistent with the lifecycle hypothesis and reinforce the findings of previous studies, which have predominantly applied the lifecycle framework to samples of academic economists from the United States. In particular, the finding that annual number of citations received and EconLit journal publications of Australian economics professors peak in their mid-to-late fifties is consistent with the results of similar studies for samples of academic economists in the United States such as Diamond (1986). As one would expect within a time allocation model, we find that generally time allocated to research improves productivity, while time allocated to teaching and administration has a negative effect on research output.

We get mixed findings as to whether professors at top-ranked departments have higher productivity than professors working for departments not in the top five. Generally we find that differences in productivity between professors in the top five departments and at other departments are statistically insignificant, but this result is sensitive as to

how productivity is measured as well as the composition of the top five. Finally, we find that professors who obtained their Ph.Ds in Australia have higher productivity than professors who obtained their Ph.D overseas. While this last finding has interesting policy implications for hiring practices, our findings for the PHD variable in particular might suffer from small sample bias if, for example, there are extremely productive professors with a Ph.D from a foreign university who did not respond to our questionnaire. It is important to bear in mind that it, as well as the other results, has to be seen in context of the relatively small sample size.

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TABLE 1
Percentage of Respondents from Economics Department with Professors

University	Respondents (%)
Griffith University	0
Murdoch University	0
University of New England	0
University of Tasmania	0
University of Wollongong	0
University Technology of Sydney	0
Victoria University of Technology	0
Australian National University	33.33
Macquarie University	33.33
Royal Melbourne Institute of Technology	33.33
Deakin University	50
Flinders University	50
University of New South Wales	50
University of Queensland	50
University of Western Australia	50
Monash University	66.66
University of Melbourne	66.66
University of Sydney	66.66
Australian Defence Force Academy	100
Curtin University of Technology	100
James Cook University	100
Queensland University of Technology	100
University of Adelaide	100
University of Newcastle	100
University of Western Sydney	100

TABLE 2
Individual Characteristics of Respondents

Number of Professors	26
More than 15 per cent of normal working hours spent on teaching	10
More than 20 per cent of normal working hours spent on administrative activities	16
More than 20 per cent of normal working hours spent on research	19
Average experience (length of time since earning Ph.D) in years	22.4
Employed in one of the five top-rated economics departments according to Towe and Wright (1995) based on publications in G1 and G2 journals	11
Ph.D from a university outside Australia	18

TABLE 3

Average Experience and Publication Records in EconLit Classified Journals for Economics Professors According to the Three Ph.D Cohorts

Ph. D ohorts	Number of Professors	Average Experience (in years)	Average Number of Years to be Appointed as a Professor after Finishing Ph. D	Average Number of Publications in G1 Journals	Average Number of Publications in G2 Journals	Average Number of Publications in G3 Journals	Average Number of Publications in G4 Journals	Refereed Publications Non-EconL Journals
1	5	33.4	13.2	5.8	5.8	22.0	50.6	34.0
2	13	24.2	15.4	2.3	2.5	9.2	17.7	5.30
3	8	12.5	9.8	3.4	4.6	11.0	24.8	6.8

TABLE 4:
Weighted Number of Standardized Pages for each Ph.D Cohort in G1, G2 and G3 Journal Categories

	G1		G2		G3	
Ph.D Cohort	Number of Pages	Number of Professors	Number of Pages	Number of Professors	Number of Pages	Number of Professors
C1	245.43	4	277.63	4	1199.62	5
C2	333.24	10	332.98	11	1518.39	12
C3	290.24	6	387.31	8	1191.83	8

TABLE 5
Regressions for Citations, Pages Published and Number of Publications in EconLit Journals for All Professors in the Sample Using Robust Estimation

	Column 1	Column 2	Column 3
Variables	CIT	PAGES	PUB
EXP	58.792[a]	8.216[a]	9.727[a]
	(6.030)	(6.718)	(6.696)
EXP^2	-0.972[a]	-0.384[a]	-0.158[a]
	(4.428)	(4.149)	(4.835)
PHD	-115.85[a]	-130.72[b]	-24.781[a]
	(3.090)	(2.266)	(4.436)
EMP	-41.199	59.634[b]	-7.633
	(1.163)	(1.81)	(1.446)
RES	121.51[a]	91.301[b]	15.207[a]
	(3.079)	(1.641)	(2.586)
TEACHAD	-230.90[a]	-101.31[c]	-43.493[a]
	(5.050)	(1.479)	(6.383)
Constant	-434.34	-141.66	-54.656
Number of Observations	26	26	26

Notes:
a Indicates coefficient is significant at the 0.01 level of significance using one-tailed t-test
b Indicates coefficient is significant at the 0.05 level of significance using one-tailed t-test
c Indicates coefficient is significant at the 0.10 level of significance using one-tailed t-test

TABLE 6
Distribution of Publications in G1, G2, G3 and G4 Journal Categories Over the Lifecycle

Experience (Years)	G1		G2		G3		G4	
	Number of articles	Number of professors	Number of articles	Number of professors	Number of articles	Number of professors	Number of articles	Number of professors
Pre-PhD	1	1	3	3	15	6	27	6
0-5	27	12	31	13	85	20	104	18
6-10	25	12	26	12	72	24	88	20
11-15	15	10	20	11	29	11	67	17
16-25	12	7	10	4	67	14	137	17
26+	2	2	12	3	22	10	127	10
Total in Each Group	82	44	102	56	290	85	550	88

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TABLE 7
Characteristics of the 10 Most Prolific Publishers in the Sample

Rank	Top-five Ranked Department according to Towe and Wright (1995) based on publications in G1 and G2 journals?	Ph.D from Australian or Foreign University?	Relative Share of Publications as a Percentage of the Top 10 Publishers
1	O	A	21.1
2	T	A	17.1
3	O	A	13.3
4	T	F	12.1
5	T	F	7.3
6	O	F	6.9
7	O	A	6.3
8	O	F	6.2
9	O	F	4.8
10	T	F	4.6

Notes:
T denotes that the professor is a member of a top-five economics department based on publications in G1 and G2 journals. O denotes that the professor is employed by an economics department that is not among the top five. A denotes that the professor obtained his/her Ph.D from an Australian university, F denotes that the professor obtained his/her Ph.D from a university outside of Australia. The relative shares of publications in column 3 do not add up to 100 because the figures are rounded.

TABLE 8

Regressions for Citations, Pages Published and Number of Publications in EconLit Journals for Professors Who Have At Least Five Years Professorial Experience

Variables	CIT	PAGES	PUB
PREPROFEXP	13.694[a]	13.168[a]	3.629[a]
	(2.997)	(3.325)	(3.667)
POSTPROFEXP	3.633	8.325[a]	3.521[a]
	(1.210)	(3.819)	(5.349)
PHD	-0.307	-43.299[b]	-40.911[a]
	(0.007)	(2.133)	(4.539)
EMP	-22.612	-21.413	-17.448[b]
	(0.355)	(0.474)	(2.032)
RES	73.116[c]	83.561[a]	34.557[a]
	(1.369)	(2.438)	(3.758)
TEACHAD	-334.00[a]	-310.18[a]	-29.122[b]
	(6.590)	(11.51)	(2.690)
Constant	227.22	193.09	-15.103
R^2	0.328	0.726	0.757
Jarque-Bera Normality Test[#]	6.209	4.789	1.023
Number of Observations	18	18	18

Notes:

Figures in parentheses are White's heteroscedastic consistent t-ratios

a Indicates coefficient is significant at the 0.01 level of significance using one-tailed t-test

b Indicates coefficient is significant at the 0.05 level of significance using one-tailed t-test

c Indicates coefficient is significant at the 0.10 level of significance using one-tailed t-test

$\chi^2_{2,\,0.01}$ is 9.210. Thus null hypothesis of the existence cannot be rejected in either case. Hence each of the regressions satisfy the normality test.

TABLE 9
Regressions for Publications Prior and Subsequent to Being Appointed Professor in EconLit Journals for Professors Who Have At Least Five Years Professorial Experience

Variables	PREPROFPUB	POSTPROFPUB
PREPROFEXP	2.401[a] (4.202)	1.773[b] (2.418)
POSTPROFEXP	-	3.321[a] (6.017)
PHD	-17.637[b] (2.274)	-31.018[a] (3.933)
EMP	-	-14.233[c] (1.964)
RES	-	29.151[a] (3.419)
TEACHAD	-	5.678 (0.650)
Constant	-1.293	-43.277
R^2	0.485	0.720
Jarque-Bera Normality Test[#]	4.356	1.115
Number of Observations	18	18

Notes:
Figures in parentheses are White's heteroscedastic consistent t-ratios
a Indicates coefficient is significant at the 0.01 level of significance using one-tailed t-test
b Indicates coefficient is significant at the 0.05 level of significance using one-tailed t-test
c Indicates coefficient is significant at the 0.10 level of significance using one-tailed t-test
$\chi^2_{2,\,0.01}$ is 9.210. Thus null hypothesis of the existence cannot be rejected in either case. Hence both regressions satisfy the normality test.

ENDNOTES

[1] A preliminary internet search of departmental web sites in February 2000 suggested that three universities which otherwise would have been included – University of Canberra, James Cook University and La Trobe University – had no full professors of economics at that time.

[2] We also considerd other compositions of the top five economics departments based on the results in Towe and Wright (1995) and Sinha and Macri (2002). This is discussed further below.

[3] As a method of dealing with influential observations, trimmed least squares was first suggested by Koenker and Bassett (1978) and is developed further in Ruppert and Carroll (1980). For further details on this approach see Judge *et al* (1988, pp. 905-906) and the SHAZAM Manual, p. 266.

[4] While RES and TEACHAD reflect the time allocation decisions of the respondents at the time of the survey (February, 2000), they may not be accurate for their full life cycle. (We address this issue below). We also ran regressions without these dummies and the results were almost the same.

[5] One qualification on this statement is that Pomfret and Wang (2002) consider the Monash economics and econometrics departments together. In this study we only surveyed professors in the Monash economics department. Note that Towe and Weight (1995) consider both economics and econometrics departments but where a university has both (such as at Monash) treat them separately for purposes of ranking. Sinha and Macri (2002) only consider economics departments.

[6] As discussed above, given that we do not have any respondents in the sample from La Trobe or Tasmania, EMP is defined here in terms of the top three or top four economics departments.

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