DISCUSSION PAPER SERIES

IZA DP No. 64

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October 1999

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 64
October 1999

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ABSTRACT

Salary and the Gender Salary Gap in the Academic Profession*

The academic profession is an occupation in which pay has fallen dramatically, resulting in the setting up of a Committee of Inquiry to examine both pay relativities and mechanisms for pay determination. This paper considers salary determination and the gender salary gap in the academic labour market drawing upon a particularly detailed data set of 900 academics from five traditional Scottish Universities. Results reveal an aggregate gender salary differential for academic staff of 15%. Most of this differential can, however, be explained by our model. Evidence suggests a limited opportunity for female academics to combine career and family, despite the flexibility of an academic job and emphasises the importance of mobility to the male career. Publication record, but not teaching ability, is found to be an important determinant of salary. The dominant contribution of rank to both the determination of female academic salaries and the gender salary gap suggests vastly differential opportunities for promotion faced by men and women.

JEL Classification: J44

Keywords: Academic labour market, salary, gender differences

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* The background research to this paper was completed during the course of my PhD at Aberdeen University, Scotland. I gratefully acknowledge the funding for this research provided by the Scottish Economic Society and the helpful comments of my supervisors, Professor Peter J. Sloane and Professor Ioannis Theodossiou.

1. Introduction

Establishment level academic salaries in the UK are formally set through nationally agreed pay scales and appointment procedures leading up to professorial grades. The existence of this formal framework, where staff progression is automatic and largely dependent on years of tenure, has resulted in academic salaries slipping behind those of other professions. The Hay report (1997) revealed that over the last 10 years university pay has dropped as much as 20% in real terms behind comparable professions in the public sector. One might expect this formally structured labour market to at least ensure gender equality. Conclusions from the Bett (1999) report however suggest the underpayment of women in relation to their male colleagues at every grade.

The UK academic profession has fostered an increase in competition in recent years. There has been a consolidation of the importance of publication to reward with the emergence of the research assessment exercise. Short term contracts have increased dramatically and there are no longer any assurances of automatic tenure. Does such an a internal labour market work efficiently within a fixed framework of salaries? and do current academic salaries reflect an efficient outcome? Academics have certainly undertaken periods of extended study relative to the general labour force at an opportunity cost of perhaps considerable foregone earnings, but evidence suggests that that academics may place a lower emphasis on pecuniary relative to non-pecuniary aspects of work than in other sectors of the workforce[1]. Strikes over pay during 1996 and 1999 however are suggestive of a profession on the edge of their reservation salary and the profession may be at risk of loosing its best talent to competing occupations and/or positions abroad.

We cannot begin to address such questions and problems without a thorough investigation of the profession and the current determinants of salary. Government reports by Dearing (1997) and the recent report by Bett (1999) are suggestive of the progressive deregulation of established pay structures. The lack of appropriate data in the UK is a particular problem for academic studies of the state of play. National statistics, collected by the Universities Statistical Record and later by the Higher Educational Statistics Agency (HESA), contain only very limited information. The census of

academic salaries collected data on gender, age, date of recruitment, rank, faculty and salary, but ceased in 1993. Studies commissioned by the AUT and national press have collected only sample data limited to specific issues of interest e.g hours of work and time use. Information concerning academic staff held by the universities themselves is generally very difficult to compile. The largest problem here however is access. To the author's knowledge, no other data than that outlined above is currently available for British academics[2]. To date, despite a large literature on gender differences in academia in the US, only two studies in the UK can be identified[3].

This paper therefore considers the determination of academic salaries and measures the gender salary gap in the academic labour market drawing upon a particularly detailed data set of 900 academics from five traditional Scottish Universities. We therefore provide some of the first academic research into salary within the UK academic profession. Uniquely, our study includes detailed information on individual productivity, a factor omitted in previous research and takes account of cohort effects present in the UK academic profession.

2. Previous Literature and Data

Much of the literature on academic reward originates in the US. Due to large differences in model specification, subject of study and time period of analysis, studies suffer from contradictory results. Approaches can be broadly split into those studies taking a national perspective and those which concentrate on individual establishments (Lindley et al.1994, Ferber and Green 1982), those which consider a particular subject group, such as economists (Broder 1993, McMillen and Singell 1994, Kahn 1993), and those which consider the broader picture. There is uncertainty as to whether gender differences reflect differences in human capital or productivity between individuals, discrimination by universities or supply decisions by workers and disagreement about whether gender differences originate prior to entering an academic career, at initial entry (Hirsh and Leppel 1982, Formby, Gunther and Sakano 1993), or through experience and rank (Johnson and Stafford

[1] Ward and Sloane (1999).
[2] Although a study of researchers is underway at the Institute for Employment Research (IER) at Warwick university.
[3] See McNabb and Wass (1997) and Baimbridge and Simpson (1996).

1974, Tuckman, Gapinski and Hagemann 1977). A common thread which runs through the literature, however, is evidence of the existence of gender differences in salary. The comparability between the US and UK literature is limited however, due to their very different salary structures.

McNabb and Wass (1997) provide the only econometric analysis for the UK to date and consider the gender difference in salary levels of British academics in 'Old Universities' for the years 1975, 1985 and 1992. They reveal a raw gender salary differential of 15.2% for 1992. Their analysis lacks variables on male and female research productivity and personal background, but they suggest that about two thirds of the gender salary differential is accounted for by differences in male and female characteristics - women generally have less labour market experience, are under represented in senior positions and are crowded in faculties where salaries are lower. The remaining third of the salary gap represents the upper bound of discrimination. Their results suggest the progressive deregulation of established pay and promotion structures in UK academe.

Academics are a relatively homogeneous group in terms of their motivation and investment in human capital. Flexibility in working hours - both in the absolute number worked per week and their distribution - provides a stark difference between a conventional working population and an academic one. A British academic has no hours stipulated in his or her contract, or even a rigidly defined place of work. As a consequence, holidays and days, or even hours off work, conference visits and travel are more easily incorporated into an academic's working life than that of an individual working in another labour market. An academic may therefore choose, around the constraint of set teaching hours, where and when he or she wants to work and can work with relative freedom. One might therefore expect women to have stronger long term work commitments than women in other labour markets - partly due to the large investments in human capital, and partly to the fact that flexibility of academic career is more likely to allow a woman to combine a career with domestic and family responsibilities[4]. These characteristics should enhance our ability to quantify gender differences.

[4] McNabb and Wass (1997).

The data used in this paper come from a unique cross section study collected, using a postal questionnaire, from five of Scotland's eight old established universities: Aberdeen, Dundee, Glasgow, Heriot-Watt and St. Andrews undertaken in 1995/6. It encompasses detailed information on the personal and working history, productivity and salary of 900 academics. The average response rate achieved was 30%, reasonably high for this type of study (Court 1994, for example, achieved a 21% response rate). Data were weighted for non-response at a faculty level by sex allowing for non-response at the level of rank by sex. Academic staff was taken to include professors, senior lecturers and lecturers, research and teaching fellows and assistants. By collecting data through the use of a postal questionnaire and the careful designing of questions, it is possible to control for many more factors than with secondary published data. Indeed, data collection with this type of detail is rarely possible at a national level[5].

Summary statistics for the data[6] set as a whole reveal that two in three research assistants, 1 in 3 lecturers, 1 in 5 senior lecturers and 1 in 18 professors are female. There are therefore slightly more research assistant posts and fewer professorships held by females in the Scottish Universities considered than in the U.K academic population as a whole[7]. Three quarters of female academics in the five Scottish universities studied are under the age of forty, compared with only about two fifths of men and the average female in the labour force is nearly eight years younger than the average male of 44. The majority of women in the data set are, therefore, young women who will differ greatly in their characteristics from the characteristic of the average male in the data set. The vast majority of the young women in our data set are research assistants on short term contracts.

Figures 1 to 4 consider the gender salary differential by age, rank, subject and tenure. Figure 1 shows the relationship between the average salary and age of respondents. Men and women are found to earn about the same between ages 20 and 36-40. Women then experience a period of

[5] A copy of the questionnaire is available on request. For a table of variable definitions, means and standard deviations see Table 1. Variables used in the current analysis are defined at the beginning of the results tables.
[6] More detailed statistics for the data set can be found in Ward (1999).
[7] The Times Education supplement (July 26th 1996) ranked the proportion of female professors by university. The five universities considered have among the lowest proportions of female professors in the UK. All five are in the second half of this list apart from Glasgow which is ranked 25th out of 63. The University of St. Andrews is ranked 55th and Aberdeen University 58th. Statistics from HESA (1995/6) reveal that the old established Scottish universities also have a higher proportion of young academics than Great Britain as a whole.

lower average pay than their male counterparts until the age of about 63 when female average salary rises above that of males[8]. This pattern may reflect cohort effects within the data which are discussed later. Alternatively, the gap could reflect men being appointed on higher salary points, receiving discretionary awards[9] or promotion more readily than women, or the depreciation effects of career breaks by women in the 36-40 to 63 age range.

Figure 2, the average salary of men and women by rank suggests that there is no difference between male and female salaries *within* rank. The results indicate that those women who manage to become senior lecturers and professors do not suffer a disadvantage in pay terms. Female professors receive on average higher salaries than males, although the numbers within this group are small.

Figure 3 investigates male and female average pay by faculty. Arts, medicine and social sciences employ the most women, science and engineering the least. Female staff are found to receive a lower average pay than male staff in all faculties[10], the difference being largest in medicine[11]. Much of this differential will be due to the differences in rank and experience between men and women.

Finally, figure 4 presents the difference in male and female average salary by years of tenure. The academic tenure-salary profile is characterised by the concave function found by Johnson and Stafford (1974) among others, although the male curve is more defined than the female, with the female curve lying below the male. Females are found to experience a dip in their average salary at 11-15 years of tenure and an upturn in their reward from 30 years of tenure onwards with their profile crossing the male profile at around 33 years of tenure. Although average tenure is, on average, less for women than men, tenure levels for both groups are relatively high in comparison with average job tenures.

[8] Although the number of individuals over 63 is only 12.

[9] Part of the gender difference in salary between the ages of 36-40 and 63 may reflect males receiving discretionary awards more readily than women. See Ward (1999) for a detailed discussion.

[10] This result was also found by the AUT (1992).

[11] Smaller percentages of women than men are paid across ranks on the clinical scale - a scale for clinical staff characterised by higher levels of pay at every salary point.

3. Modelling of the determinants of academic salary

There have been two standard approaches to the measurement of gender differentials. First, one can measure the fixed advantage or disadvantage associated with the sex of a worker. Here a Mincer (1974) human capital equation is modelled which predicts earnings depend on workers' observed characteristics and gender. If the coefficient for the gender variables is significantly different from zero, other things being equal, this implies differential earnings for comparable men and women. The main criticism of this approach is that the coefficient values on the explanatory variables are assumed the same for both men and women. This will produce biased estimates of the gender differential if significant interactions exist between membership of a minority group and various other characteristics which are not themselves a function of discrimination (Dex and Sloane, 1988).

The most widely used approach for the measurement of gender salary differences has been the standard direct regression approach of Oaxaca (1973) and Blinder (1973). This model determines wage as a function of personal characteristics and variables thought to be related to an individual's productivity. Two separate human capital regressions of earnings against individual characteristics are run, one for males and one for female workers, the gender pay differential being calculated as arising from firstly, the difference in rewards to male and female characteristics in the labour market, (the unjustified pay differential or the upper bound estimate of discrimination) and secondly, the difference in the quantity of these endowments held by men and women (the non discriminatory, explained pay differential, or 'justified' discrimination). The assumption normally made is that the male earnings function is the one that would prevail in the absence of discrimination.

Variables to be included here in the investigation of the determinants of academic salary include, first, variables relating to an individual's personal characteristics (e.g. marital status, family status, citizenship). Greenhalgh (1980) for example emphasises the importance of marital status on the gender salary gap of UK workers. In studies of the academic labour market, marital and family status might be expected to have a more limited effect than in other labour markets. In US studies for example, Strober and Quester (1977) have revealed that only a small fraction of full-time female

faculty interrupt their careers. Barbezat (1987) finds that marriage has no effect, and the presence of children only a small indirect effect on female salaries.

Variables relating to an individual's personal background (such as education and experience) are central to the human capital approach. Theory predicts that an individual's earnings profile is affected by prior investments in education and growth of earnings over the working life is due largely to subsequent labour market investments in formal and informal job training and in labour mobility. Investments in human capital will continue at a diminishing rate between entry to the labour market and retirement and it is this diminishing chain of investment that forms the typical inverted U-shaped pattern of the earnings profile. Experience is usually included in the earnings function as an experience term and its square due to the convenience, consistency and good statistical fit of this specification. In order to take account of labour mobility a term for firm tenure and its square is also added to the earnings function in order to gauge worker's returns to firm specific investments.

The academic profession, however, with its fixed framework of financial reward requires a somewhat different specification. The relationship between age and salary is intensified with automatic progression along formal salary scale. Salary rising annually along a fixed salary scale means that years of experience, age and tenure are no longer so statistically separable. In addition to this it is necessary to take account of cohort effects and the effects of mobility on academic salary[12].

The academic profession exhibits a strong cohort effect. The older academics in the data set work within a very different profession today to the one that they entered. Many will have observed the implementation of Sex Discrimination legislation in the 1970s and an increase in competition within the profession with the onset of the research assessment exercises and the increase in short term contracts. The older academics in the data set will most likely have required less in the way of formal qualifications, for example, than those entering the labour market now. In the days of the eldest cohort of academics, female academics were rare and lower academic standards may have been expected of them. Today, we find a higher proportion of women working to the same standards as

[12] The normal yearly progression of academics up the steps of a grade entail relatively small salary increments. Job changes entailing a change in grades however will usually result in much more substantial changes in status and salary. Mobility may therefore be a particularly important determinant of salary.

those expected of men. The majority of women now in the profession are young women who differ in their characteristics from the characteristic of the average male in the data set.

Tenure and its square are therefore inserted into the earnings function to catch the effect of university specific investment and mobility of academic staff[13] and a dummy variable for academics over the age of 36 captures the cohort effect within the profession[14]. A variable measuring the total length of time away from work is included to take account of inactivity due to for example child care. Dummy variables relating to number of previous positions, institution of previous positions, educational qualification and quality of educational institutions attended capture the effects of previous education and labour market experience.

Variables relating to productivity (for example publications and teaching performance) are likely to be an important determinant of earnings in an academic environment dominated by periodic teaching and research assessment, although their effect may be weakened to some extent by salary progression along a scale. There are no readily available natural measures of research and teaching productivity suggested in the literature[15]. The simple measure of the number of publications may be criticised because it tells us a minimal amount about the quality of publication. Quality however is a very difficult factor to capture, since it is subject specific and requires detailed insider knowledge. In the present study the number of publications is converted to a yearly publication rate. Differences in publication rates across rank and subject group are controlled for by the inclusion of dummy variables for faculty and title. No formal measurement of an individual's teaching performance is available in the UK academic profession. Instead we use student assessment. This measure is open to some criticism as students might not be independent in their teaching appraisal with a number of

[13] Most existing evidence on the relationship between seniority with a given employer and salary suggest that wages will rise with job tenure, although the reason for the rising wage tenure profile has been debated at some length. Work on the wage tenure profile in academia has been undertaken by Ransom (1993), Brown and Woodbury (1995) and Hallock (1995).

[14] Various specifications for age to account for this cohort effect were considered. A split in the data set at age 35, represented in analysis through the use of a dummy variable for age 36 and over, appears to fit the data best and corresponds to that used by HESA. It remains the case, however, that the distribution of males and females are very different with 22% of men in professorial posts compared to 2.5% of women and only 23.4% of men on short-term contracts compared to 60.2% of women. Only 30.5% of men are aged below 36, compared to 61.0% of women. See Ward (1999) for a more detailed discussion.

[15] For a discussion of this see Hare and Wyatt (1988).

factors influencing their assessment which may strictly be unrelated to an individual's ability as a teacher[16]. In analysis of the UK academic profession, however, it is the only measure available to us.

Administrative responsibilities, external examiner duties and offices held might be expected to boost an individual's human capital and attract financial reward. Whether an individual is a full or part time worker has also been found to be an important determinant of pay in the labour market as a whole (Ermisch and Wright, 1993)[17]. All of these factors are accounted for by the inclusion of dummy variables in analysis. A variable measuring the number of discretionary awards received is also included to catch the effect of past reward to work content and responsibility on academic salaries[18].

Finally, dummy variables for university, faculty and rank are included in analysis to catch any differences in salary determination within university, subject group and seniority. Statistical evidence presented earlier has suggested that all may be important explanatory factors for the gender salary gap. Arguments concerning the exogeneity of rank variables can be made. Regressions are therefore run both including and excluding rank.

The first stage in analysis of gender salary differentials might be to estimate probit participation equations in order to correct for sample selectivity[19]. Such equations have been suggested to correct for biases resulting from the fact that the data sample may not be a random sample of the working population being studied. It might be, for example, that individuals not included in our data set (i.e. non working academics) may vary in some systematic way from working academics and this might introduce a bias into results. In the present study, however, no data were available on individuals not currently in the academic workforce thus such a correction was not feasible. However arguments concerning the homogeneity of the academic labour force, that is that women are more likely to have

[16] Some US studies have argued the use of student assessments as a measurement of faculty teaching ability is not a good one. See Katz (1973) for a discussion.

[17] Studies of the UK labour market have argued that full-time and part-time staff should be considered separately in regression analysis. Restrictions on sample size in the current study however render this approach infeasible.

[18] One could argue that the receipt of a discretionary reward might be a function of gender. Results were therefore run including and excluding this variable. Its inclusion was found not to influence the other variables significantly, thus we remain with the current specification as it provides interesting information.

[19] Studies of the general labour market are increasingly recognising and correcting for sample selection bias effects in women's earnings functions (see for example Joshi and Newell, 1987, Dolton and Makepeace, 1987).

stronger long term work commitments than women in other labour markets, hypothesise that sample selection in this labour force will not pose as severe problems as those found in the labour market as a whole[20].

Table 2 presents the results of ordinary least squares regression analysis of the log of salary on a series of explanatory variables. The first two columns in the table give results for the pooled sample including a dummy variable for gender. From the first column we see that the gender variable is significant and positive. Male academics therefore experience a 7.7% salary advantage over female academics not accounting for rank. Including dummy variables for rank (column 2) reduces this differential to just over 3% which is no longer significant. This result suggests that over half of the gender differential in salary is due to differences in rank between male and female academics[21]. The remaining (insignificant) differential reflects lower female salaries.

The most important influence on salary is full-time work. A huge premium of 65-70% is associated with being a full-time as opposed to part-time academic. This suggests a limited role for parents who wish to combine family and career through part time work as in other labour markets. The significantly negative coefficient on time out of the labour market reinforces this effect. Not surprisingly, rank is the second most important influence on an academic's salary. Professors earn 40% more, readers and senior lecturers 27% more and lecturers 8% more than the excluded category researchers. Discretionary awards account for just under 3% of the average individual's annual salary. Results also reveal a concave tenure profile for academics, as in other labour markets, although the positive effect of age dominates.

A significant salary premium is associated with faculty affiliation, only partially accounted for by the proportion of senior staff. Academics in the faculty of medicine earn on average 20-23% more than academics in the excluded faculty arts. Individuals working in the other three faculties receive a significant salary advantage of around 10%. Baimbridge and Simpson (1996) argue that the effect of faculty on salary will depend upon the prevailing demand and supply for a faculty's subject group and may measure variations in market pressures for people with subject specific skills, variation in

[20] Indeed the US literature on gender differences in academe does not generally correct for sample selectivity.

tastes for different disciplines and/or the impact of crowding on female salaries. Our results would therefore suggest that the salary advantage for academics in the faculty of medicine might reflect high demand for these skills from the external labour market, preferential investment into this faculty by universities[22] and/or the impact of the male domination of the faculty of medicine, although the latter of these explanations is rejected due to the large number of women in the faculty of medicine. Similarly the salary disadvantage of academics in the faculty of arts may reflect the low external value of the skills required within this subject area, less investment into this faculty by universities and/or the impact of the female domination of the faculty of arts.

Productivity variables such as the number of books published, an individual's publication rate, administrative responsibility and the number of offices held are, as expected, positively rewarded[23], approximately half of this effect is accounted for by the seniority of staff. Individuals who completed their first degree at the same university as their present job incur a salary premium, as do individuals who completed their PhD at either Oxford or Cambridge[24]. These variables indicate a reward to individual's ability, firstly, to compensate for foregone earnings while training was taking place, secondly, to reward an increase in productivity[25], acknowledged firstly through a university's insider knowledge of the quality and content of an individual's training and performance, and secondly by the reputation of the university studied at. Mobility in previous experience is also positively rewarded[26], the number of previous posts held has a positive influence on salary.

Academics in the universities of Aberdeen, Dundee, Heriot-watt and St.Andrews all experience a significant salary advantage over the comparator university Glasgow. This is an interesting finding,

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[21] McNabb and Wass (1997) also find this effect for academic staff in old established UK universities over the years 1992, 1985 and 1975.

[22] Medical faculties have separate salary scales to keep academic salaries competitive with those paid to the medical profession in general.

[23] Dropping these productivity variables from regression analysis increases the dummy coefficient on gender from .077 to .089. Just under 14% of an academic's salary is therefore dependent on an individuals' productivity. This compares with Barbezat's (1991) 25% estimate for US academics and reflects the much greater reliance of American salaries on individual performance in the absence of a formal salary structure.

[24] The coefficient on this variable halves with the inclusion of dummy variables for rank. This is consistent with the larger number of older and more senior academics who studied at Oxbridge which we find in the data set.

[25] Baimbridge and Simpson (1996). For the academic labour force it is likely that the latter of these two effects will predominate. The holding of an MSc or PhD in itself was not significant in regression analysis. This implies that such a qualification can only be a prerequisite for entry to the academic profession. Reward to a degree from one's current institution, Oxford or Cambridge therefore implies a reward to an acknowledged quality of qualification.

given that salaries are set on a nationally agreed pay scale and reveals a flexibility in interpretation of salary grades by awarding universities.

Finally, the exclusion of some variables from regression analysis is also in itself interesting. The variable for non-UK citizenship was not significant and was excluded from the regression presented. There is therefore no apparent advantage in academia for citizens above non citizens. The marriage dummy variable was also not significant[27]. Marital status therefore does not effect the reward to an individual's career. The presence of children under 16 however does attract a positive reward to academic's salary (KID2 is positive and significant). Finally, high teaching ability was not found to be rewarded in the academic profession.

It is necessary to comment on the relatively large constant term found in all the regressions for academic salary in this paper. A large constant term may be interpreted as suggestive of omitted variable bias, that is, that the explanatory variables are inadequate or inappropriate to reveal the determinants of earnings[28]. In the present analysis, however, the data provided by the use of a postal questionnaire is particularly detailed in the information concerning individual characteristics. Previous studies of the UK academic labour market by Baimbridge and Simpson (1996), and McNabb and Wass (1997) have also found very large constant terms in regression analysis. It is therefore most likely that the large constant term is symptomatic of a formal salary scale where progression up a point on a salary scale occurs annually, with a certain degree of automation.

4. The determinants of academic salary by gender.

Regression analysis is also undertaken separately for men and women to catch any gender differences in salary determination. The results of this analysis are presented in columns 3 and 4 of table 2 excluding dummy variables for rank and columns 5 and 6 including them. The returns to age are found to be greater than the returns to tenure for both men and women. Returns to tenure are greater for female academics than male. McNabb and Wass (1997) attribute the lower returns to

[26] Consistent with the findings of Ferber and Green (1982).
[27] Consistent with the findings of Barbezat (1987).

men to the fact that at more senior levels, tenure has a negative effect on earnings and that senior ranks account for a larger proportion of male than female staff[29]. In the current study, inclusion of rank variables yields the effect of tenure as a positive, but insignificant determinant of male salary[30]. We find no negative effect of tenure on salary at more senior levels (see table 3)[31]. The insignificance of tenure and its square together with the negative significance of the JOB1SAME variable in the male regression including rank indicates that male academics receive a salary penalty if their last position was also in the institution of their current job. This suggests the importance of mobility as a determination of a male academic's salary *across* ranks[32]. Hoffman (1997) considering data for 1991-92 from Western Michigan University and data from 22 institutions in Illinois in 1993 suggests that salary compression (new hires receiving a higher salary with similar qualifications than existing staff[33]) is occurring when the coefficient for salary is reduced or negative, the result of experienced faculty moving between institutions, most usually to institutions which are aggressively hiring to expand or improve or maintain the quality of their faculty. Conversely, a positive return to tenure seniority is found in universities with little hiring, where the university is not expanding, or where it is satisfied with the quality of their faculty. This argument implies that salary compression may explain the negative salary effect across ranks experienced by male academics staying in more than one position in their current institution. Hiring by Scottish universities to maintain or improve the quality of staff is consistent with a research environment driven by research assessments. Unlike American results, however, we find this effect occurring across ranks for male staff. Again, this is consistent

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[28] See Jones (1983) and Chiplin and Sloane (1982) for a discussion of this.

[29] Ransom (1993) analysing national data from 1969 to 1988 and data from the University of Arizona for 1972, 1977 and 1982 shows that analysis at both a national and institutional level reveals university professors' higher seniority is associated with lower salaries, but experience is positively related to salary. He argues these negative returns to job tenure are the result of mobility costs for faculty and the exercise of monopoly power by universities - individuals with high moving costs receive lower salary offers and have higher seniority than individuals with low moving costs. Brown and Woodbury (1995) analysing data for 1981, 1986 and 1990 consider returns to seniority and the degree to which these returns respond to entry level salaries at Michigan State University and find some evidence to support Ransom's findings.

[30] Brown and Woodbury (1995) suggests that the wage tenure profile may vary over time and may be sensitive to entry market conditions in an academic's field. They propose the finding of a flat or negative return to job tenure reflects the unimportance of university-specific skills in academic labour markets as teaching and research skills are easily transferable.

[31] Hallock (1995) examines a single institution and finds no evidence of a negative return to seniority, raising doubts to the existence of declining wage tenure as a general rule of higher education institutions.

[32] Weight is given to this proposition by the finding of negative coefficient on the job1same variable across rank in table 3.

[33] Higher salaries might be offered to new hires over promoted current faculty as an incentive to attract new individuals and compensate them for costs incurred.

with research assessment exercises based on the assessment of *all* staff grades within a department. There is therefore an incentive for departments to attract the best individuals across ranks.

The positive effect of tenure on salary for female staff might be explained by the high proportion of young and contract staff in the data set many of whom are likely to be new hires, the lower mobility of female staff, or that universities are recruiting fewer female staff[34]. An alternative explanation may be put forward by Ransom (1993) who notes that a positive correlation between salary and seniority or tenure may be observed in a cross section, even if salary does not increase with tenure for individuals because well matched individuals are highly paid and will stay with their firm, whereas poorly matched individuals receive low wages and are therefore more likely to leave the firm to search for a better job. As a result, average wages increase with tenure.

Rank and full-time work have a strong effect on the annual salary of both male and female academics although the reward to promotion is substantially greater for women than men, shown by their larger coefficients on the dummy variables for rank. The larger coefficients on dummy variables for rank in the case of women implies either that they are less well paid than men in the rank below on promotion or that they were given more substantial increases on promotion than men. It could also be that more substantial increases are given when moves are made from temporary (research assistant) jobs to lectureships. Table 3 indicates that the gender salary differential is widest at the level of researcher and narrowest at the rank of professor. Strober and Quester (1977) argue that such narrowing may be the result of discrimination and the later promotion of women in all faculties in relation to their male counterparts[35]. Bonuses associated with faculty attainment are noticeably larger for women in relation to the default faculty arts. This result suggests some weak support for a crowding type hypothesis[36]. Differential reward by university reveals a larger reward to male staff in Aberdeen and Dundee universities and female staff in Heriot-Watt and St.Andrews universities in comparison with the omitted category University of Glasgow.

[34] Either because they are satisfied with the quality of their current female staff, because of a shortage of quality females in the applicant pool, or because of discrimination.
[35] Detailed examination of differential promotion opportunities by gender falls outside the bounds of this paper, but is the subject of future work.

Accounting for rank, a significantly positive premium is paid to male academics for increased publication, administrative responsibility and the attainment of office[37]. The insignificance of the corresponding female coefficients on these variables[38] is most likely explained by the large number of female academics in the lower rungs of academia who have not yet established a publication record and for the small number of female academics in the higher rungs of academia, those most likely to hold office and administrative responsibility. An alternative explanation is that female academic staff are not being rewarded for their publication[39]. Females are penalised less than males for time out of the labour market, males suffer five times the salary disadvantage of females for a month away from work[40]. The final effect worth commenting upon is the finding of a significant positive effect of discretionary awards on salaries for male academics alone.

5. Decomposition of the gender salary gap

Turning to decomposition of the gender salary gap, tables 3 and 4 present results of the decomposition exercise excluding and then including dummy variables for rank. The aggregate gender salary differential for academic staff is found to be 0.26 or around 30%. This is larger than the 16% gap quoted by the AUT for 1990 and the 15% differential found by McNabb and Wass using 1992 data and reflects the inclusion of research assistants in our analysis. Indeed, if we exclude these individuals from the data set the differential falls to 0.16, or 15%, identical to McNabb and Wass's (1997) estimate. We find that excluding rank, one quarter of the gender differential remains even after controlling for measured characteristics and represents the upper bound of discrimination. When rank is included, however, this unexplained proportion is reduced to just over one tenth of the salary differential. This is substantially lower than estimates in other labour markets and the

[36] Women employed in more male dominated faculties receive a higher salary than women in less male dominated faculties (Baimbridge and Simpson 1996). Evidence for this effect is weak because there is a high proportion of women in the faculty of medicine.
[37] Consistent with the findings of Tuckman, Gapinski and Hagemann (1977).
[38] Pounder (1989) also finds an insignificant effect of publication on salary.
[39] Ward and Sloane (1999) find that although increased publication has a significantly positive effect on male satisfaction with their salary, its effect on female satisfaction is significantly negative. Thus, at a given salary, relatively highly published men are more satisfied with their salary than relatively highly published women.
[40] McMillen and Singell (1994) studying the first job choice of economists using data on PhD economists from the period 1960 to 1989 find that the top fifty US schools appear to reward an average female less than a male counterpart for 'good traits' but penalise her less for 'bad traits'.

unexplained proportion of McNabb and Wass (1997) and reflects the detail of variables included in analysis. Information on productivity is therefore essential for separate estimates of the unexplained proportion of the gender salary gap. Considering the individual contributions of each of the explanatory variables (table 5) reveals that rank alone explains 40% of the total gender salary differential. The limited advancement of women in Scottish universities can therefore be argued as the main determinant of their lower average salary.

Four other factors dominate the explanation of the gender salary gap. The importance of age reflects the older average age of male academics in the data set and the fact that yearly progression up a the fixed salary framework of the UK labour market is related to age. McNabb and Wass (1997) suggest that this effect might also reflect lower female returns to age, either with female academics being appointed at lower points on salary scales, or benefiting less from accelerated progression on within rank scales. Full-time work and time out of work are also important contributory factors to the explanation of the gender gap. This suggests that women are losing out through taking time out of work, or reducing their hours of work per week. There is therefore limited opportunity to combine an academic career with a family without financial loss. Finally, faculty attainment is an important factor furnishing the gender salary divide[41]. The importance of being in the faculty of medicine reflects the higher salary scale for some staff within this faculty and the greater proportion of male academics who are paid on it.

6. Conclusion.

Our analysis of salary in academia has uncovered a number of interesting effects. A gender salary differential of between 15 and 30% is uncovered. As appointments, starting salaries, salary progression and promotion decisions are formally structured in the UK academic profession, we might therefore expect to find that women hold very different characteristics and/or exhibit different preferences to men, that affect their salary. Examination of female preferences fall outside the bounds of this paper, but are the subject of future work. We do find that on average women are

[41] McNabb and Wass (1997) find a very high gender differential in the faculty of medicine which has increased over the period 1985-1992.

younger, have less labour market experience, have lower rates of publication and are crowded in lower ranks and certain subject areas. Only 10% of the differential remains once controlling for these features.

Rank, age, full-time work, time out of the labour market and faculty affiliation are revealed to be the largest contributors to the gender salary gap in the academic profession. This suggests limited room for the combining of an academic career and a family for female academics, despite the appearance of a flexible working environment, and lends support to the worries of the AUT (1992). The dominant contribution of rank to both the determination of female academic salaries and the gender salary gap suggests vastly differential opportunities for promotion faced by men and women and problems for women researchers on short term contracts.

Analysis of the determinants of academic salary reveal the insignificant effect of tenure on salary and the significantly negative effect of holding two consecutive jobs at the same institution in the male salary regression stressing the importance of mobility to a male academic career. Results also highlight the importance of publication, administrative responsibility, external examiner duties and offices in attracting financial reward. Teaching ability is absent from significant reward. A progressive series of policies to address the gender imbalance currently active in the academic profession might be recommended, including measures to reduce the high proportion of short term contracts at researcher level and implementation of anti-discrimination policy at the level of promotion review.

Table 1: Variable List and summary statistics.

Variable	Definition	Means		Std. Dev.	
		Females	Males	Females	Males
ABERDEEN	=1 if respondent works in the university of Aberdeen, =0 otherwise	.126	.186	.332	.389
ADMIN	=1 if respondent holds administrative duty, =0 otherwise	.017	.055	.130	.228
AGE36OVR	=1 if respondent is over the age of 36, =0 otherwise	.390	.695	.489	.461
ARTS	=1 if respondent works within the faculty of arts, =0 otherwise	.164	.178	.371	.383
BOOKS	The number of books published by a respondent	.392	1.44	1.250	2.848
DISCREC	Number of discretionary awards received in total	.304	.645	.822	1.032
DUNDEE	=1 if respondent works in the university of Dundee, =0 otherwise	.337	.182	.473	.387
ENGINEER	=1 if respondent works within the faculty of engineering, =0 otherwise	.045	.150	.208	.358
FULLTIME	=1 if respondent works over 30 hours per week, =0 otherwise	.902	.958	.297	.204
GLASGOW	=1 if respondent works in the university of Glasgow, =0 otherwise	.337	.357	.474	.480
HERIOTWT	=1 if respondent works in the university of Heriot-Watt, =0 otherwise	.018	.101	.131	.301
JOB1SAME	=1 if respondent's last job was in the university of their current position, =0 otherwise	.130	.137	.337	.345
KID2	=1 if respondent has children under the age of 16, = 0 otherwise	.370	.389	.484	.488
LECTRER	=1 if respondent is a lecturer, =0 otherwise	.320	.353	.467	.478
MED	=1 if respondent works within the faculty of medicine, =0 otherwise	.452	.205	.499	.404
NUMPOSTS	Number of posts held over working life	3.629	3.402	2.422	1.874
OXBRDEG3	=1 if respondent gained their Ph.D. at Oxbridge, =0 otherwise	.036	.128	.187	.334
OFFICES	Number of university offices held in total	.456	1.360	1.366	3.642
PRODPUB	Respondent's publication rate (=number of articles published/length of academic work experience) Academic work experience is derived from detailed reports of individuals work histories, or where this information is missing or not detailed enough it is derived from : age - start of first job - length of any breaks from work - work outside academia	.843	1.912	1.003	6.224
PROFFOR	=1 if respondent is a lecturer, =0 otherwise	.025	.220	.156	.414
RESCHER	=1 if respondent is a researcher, =0 otherwise	.483	.145	.501	.352
SAMEDEG1	=1 if respondent gained their first degree at the university of their current position, 0 otherwise	.280	.206	.450	.405
SAMEDEG3	=1 if respondent gained their Ph.D. at the university of their current position, 0 otherwise	.219	.178	.415	.383
SCIENCE	=1 if respondent works within the faculty of science, =0 otherwise	.166	.294	.373	.456
SENREAD	=1 if respondent is a senior lecturer or reader, =0 otherwise	.102	.257	.303	.437
SEX	=1 if male, =0 if female				
SOCSCI	=1 if respondent works within the faculty of social science, =0 otherwise	.164	.167	.371	.373
STANDREW	=1 if respondent works in the university of St. Andrews, =0 otherwise	.183	.175	.388	.380
TENURE	Length of time with current employer, measured in years	5.307	12.409	9.741	11.173
TENURESQ	Tenure squared	122.703	278.599	768.287	452.036
TIMEOUT	Time out of the labour force, measured in months	1.231	.131	3.227	.645
GLASGOW	=1 if respondent works in the university of Glasgow, =0 otherwise	.337	.357	.474	.479

Figure 2 Average Salary of men and women by rank

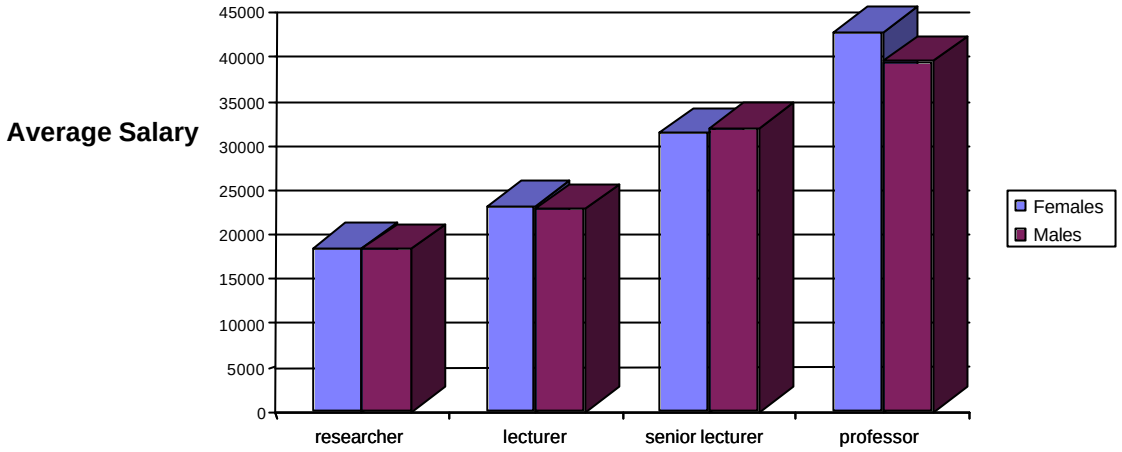

Figure 3 Average Salary of men and women by faculty

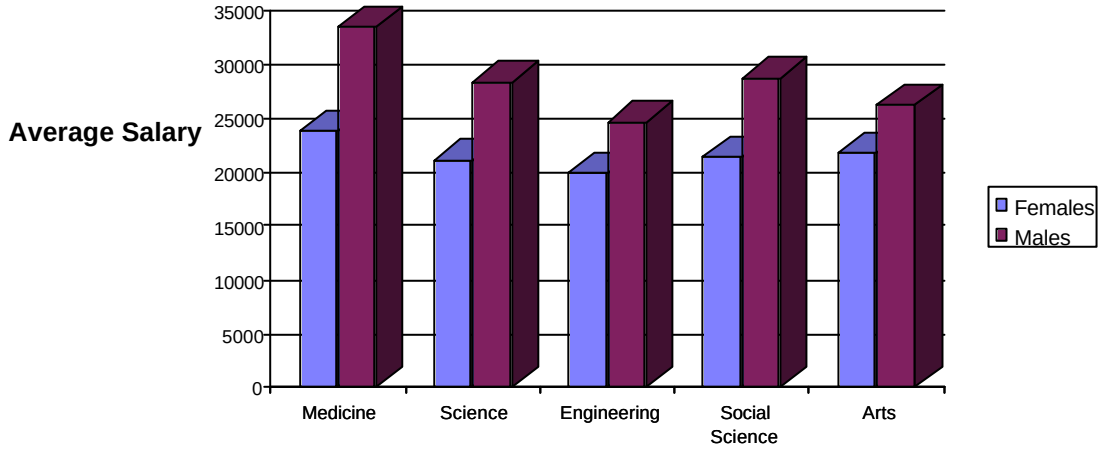

Figure 4 The relationship between salary and tenure

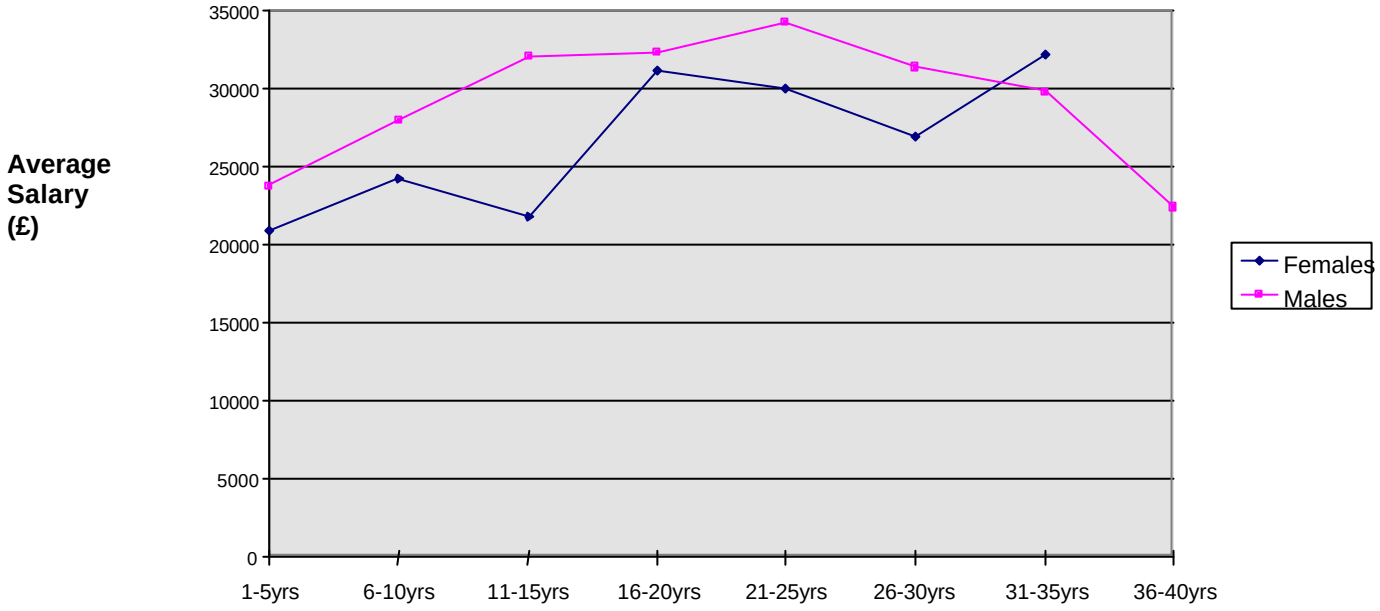

Table 2: OLS Human capital regression, dependent variable: Log of salary.

Variable	*All*	*All*	*Females*	*Males*	*Females*	*Males*
SEX	.077***	.032				
	(.029)	(.028)				
AGE36OVR	.283***	.192***	.282***	.286***	.169***	.207***
	(.032)	(.032)	(.058)	(.034)	(.069)	(.032)
TENURE	.006***	.002	.010*	.006***	.010**	.003
	(.002)	(.002)	(.005)	(.002)	(.005)	(.003)
TENURESQ	-.00007***	-.00004*	-.0001*	-.00009*	-.0001**	-.00007
	(.00002)	(.00002)	(.00006)	(.00005)	(.00005)	(.00007)
FULLTIME	.695***	.652***	.596***	.842***	.565***	.791***
	(.119)	(.120)	(.161)	(166)	(.158)	(.168)
BOOKS	.016***	.006	.005	.016***	.008	.006
	(.005)	(.005)	(.017)	(.004)	(.015)	(.005)
PRODPUB	.004***	.002**	.037	.003***	.017	.002***
	(.002)	(.001)	(.020)	(.001)	(.021)	(.0008)
ADMIN	.222***	.154***	.304***	.177***	.138	.118***
	(.040)	(.042)	(.127)	(.040)	(.187)	(.041)
SAMEDEG1	.068**	.070**	.028	.010***	.044	.092***
	(.034)	(.032)	(.0470	(.038)	(.044)	(.036)
OXBRDEG3	.101***	.055*	.254*	.071***	.227*	.033
	(.033)	(.033)	(.141)	(.026)	(.146)	(.023)
JOB1SAME	-.031	-.005	.120	-.131***	.119	-.097**
	(.050)	(.048)	(.092)	(.041)	(.087)	(.039)
ABERDEEN	.086***	.046*	.037	.097***	.005	.057*
	(.032)	(.029)	(.070)	(.033)	(.062)	(.031)
DUNDEE	.077***	.050**	.006	.128***	.007	.089***
	(.027)	(.025)	(.040)	(.036)	(.039)	(.034)
HERIOTWT	.090***	.064**	.266***	.108***	.171***	.081***
	(.035)	(.033)	(.056)	(.038)	(.069)	(.035)
STANDREW	.119***	.120***	.216*	.070*	.244**	.053*
	(.049)	(.050)	(.125)	(.038)	(.124)	(.035)
ENGINEER	.094**	.075*	.181*	.051	.196*	.015
	(.049)	(.047)	(.111)	(.042)	(.112)	(.041)
MED	.233***	.205***	.260***	.230***	.307***	.169***
	(.049)	(.042)	(.088)	(.046)	(.091)	(.046)
SCIENCE	.114***	.102***	.224*	.071***	.280**	.043
	(.042)	(.042)	(.123)	(.029)	(.128)	(.030)
SOCSCI	.124***	.105***	.252***	.076*	.250***	.050
	(.039)	(.039)	(.093)	(.043)	(.090)	(.041)
KID2	.078***	.058***	.074	.045**	.064	.028
	(.024)	(.024)	(.059)	(.024)	(.057)	(.022)
TIMEOUT	-.014***	-.009*	-.012*	-.044***	-.006	-.031***
	(.005)	(.006)	(.008)	(.016)	(.008)	(.013)
OFFICES	.012***	.005**	.017*	.014***	.004	.008***
	(.004)	(.003)	(.011)	(.004)	(.010)	(.003)
NUMPOSTS	.027***	.025***	.034***	.024***	.029***	.025***
	(.007)	(.006)	(.014)	(.007)	(.012)	(.006)
DISCREC	.028***	.014*	.028*	.033***	.010	.021***
	(.009)	(.008)	(.017)	(.009)	(.015)	(.009)
LECTRER		.083***			.137***	.043
		(.032)			(.055)	(.041)
SENREAD		.272***			.309***	.223***
		(.048)			(.097)	(.053)
PROFFOR		.402***			.610***	.342***
		(.053)			(.137)	(.054)
CONSTANT	8.803***	8.876***	8.754***	8.794***	8.75***	8.871***
	(.127)	(.132)	(.227)	(.162)	(.227)	(.169)
No of obs.	723	723	241	482	241	482
R^2	.60	.65	.51	0.65	.55	.71
Adjusted R^2	.59	.64	.46	.64	.50	.69

*** indicates significance at 1% level, ** indicates significance at 5% level, * indicates significance at 10% level. Following tests for heteroskedasticity, all reported results show t-ratios derived from heteroscedastic-consistent standard errors using White's (1980) procedure. Normality tests could not reject the null hypothesis that the

errors of the equation are independently and normally distributed.

Table 3: OLS Human capital regression by rank, dependent variable: Log of salary.

Variable	***Researchers***	***Lecturers***	***Senior lecturers***	***Professors***
SEX	.098***	-.031	.034	.013
	(.032)	(.033)	(.061)	(.178)
AGE36OVR	.067	.185***	-.122	.291*
	(.0750	(.029)	(.092)	(.165)
TENURE	.005	.004	.0001	.029***
	(.008)	(.003)	(.009)	(.011)
TENURESQ	-.00006***	-.00006*	-.0001	-.001***
	(.00008)	(.00003)	(.0003)	(.0004)
FULLTIME	.580	.702***	1.126***	.940***
	(.132)	(.146)	(.310)	(.383)
BOOKS	-.008***	.013*	.012	.002
	(.042)	(.008)	(.008)	(.0060
PRODPUB	.052*	.029**	-.025	.0008
	(.017)	(.015)	(.021)	(.0006)
ADMIN	.369***	.111*	.064	.056
	(.220)	(.073)	(.083)	(.053)
SAMEDEG1	.106*	.051*	.002	.019
	(.045)	(.027)	(.059)	(.067)
OXBRDEG3	.167	.101*	-.028	-.056
	(.101)	(.065)	(.037)	(.058)
JOB1SAME	-.056	-.051	.171**	-.137*
	(.046)	(.055)	(.087)	(.077)
ENGINEER	-.027***	.069	.086	-.038
	(.061)	(.048)	(.077)	(.105)
MED	.189	.100*	.200***	.185**
	(.050)	(.060)	(.066)	(.095)
SCIENCE	.062***	.057	.0004	.017
	(.046)	(.047)	(.033)	(.069)
SOCSCI	.206***	.037	-.006	-.062
	(.081)	(.040)	(.037)	(.076)
KID2	.131	.089***	-.031	-.058
	(.058)	(.029)	(.030)	(.047)
TIMEOUT	.003	-.025***	-.034	.107
	(.005)	(.011)	(.026)	(.130)
OFFICES	-.033	.016	-.006	.005
	(.046)	(.017)	(.007)	(.006)
NUMPOSTS	.013	.013	.004	.031***
	(.009)	(.011)	(.009)	(.013)
DISCREC	.008***	.014	-.004	-.003
	(.017)	(.014)	(.014)	(.014)
CONSTANT	8.943	9.046***	9.360***	9.104***
	(.142)	(.158)	(.342)	(.462)
No of observations	219	235	141	103
R^2	.60	.51	.59	.52
Adjusted R^2	.60	.46	.52	.40

*** indicates significance at 1% level, ** indicates significance at 5% level, * indicates significance at 10% level. Following tests for heteroskedasticity, all reported results show t-ratios derived from heteroscedastic-consistent standard errors using White's (1980) procedure. Normality tests could not reject the null hypothesis that the errors of the equation are independently and normally distributed.

Table 4: Decomposition of the gender wage differential excluding rank.

Observed wage differential	***0.26***
Justified	0.20
Unjustified	0.06
Total	0.26

Table 5: Decomposition of the gender wage differential including rank.

Observed wage differential			***0.26***
Justified			0.23
Variable Contribution:		%	
Age36ovr	0.063	(27.28%)	
Tenure	0.020	(8.47%)	
Tenuresq	-0.01	(4.11%)	
Fulltime	0.043	(18.64%)	
Books	0.006	(2.52%)	
Prodpub	0.002	(0.85%)	
Admin	0.004	(1.92%)	
Samedeg1	-0.007	(2.97%)	
Oxbrdeg3	0.003	(1.33%)	
Job1same	-0.001	(0.31%)	
Aberdeen	0.003	(1.49%)	
Dundee	-0.014	(5.96%)	
Heriotwt	0.007	(2.93%)	
Standrew	-0.0005	(0.20%)	
Engineer	0.002	(0.67%)	
Med	-0.042	(18.19%)	
Science	0.006	(2.39%)	
Socsci	0.0001	(0.05%)	
Kid2	0.0005	(0.22%)	
Timeout	0.034	(14.71%)	
Offices	0.007	(3.13%)	
Numposts	-0.006	(2.43%)	
Discrec	0.007	(3.15%)	
Lectrer	0.001	(0.63%)	
Senread	0.035	(14.98%)	
Proffor	0.067	(28.82%)	
Unjustified			0.03
Total			0.26

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