

# **Schooling, Experience and Performance: Payroll Evidence from a Financial Sector Firm**

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## Abstract

We analyse the determinants of earnings for both managerial and staff employees, using a unique dataset from a large financial sector firm. The returns to college are associated with 9% higher salaries compared to workers with lower education, even after controlling for general and firm experience, hierarchical position, performance ratings, gender, ethnicity and several other factors. Returns to college are larger for inexperienced workers, while returns to experience are greater for low-educated workers. Managers have higher returns to general experience compared to staff workers and negative returns to firm tenure. When performance is good wages are almost two times higher for college graduates and for managers, whereas only low-educated workers are penalized for bad performance. A large fraction of the returns to education functions through job hierarchy, while the inclusion of performance measures does not influence the impact of schooling on earnings. Returns to experience and firm tenure are similar for high and low-educated workers in the first five years but become insignificant subsequently for highly educated workers. Asymmetric information is the key factor explaining the combination of these findings related to earnings inequality.

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## 1. Introduction

The generation and distribution of income in a society is the main economic problem. Economists and social scientists highlight the significance of human capital and skills, acquired through education and experience, in explaining economic inequality and social progress. Human behaviour and market forces lead to a highly unequal allocation of resources across countries, industries, firms, skill groups, and between managers and workers within the same or in different businesses. The determinants of this uneven distribution are numerous which makes it difficult to disentangle the fundamental causes from confounders. Economists have therefore concentrated on identifying the impact of education, experience and productivity, on key variables, such as growth, income or earnings.

Most existing studies focus on cross-country comparisons or examine the returns to education and experience within a country.<sup>1</sup> This study contributes to a rather different branch of the literature, as it focuses on explaining earnings differences at the firm level and in particular within a large financial sector firm.<sup>2</sup> Utilising a unique and detailed payroll dataset for both managers and staff workers we examine the impact of key factors, such as education, general experience, firm tenure and performance on earnings. Importantly, our results shed some light on how education and experience interact and affect wages for different skill groups, as well as why the same performance pays workers differently depending on how well educated they are or on where there are positioned within the firm hierarchy. Our approach also enables

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<sup>1</sup> For a recent cross-country study on the impact of education and experience on wages see Krueger et al. (2010), while Heathcote et al. (2010) and Blundell and Etheridge (2010), offer similar evidence for the US and the UK respectively.

<sup>2</sup> Some of the existing studies in labor and personnel economics which analyze earnings within a firm include, Baker et al. (1994), Lazear (2000), Treble et al. (2001) and Kahn and Lange (2014), among many others.

us to compare and contrast firm-level findings with aggregate results from related studies and derive interesting policy implications.

Following the seminal contributions by Becker (1964) and Mincer (1974), and based on the observed declining influence of physical capital, economists called the era following the first half of the twentieth century as the age of human capital. According to Becker's (1964) human capital approach education enhances productivity. Nevertheless, boosted productivity is not the only effect that education has on earnings. Spence's (1973) education signalling approach suggests that in the presence of asymmetric information schooling conveys information about worker ability to uninformed firms. Similarly, experience influences earnings by increasing productivity but it can also boost salaries by allowing employers to observe the hidden talents of their workers. This paper contributes to these debates regarding the informational and the fundamental components of education and experience by showing that after controlling for various other factors, the wage benefits from education and experience are very different for different groups of workers.

In particular, the literature has highlighted the large and increasing impact of education on wages, typically associating the education premium with the skill-biased technical change, as in Katz and Murphy (1992), Acemoglu (1998), Kiley (1999) and Autor et al. (2008), among others.<sup>3</sup> Card and Lemieux (2001) show that the education premium increases much more for young and inexperienced workers. Nevertheless, studies on the experience premium are much scarcer.<sup>4</sup> Weinberg (2004) is one of the few who observe that the experience premium increased much more for low-educated workers. Caselli (2015) offers an explanation for this

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<sup>3</sup> Acemoglu (2002), Hornstein et al. (2005) and Acemoglu and Autor (2011) review this literature, while Card and DiNardo (2002a) criticize this explanation.

<sup>4</sup> Some counter examples are based on skill-biased technical change with on-the-job training (Heckman et al., 1998), general purpose technologies (Aghion et al., 2002), technology-experience complementarity in adoption (Weinberg, 2004) and vintage human capital (Hornstein et al., 2005)

pattern based on the declining importance of physical strength possessed typically by young and inexperienced workers leading to experience-biased technical change; EBTC. Jeong et al. (2015) justify this based on demographics, while Koutmeridis (2015) grounds this on the falling productivity among unskilled-inexperienced workers.

This paper contributes to this dense literature and sheds further light on these findings for the aggregate economy, using personnel records that include performance measures, among other features, and allows the distinction between general experience and firm tenure for both managers and staff workers. In particular, some of the insightful predictions of the existing literature hold even after controlling for various other characteristics which are usually missing from most datasets, such as that education is more important for inexperienced workers while experience is more vital for low-educated employees. However, other results from previous studies are not consistent with our findings, which suggest that general experience and firm tenure evolve very differently for different education groups or for managers at the firm level. We show that distinguishing the former from the latter findings is key in understanding the determinants of earnings. Importantly, we also find that performance yield different returns to different groups of employees. In fact, when performance is good wages increase almost two times more for college graduates and managers. In contrast only low-educated workers are penalized for bad performance.

We interpret the combination of these results as being indicative of the importance of asymmetric information in the labour market, as the acquisition of transferrable market qualities, such as a college education degree or a higher ranked position, allows employees to exploit fuller the fruits of their work in their current firm, potentially by having the option to move to other firms.

The remainder of the paper is structured as follows. Section 2 explores theoretical aspects of the determinants of earnings. Section 3 describes the data from this large financial

sector firm and offers some descriptive analysis. Section 4 reports the modelling approaches we implement and presents the empirical results. Section 5 offers an interpretation and discusses our results. Section 6 gives some concluding remarks. Appendices A, B and C provide some descriptive statistics, the hierarchical organisation of this financial sector firm and variable definitions respectively.

## **2. Modelling Issues on the Determinants of Earnings**

The literature documents the main determinants of earnings variation across workers and some of the key variables affecting wages include education, experience, gender, race, etc. Since Mincer's (1974) seminal work, economists realized the vital influence of education and experience on wages and provided theoretical foundations to empirical labour economics, as they used utility maximisation models to derive the standard log wage regression.<sup>5</sup> The basic empirical model can be written in the following cross-sectional form:

$$\text{Log}W_i = \alpha + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \text{Controls} + \varepsilon_i \quad (1)$$

Where  $i$  stands for individual,  $W$  for wage or earnings,  $S$  for schooling,  $X$  for experience, while  $\varepsilon$  is the error term. Equation (1) indicates the influence of education and experience on wages, which according to many studies has increased during the past four decades.<sup>6</sup> This increasing

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<sup>5</sup> See Acemoglu and Autor (2011) for a full derivation of the Mincerian log wage regression.

<sup>6</sup> Employing one of the most widely used datasets, the Current Population Survey, which is representative for the US labour market, Koutmeridis (2013) shows that for white males the predictive power of this simple cross-sectional regression was 23 percent in 1963 and increased to 33 percent in 2008, the returns from an additional year of education doubled from 6.3 percent to 12.2 percent and the returns from an additional year of experience increased from 3.6 percent to 5 percent (see his Table 1).

influence of education and experience on earnings represents one of the most important recent developments in the labour markets.

Even though education seems to affect wages in a linear fashion, experience appears to have a nonlinear influence on wages.<sup>7</sup> That is why the inclusion of a quadratic term on experience in equation (1) provides an improved fit of the data. Additionally, controls typically include gender and ethnic background and may include other indicators related to geographic region of employment, among others.

Apart from education and experience, there are other important determinants of wages, which are typically missing from most datasets. One such variable is tenure in the firm, which has to be distinguished from general experience. The inclusion of tenure  $T$  and its quadratic term transforms (1) to the following equation:

$$\text{Log}W_i = \alpha + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 T_i + \beta_5 T_i^2 + \text{Controls} + \varepsilon_i \quad (2)$$

These are some key factors that influence wages in the aggregate economy. When we focus our attention on wage differences inside a firm, additional determinants may play a key role, such as performance observations and the hierarchical position of workers.

$$\text{Log}W_i = \alpha + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 T_i + \beta_5 T_i^2 + L_i Z + E_i \Theta + H_i \Delta + P_i \Gamma + \varepsilon_i \quad (3)$$

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<sup>7</sup> Although the literature typically uses only a linear education term, it is worthwhile mentioning that according to Card (1999) the cross-sectional relationship between education and wages can also be nonlinear due to individual heterogeneity that modifies the standard wage regression with the inclusion of a person-specific constant and a quadratic term on education.

Equation (3) incorporates all these factors that set the level of wages  $W$ , namely schooling  $S$ , general experience  $X$ , firm tenure  $T$ , vectors of dummy variables for the geographic region or location of employment  $L$ , the ethnic group of origin  $E$ , the position rank or hierarchy in the firm  $H$  and the evaluation of performance for each employee  $P$ , plus an error term  $\varepsilon$ , for each individual  $i$ . This is our preferred specification that we bring to the firm-level payroll data and we use for our baseline cross-sectional results.<sup>8</sup>

### **3. Payroll Data from a Large Financial Sector Firm and Descriptive Statistics**

The data used is based on personnel records of British operations of a financial sector firm over the period January 1989 to November 2001. Personnel records are collected in the form of monthly snapshots on the first day of each month, coinciding with the date where monthly payment transfers are made. At the same time careers in terms of job grades, qualifications, payroll data and biographic information on all employees are also updated. For the purpose of our analysis, these personnel records include a unique identifier for each employee as well as salary, educational qualification on entry, performance ratings, hierarchical grade of employment, regional area of employment, age, gender and ethnic origin.

Our analysis focuses on full-time employees. On average 40,000 of them are employed by the firm on a yearly basis. The cross-sectional analysis covers 22,729 employees employed in the year 2000 for whom data on educational attainment on entry to the firm and a valid performance rating is available. Of these  $n = 11,341$  are men and  $n = 11,388$  are women (see Table A1 in Appendix A). The panel data analysis is based on a balanced sample over the entire period resulting in  $n = 7,370$  employees generating 95,810 year on year observations. For the panel data analysis the male sample size is  $n = 3,750$  and the female sample size is  $n = 3,621$ .

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<sup>8</sup> We use a modified version of this for our panel data approach.

The internal hierarchy of the firm is broadly split into staff and managerial grades. Together these are further split into 14 grades.<sup>9</sup> A graphical presentation is shown in Appendix B. The firm refers to these grades, moving from the bottom to the top of the hierarchy, as induction grade (S01), junior staff grades (S02 and S03), senior staff grades (S04 and S05), junior management grades (M93 and M94), middle management grade (M95), senior management grade (M96) and the executive management (M97-M99) with two unclassified grades, S00 and M00, comprising employees in staff or managerial grades that are ungraded at the time we observe these in the data and could therefore occupy any of the staff or managerial grades respectively.

Overall performance during the year is measured on a five point scale. The ratings are unsatisfactory performance (1), improvement required (2), good (3), high (4) and outstanding (5). Each employee's performance is reviewed annually. Individual pay awards in the bank do take account of performance and comparisons with the salaries of other individuals with the same or similar responsibilities and skill levels.

Educational attainment describes qualification on entry to the firm and grouped into degree level education, further education, A-level or equivalent, and O-level or equivalent. We also derived the number of years of schooling on entry to the firm for each employee.

Pre-company service is defined as age minus schooling minus company service minus five. Seniority is derived from the date of entry to the firm. All variables are defined in Appendix C. We break down our analysis not only by gender but also by staff and managerial grades for both the cross-sectional and panel data analysis.

Descriptive statistics for the cross-sectional samples for the year 2000 are shown in Table A1 for the overall sample and by gender, Table A2 for staff grades by gender and Table

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<sup>9</sup> The internal hierarchical organisation of this large financial sector firm is also discussed in Treble, et al. (2001).



A3 for managerial grades by gender. Table A4-A6 show respective descriptive statistics for the panel data samples.

Mean earnings amongst employees in the year 2000 are £24,076. Mean earnings for women fall short of those for men and the same holds true when comparing men and women in staff and managerial grades (Tables A2 and A3). It is worth noting that average salary differences between men and women in managerial grades are considerably larger compared to staff grades.

We observe differences in where men and women are employed in the hierarchy of the firm. Of all employees in staff grades, 34% are men whereas 66% are women. The picture is reversed in managerial grades, which are dominated by male employees (74%) with only 26% being women. Therefore, women predominantly occupy staff grades, whereas men overwhelmingly occupy managerial grades.

In terms of educational qualification on entry to the firm it is interesting to note that the majority of the sample (80%) holds either an A-level or O-levels qualification, suggesting that the firm may have particular training schemes for individuals who do not have a university education. Only very few employees have a further education qualification whereas 17.2% hold a degree. Degree qualifications are more pronounced amongst men (24%) compared to women (10%) in 2000 and so are O-level or equivalent qualifications (40% in men and 63% in women). Comparisons by staff and managerial grades show that larger proportions of men and women with a degree qualification are found in managerial grades. However, the difference of men and women with an A-level qualification is small in managerial grades, where a large proportion of women have an O-level qualification on entry. 67% of women in staff grades have an O-level qualification on entry (50% of men).

On average employees have 4 to 5 years of pre-company experience and this holds true for staff and managerial grades as well as for men and women. The average seniority with the

firm is 13.7 years for all employees, for staff grades this is roughly 12 years and for managerial grades it is on average 16 years. Note that average seniority is similar for men and women in staff grades but roughly two and a half years higher for men as opposed to women in managerial grades.

The majority of employees (65%) received an annual performance evaluation of good. 30% received a performance rating of high, 4% of outstanding, 1% of unsatisfactory and for 1.3% improvement is required. A very similar distribution emerges for men and women. In staff grades, more women receive a good performance rating (71%) compared to men (68%). In managerial grades the proportion assigned each rating is very similar for men and women.

In terms of the ethnic composition of the sample, 90% of employees are of white ethnic background and this is also true across staff and managerial grades.

There is regional variation in terms of where employees work. Around 45% of employees are based in Greater London or the South East.

#### **4. Empirical Results**

This section presents the main empirical results, which in several occasions are heterogeneous when broken down in different education and experience groups or in staff workers and managers. Based on the empirical specification of equation (3), Table 1 offers the results of baseline OLS earnings regressions for all workers in columns (1)-(4), for staff workers in columns (5)-(8) and for managers in columns (9)-(12). The results indicate the importance of schooling, general and firm experience and gender, which are consistent with the existing literature and highlight the significance of job rank, which explains almost 40% of the earnings variation.

##### *4.1 Returns to Experience are Larger for Low-Educated Workers*

Table 2 shows that the returns to experience are significantly larger for relatively low-educated workers compared to their highly educated colleagues. In particular, an additional year of general pre-company experience increases earnings by 1.2% for low-educated workers, which is two times larger compared to an increase of only 0.6% for highly educated employees. The difference is even sharper for tenure, as an additional year of company experience increases earnings by 1% only for the relatively low educated workers, while there is no effect for highly educated workers (compare columns 3 and 6 of Table 2).

Tables 3 and 4 compare and contrast the determinants of earnings for staff workers and managers. In particular, Table 3 focuses on staff workers and indicates that general experience is significant only for low educated staff, while tenure is significant for both low and highly educated staff workers. Table 4 concentrates on managers and it shows that the returns to general experience are significant for both low and highly educated managers but the effect is larger and almost twice in magnitude for the former. Interestingly, tenure has no effect to low-educated managers and surprisingly a negative effect to highly educated managers. Table 5 offers a comparison between all staff workers and all managers. The results are noteworthy as they reveal that staff workers benefit two times more by accumulating an additional year of firm-tenure compared to gaining a year of general experience. In contrast, managers profit from general experience, as an additional year of pre-company experience yields to them twice the returns compared to staff workers, while managers have negative returns to firm-tenure.

Intuitively, these findings justify why highly skilled managers may have an incentive to switch firms more frequently and exploit the large returns to general experience, instead of remaining attached to a particular firm, where job tenure not only does not increase but it actually harms their earnings.

Following the significant result that the returns to general and firm experience are larger for low-educated workers, we examine further their functioning. One possibility is that the

returns to experience are larger for the relatively low educated workers for each year of general experience and tenure. However, the use of dummies for general experience and firm tenure reveal a rather different pattern. Table 6 indicates that the returns to firm tenure are similar for workers with different levels of education during the first 5 years of tenure. However, they become insignificant for the highly educated workers for almost all the subsequent years, while for low-educated workers they remain significant for each additional year of tenure. Interestingly, when we perform the same exercise with general experience dummies the results are quite similar for low and high-education groups.

#### *4.2 Returns to Education are Larger for Younger (Low-Experienced) Workers*

Table 7 illustrates that the returns to college are larger for relatively young and therefore inexperienced workers. It is remarkable that the results are similar when we do not control for job rank. However, in columns (7) and (12), which display the clean effect, the differences become more evident.

Returning back to Table 1 and comparing the coefficient of college education in columns (3) and (4), we can see that a large fraction of the returns to education functions through job rank. A comparison between columns (2) and (4) shows that performance does not influence much the impact of education on earnings.

#### *4.3 The Same Performance Pays More for Managers and High-Educated Workers*

One of the most interesting results of this study is that bad performance only harms the earnings of low-educated workers. Good performance increases the earnings of managers and highly educated workers considerably more compared to staff or low-educated workers. One would expect that within the group of staff workers those who are highly educated would be penalised similarly or less compared to their low educated colleagues. Nevertheless, this group of highly

educated non-managerial employees receive the largest penalty for bad performance (see column 6 in Table 4). One explanation for this behaviour may be that managers consider the highly educated non-managers as potential competitors and they punish them more compared to their low-educated colleagues, by whom they do not feel threatened.

## **5. Discussion**

Our regression analysis indicates that the returns to education are higher for low-experienced workers, while the returns to experience are larger for low-educated workers. The combination of these two results highlights that skills play a key role in the absence of other factors that boost earnings. In fact, education becomes an even stronger determinant of wages in the absence of experience, whereas experience becomes a significant element of wage growth in the absence of college education.

There are two potential explanations for this. The first is based on the informational components of education (signalling) and experience (employer learning) and suggests that worker ability is revealed to uninformed firms either through education or while employers accumulate performance observations with experience. The second explanation is grounded on the fundamental / non-informational components of education (human capital) and experience (employee learning or learning-by-doing) and argues that workers either increase their productivity through education or by learning while they work.

Another issue is the importance of being in a position to negotiate or bargain a higher salary, such as either being highly educated or in a managerial grade. Our findings indicate that in either case the same performance offers higher returns, while only low-educated workers are penalised for bad performance. A potential explanation is that highly educated workers and managers are relatively mobile compared to low-educated workers or staff employees. It seems that in the presence of asymmetric information, a college degree or a highly ranked position

are interpreted by competitive firms as good indications of talent. That is why when performance is good the current employer rewards more generously these workers in powerful positions who have credible outside options. When performance is bad, it seems that the firm punishes only the workers in relatively less powerful bargaining positions. These findings are robust even after controlling for a wide range of other characteristics.

## **6. Conclusions**

The factors that determine earnings inequality form a central issue in economic analysis and a key concern for policy making. Using a unique and detailed dataset from a financial sector firm we analyse the key elements that shape the earnings of managers and staff workers. Apart from examining earnings for the entire dataset, we also separate our analysis to different skill groups, such as workers with different levels of education and experience.

Our findings show that the returns to education are higher for inexperienced workers, while the returns to experience are larger for low-educated workers. In particular, managers have higher returns to general experience compared to staff workers. Yet, managers have negative returns to firm tenure, while staff workers benefit more from firm tenure compared to acquiring general experience. We also focus on the challenging question of whether the same performance pays equally all employees. On this issue our results are enlightening. When performance is good wages are almost two times higher for college graduates and for managers, whereas only low-educated workers are penalized for bad performance. This latter result highlights how important it is for employees to be highly educated or in a relatively powerful hierarchical position in order to fully enjoy the returns of their own performance, yielding some interesting implications regarding equality and fair remuneration in the workplace and also sheds some light on incentive structures at the firm level and how this firm rewards and motivates its workers.

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**Table 1: Baseline OLS Earnings Regressions**

Dependent variable: ln annual salary 2000	All				Staff only				Managers Only			
	1	2	3	4	5	6	7	8	9	10	11	12
College Degree	0.497***	0.090***	0.482***	0.091***	0.164***	0.078***	0.159***	0.078***	0.334***	0.050***	0.321***	0.052***
Years pre-company exper/10	0.364***	0.091***	0.358***	0.093***	0.138***	0.063***	0.136***	0.064***	0.360***	0.107***	0.357***	0.112***
(Years pre-company exper <sup>2</sup> )/100	-0.074***	-0.018***	-0.072***	-0.018***	-0.033***	-0.015***	-0.033***	-0.015***	-0.070***	-0.024***	-0.068***	-0.024***
Years of company service/10	0.420***	0.076***	0.380***	0.069***	0.267***	0.133***	0.244***	0.126***	0.169***	-0.064***	0.146***	-0.065***
(Years of company service <sup>2</sup> )/100	-0.059***	-0.009***	-0.050***	-0.007***	-0.045***	-0.018***	-0.039***	-0.016***	-0.003	0.018***	0.003	0.019***
Female	-0.242***	-0.029***	-0.245***	-0.032***	-0.041***	-0.020***	-0.046***	-0.023***	-0.176***	-0.051***	-0.174***	-0.053***
Constant	9.753***	9.865***	9.736***	9.851***	9.632***	9.908***	9.630***	9.904***	10.192***	10.203***	10.136***	10.186***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (13)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Performance dummies (4)	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	22729	22729	22729	22729	13593	13593	13593	13593	9136	9136	9136	9136
Adjusted R <sup>2</sup>	0.536	0.916	0.558	0.918	0.531	0.768	0.554	0.773	0.393	0.851	0.441	0.855

Notes: The dependent variable is the natural logarithm of the average annual salary for each worker. Independent variables include college degree for a completed higher education degree, years of pre-company general experience and its square, years of tenure company experience and its square, female dummy, constant and a series of dummies, 12 dummies for different regions in the UK, 4 dummies for different ethnic groups, 13 dummies for the rank of each worker in the hierarchy of the firm and 4 dummies for performance. Notice that columns (5)-(8) include 6 rank dummies as we focus only on staff workers, while columns (9)-(12) include 7 rank dummies as we focus only on managers. Significance at the 1, 5, 10 percent significance level is indicated respectively by \*\*\*, \*\* and \*, using robust standard errors.

**Table 2: Experience and Tenure OLS Earnings Regressions - All Workers**

Dependent variable: ln annual salary 2000						
	A-level or below (High School – EDUH)			Further education or degree (College –EDUC)		
	1	2	3	4	5	6
Years pre-company experience/10	0.339***	0.118***	0.120***	0.213***	0.061***	0.063***
(Years pre-company experience <sup>2</sup> )/100	-0.078***	-0.026***	-0.027***	-0.054***	-0.016***	-0.016***
Years of company service/10	0.366***	0.110***	0.104***	0.589***	-0.007	-0.022
(Years of company service <sup>2</sup> )/100	-0.046***	-0.016***	-0.014***	-0.142***	-0.007	-0.001
Female	-0.240***	-0.028***	-0.031***	-0.311***	-0.052***	-0.055***
Performance rating 1 (unsatisfactory)			-0.119***			-0.035
Performance rating 2 (improvement required)			-0.018*			-0.007
Performance rating 4 (high)			0.031***			0.066***
Performance rating 5 (excellent)			0.070***			0.102***
Constant	9.762***	9.822***	9.812***	10.383***	9.952***	9.933***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (13)	No	Yes	Yes	No	Yes	Yes
Observations	18011	18011	18011	4718	4718	4718
Adjusted R <sup>2</sup>	0.459	0.913	0.915	0.453	0.905	0.908

Notes: As in Table 1.

**Table 3: Experience and Tenure OLS Earnings Regressions - Staff Workers Only**

Dependent variable: ln annual salary 2000						
	A-level or below (High School – EDUH)			Further education or degree (College –EDUC)		
	1	2	3	4	5	6
Years pre-company experience/10	0.163***	0.081***	0.082***	-0.028	-0.023	-0.021
(Years pre-company experience <sup>2</sup> )/100	-0.045***	-0.021***	-0.021***	0.012	0.003	0.003
Years of company service/10	0.278***	0.135***	0.130***	0.237***	0.169***	0.154***
(Years of company service <sup>2</sup> )/100	-0.047***	-0.018***	-0.017***	-0.069***	-0.048***	-0.042***
Female	-0.035***	-0.016***	-0.019***	-0.086***	-0.044***	-0.047***
Performance rating 1 (unsatisfactory)			-0.101***			-0.175***
Performance rating 2 (improvement required)			-0.021**			-0.084
Performance rating 4 (high)			0.025***			0.037***
Performance rating 5 (excellent)			0.053***			0.115***
Constant	9.603***	9.852***	9.849***	9.964***	10.152***	10.143***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (6)	No	Yes	Yes	No	Yes	Yes
Observations	11994	11994	11994	1599	1599	1599
Adjusted R <sup>2</sup>	0.575	0.799	0.803	0.421	0.703	0.709

Notes: As in Table 1.

**Table 4: Experience and Tenure OLS Earnings Regressions - Managers Only**

Dependent variable: ln annual salary 2000						
	A-level or below (High School – EDUH)			Further education or degree (College –EDUC)		
	1	2	3	4	5	6
Years pre-company experience/10	0.322***	0.150***	0.155***	0.319***	0.074***	0.078***
(Years pre-company experience <sup>2</sup> )/100	-0.063***	-0.033***	-0.033***	-0.082***	-0.019***	-0.019***
Years of company service/10	0.074***	-0.017	-0.018	0.288***	-0.083***	-0.093***
(Years of company service <sup>2</sup> )/100	0.018***	0.009***	0.010***	-0.062***	0.015**	0.020***
Female	-0.176***	-0.050***	-0.053***	-0.202***	-0.060***	-0.061***
Performance rating 1 (unsatisfactory)			-0.119***			-0.008
Performance rating 2 (improvement required)			-0.015			0.028
Performance rating 4 (high)			0.044***			0.075***
Performance rating 5 (excellent)			0.077***			0.100***
Constant	10.247***	10.138***	10.125***	10.593***	10.270***	10.250***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (7)	No	Yes	Yes	No	Yes	Yes
Observations	6017	6017	6017	3119	3119	3119
Adjusted R <sup>2</sup>	0.296	0.833	0.837	0.325	0.841	0.846

Notes: As in Table 1.

**Table 5: Experience and Tenure OLS Earnings Regressions - Staff Workers vs Managers**

Dependent variable: ln annual salary 2000						
	Staff			Managers		
	1	2	3	4	5	6
Years pre-company experience/10	0.125***	0.054***	0.055***	0.442***	0.112***	0.117***
(Years pre-company experience <sup>2</sup> )/100	-0.032***	-0.013***	-0.014***	-0.113***	-0.029***	-0.029***
Years of company service/10	0.225***	0.108***	0.102***	0.025	-0.087***	-0.090***
(Years of company service <sup>2</sup> )/100	-0.036***	-0.013***	-0.011***	0.019***	0.021***	0.022***
Female	-0.049***	-0.023***	-0.026***	-0.206***	-0.052***	-0.054***
Performance rating 1 (unsatisfactory)			-0.112***			-0.093**
Performance rating 2 (improvement required)			-0.032***			0.007
Performance rating 4 (high)			0.027***			0.055***
Performance rating 5 (excellent)			0.060***			0.082***
Constant	9.686***	9.945***	9.941***	10.455***	10.238***	10.222***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (13)	No	Yes	Yes	No	Yes	Yes
Observations	6017	6017	6017	3119	3119	3119
Adjusted R <sup>2</sup>	0.494	0.761	0.765	0.309	0.849	0.853

Notes: As in Table 1.

**Table 6: OLS Earnings Regressions with Tenure Dummies by Education Group**

lnSALARY	A-level or below (High School – EDUH)	Further education or degree (College –EDUC)
	(1)	(2)
Years pre-company experience/10	0.118***	0.062***
(Years pre-company experience <sup>2</sup> )/100	-0.026***	-0.016***
1st year of service	0.012	0.025*
2nd year of service	0.031***	0.043***
3rd year of service	0.045***	0.049***
4th year of service	0.048***	0.042**
5th year of service	0.072***	0.043**
6th year of service	0.081***	0.008
7th year of service	0.105***	0.001
8th year of service	0.086***	0.015
9th year of service	0.077***	0.015
10th year of service	0.096***	-0.008
...	...	...
25th year of service	0.183***	-0.043
26th year of service	0.186***	-0.078***
27th year of service	0.195***	-0.001
...	...	...
30th year of service	0.192***	0.079
31st year of service	0.210***	0.031
32nd year of service	0.190***	-0.097
33rd year of service	0.195***	0.065*
34th year of service	0.212***	-0.027
35th year of service	0.203***	-0.254***
...	...	...
42th year of service	0.181***	
Female	-0.030***	-0.055***
Constant	9.804***	9.903***
Region dummies (12)	Yes	Yes
Rank dummies (13)	Yes	Yes
Performance dummies (4)	Yes	Yes
Ethnic dummies (4)	Yes	Yes
Observations	18011	4718
Adjusted R <sup>2</sup>	0.915	0.908

Notes: As in Table 1. Of the omitted tenure rows (due to space reasons) all are statistically significant for column (1) and all are insignificant for column (2).

**Table 7: OLS Earnings Regression by Age Group**

Dependent variable: ln annual salary 2000	All				Age<35				Age>=35			
	1	2	3	4	5	6	7	8	9	10	11	12
College Degree	0.497***	0.090***	0.482***	0.091***	0.464***	0.097***	0.450***	0.095***	0.506***	0.070***	0.493***	0.072***
Years pre-company exper/10	0.364***	0.091***	0.358***	0.093***	0.416***	0.118***	0.407***	0.118***	0.187***	0.039***	0.194***	0.042***
(Years pre-company exper <sup>2</sup> )/100	-0.074***	-0.018***	-0.072***	-0.018***	-0.105***	-0.032***	-0.103***	-0.032***	-0.054***	-0.013***	-0.054***	-0.014***
Years of company service/10	0.420***	0.076***	0.380***	0.069***	0.586***	0.130***	0.529***	0.112***	0.018	-0.048***	0.010	-0.048***
(Years of company service <sup>2</sup> )/100	-0.059***	-0.009***	-0.050***	-0.007***	-0.136***	-0.030***	-0.117***	-0.024***	0.018***	0.013***	0.020***	0.014***
Female	-0.242***	-0.029***	-0.245***	-0.032***	-0.147***	-0.030***	-0.147***	-0.032***	-0.323***	-0.033***	-0.331***	-0.038***
Constant	9.753***	9.865***	9.736***	9.851***	9.636***	9.818***	9.632***	9.807***	10.299***	10.035***	10.238***	10.017***
Region dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic dummies (4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rank dummies (13)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Performance dummies (4)	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	22729	22729	22729	22729	10827	10827	10827	10827	11902	11902	11902	11902
Adjusted R <sup>2</sup>	0.536	0.916	0.558	0.918	0.537	0.889	0.553	0.892	0.477	0.922	0.504	0.924

Notes: As in Table 1.

## Appendix A: Descriptive Statistics

**Table A1: Descriptive Statistics in 2000 – All Workers**

<i>Variable</i>	<i>All</i> N = 22,729		<i>Men</i> N = 11,341		<i>Women</i> N = 11,388	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
In Annual salary	9.997	0.50	10.203	0.55	9.7930	0.3474
Annual salary (£)	24075.84	17723.87	30021.87	21729.24	18154.34	9301.145
<i>Education</i>						
Degree	0.172		0.239		0.104	
Further Education	0.036		0.040		0.032	
A-level	0.282		0.330		0.233	
O-level	0.511		0.391		0.630	
Years of schooling	13	2	12.985	1.933	12.088	1.628
Pre-company experience/10	0.49	0.666	0.499	0.667	0.484	0.666
Precompany experience2/100	0.69	1.682	0.693	1.706	0.678	1.657
Company Service/10	1.37	0.983	1.477	1.036	1.262	0.915
Company Service2/100	2.84	3.174	3.256	3.486	2.431	2.768
<i>Performance ratings</i>						
Unsatisfactory	0.001		0.002		0.000	
Improvement required	0.013		0.018		0.009	
Good	0.651		0.644		0.658	
High	0.295		0.297		0.293	
Outstanding	0.040		0.040		0.040	
Female	0.501					
<i>Ethnic Background</i>						
White	0.901		0.910		0.892	
Asian/Asian British	0.023		0.020		0.027	
Black/Black British	0.013		0.006		0.019	
Chinese or Ethnic Background	0.010		0.008		0.012	
Unknown ethnic background	0.053		0.055		0.051	



*Table A1 continued*

<i>Region</i>			
Greater London	0.324	0.387	0.261
South East	0.159	0.136	0.182
East Anglia	0.014	0.011	0.017
South West	0.053	0.049	0.057
West Midlands	0.088	0.083	0.093
East Midlands	0.042	0.034	0.049
Yorkshire & Humberside	0.169	0.178	0.161
North West	0.051	0.045	0.058
North	0.018	0.015	0.020
Wales	0.054	0.039	0.069
Scotland	0.014	0.011	0.017
Northern Ireland	0.001	0.001	0.001
Channel Island & Isle of Men	0.013	0.011	0.016
<i>Internal hierarchy</i>			
S01	0.000	0.000	0.000
S02	0.005	0.005	0.006
S03	0.119	0.074	0.164
S04	0.219	0.115	0.323
S00	0.051	0.042	0.059
M93	0.154	0.189	0.119
M94	0.117	0.176	0.058
M95	0.074	0.129	0.020
M96	0.028	0.049	0.006
M97	0.010	0.019	0.002
M98	0.001	0.003	0.000
M00	0.017	0.031	0.004

*Notes:* This Table offer descriptive statistics for the year 2000.

**Table A2: Descriptive Statistics in 2000 - Staff Workers Only**

<i>Variable</i>	<i>All</i>		<i>Men</i>		<i>Women</i>	
	N = 13,593		N = 4,582		N = 9,011	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
In Annual salary	9.689	0.218	9.7303	0.2397	9.667	0.204
Annual salary (£)	15479.12	3574.83	16014.71	4306.83	15206.78	3102.81
<i>Education</i>						
Degree	0.082		0.122		0.0617	
Further Education	0.036		0.043		0.0319	
A-level	0.270		0.340		0.2338	
O-level	0.613		0.495		0.6726	
Years of schooling	12.059	1.528	12.421	1.668	11.8742	1.4165
Pre-company experience/10	0.463	0.646	0.425	0.594	0.4819	0.6703
Precompany experience2/100	0.632	1.633	0.534	1.523	0.6815	1.6839
Company Service/10	1.223	0.961	1.222	1.023	1.2227	0.9285
Company Service2/100	2.419	2.924	2.541	3.187	2.3569	2.7782
<i>Performance ratings</i>						
Unsatisfactory	0.001		0.002		0.0004	
Improvement required	0.012		0.019		0.0090	
Good	0.682		0.712		0.6662	
High	0.274		0.248		0.2874	
Outstanding	0.031		0.019		0.0370	
Female	0.663					
<i>Ethnic Background</i>						
White	0.891		0.900		0.8863	
Asian/Asian British	0.028		0.023		0.0303	
Black/Black British	0.016		0.008		0.0206	
Chinese or Ethnic Background	0.010		0.008		0.0114	
Unknown ethnic background	0.054		0.060		0.0514	

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*Table A2 continued*

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<i>Region</i>			
Greater London	0.252	0.308	0.2236
South East	0.178	0.158	0.1887
East Anglia	0.017	0.012	0.0191
South West	0.066	0.069	0.0637
West Midlands	0.102	0.102	0.1021
East Midlands	0.048	0.038	0.0537
Yorkshire & Humberside	0.152	0.158	0.1489
North West	0.062	0.059	0.0633
North	0.020	0.018	0.0218
Wales	0.069	0.048	0.0801
Scotland	0.019	0.020	0.0192
Northern Ireland	0.002	0.001	0.0017
Channel Island & Isle of Men	0.012	0.009	0.0142

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*Notes:* This Table offer descriptive statistics for the year 2000 for staff workers.

**Table A3: Descriptive Statistics in 2000 – Managers Only**

<i>Variable</i>	<i>All</i> N=9,136		<i>Men</i> N = 6,759		<i>Women</i> N = 2,377	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
In Annual salary	10.457	0.450	10.523	0.459	10.270	0.366
Annual salary (£)	36866.46	22112.70	39517.48	23590.46	29328.27	14840.46
<i>Education</i>						
Degree	0.305		0.319		0.265	
Further Education	0.036		0.037		0.033	
A-level	0.299		0.323		0.232	
O-level	0.359		0.320		0.470	
Years of schooling			13.368	2.006	12.899	2.063
Pre-company experience/10	13.246	2.031	0.548	0.707	0.494	0.649
Precompany experience2/100	0.534	0.693	0.801	1.811	0.664	1.552
Company Service/10	0.765	1.748	1.650	1.008	1.413	0.845
Company Service2/100	1.589	0.974	3.741	3.596	2.711	2.712
<i>Performance ratings</i>						
Unsatisfactory	3.473		0.002		0.000	
Improvement required	0.015		0.017		0.008	
Good	0.605		0.598		0.626	
High	0.325		0.330		0.313	
Outstanding	0.054		0.054		0.053	
Female	0.260					
<i>Ethnic Background</i>						
White	0.916		0.916		0.915	
Asian/Asian British	0.017		0.018		0.013	
Black/Black British	0.007		0.005		0.012	
Chinese or Ethnic Background	0.010		0.009		0.012	
Unknown ethnic background	0.051		0.052		0.048	

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*Table A3 continued*

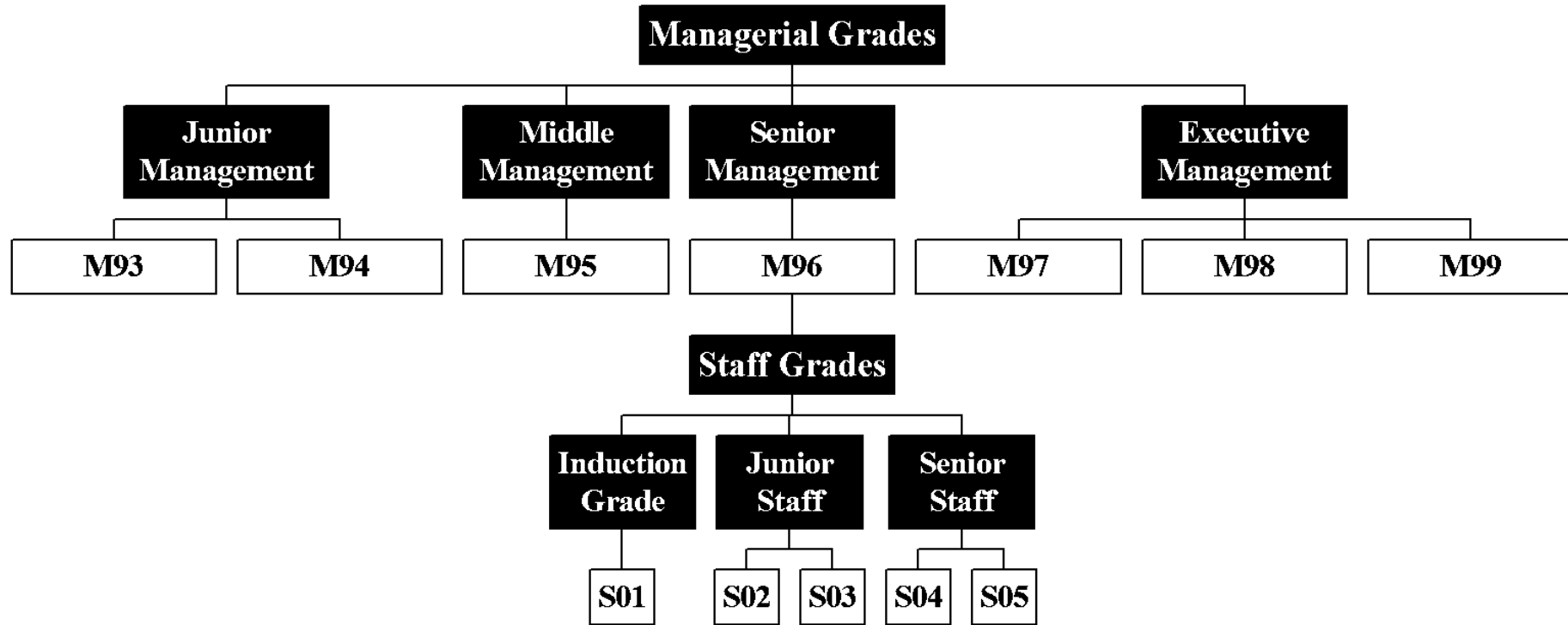
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<i>Region</i>			
Greater London	0.431	0.441	0.491
South East	0.131	0.121	0.365
East Anglia	0.010	0.011	0.094
South West	0.034	0.035	0.169
West Midlands	0.067	0.070	0.233
East Midlands	0.032	0.031	0.177
Yorkshire & Humberside	0.195	0.192	0.404
North West	0.036	0.035	0.193
North	0.013	0.014	0.108
Wales	0.031	0.032	0.157
Scotland	0.006	0.005	0.096
Northern Ireland	0.001	0.001	0.000
Channel Island & Isle of Men	0.015	0.012	0.142

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*Notes:* This Table offer descriptive statistics for the year 2000 for managers.

## Appendix B: The Internal Hierarchy of the Firm



*Note:* This graph excludes ungraded staff (S00) and managerial employees (M00)

## Appendix C: Variable Definitions

In Annual salary	The natural logarithm of annual salary
Annual salary (£)	Annual salary (£)
<i>Education</i>	
Degree	= 1 if Degree qualification; 0 otherwise
Further Education	= 1 if Further education qualification; 0 otherwise
A-level	= 1 if A-level or equivalent; 0 otherwise
O-level	= 1 if O-level or equivalent; 0 otherwise
Years of schooling	Number of years of schooling
Pre-company experience	Age minus schooling minus company service minus five
Company Service	Number of years of company service since date of entry
<i>Performance ratings</i>	
Unsatisfactory	=1 if performance unsatisfactory; 0 otherwise
Improvement required	=1 if performance requires improvement; 0 otherwise
Good	=1 if performance is good; 0 otherwise
High	=1 if performance is high; 0 otherwise
Outstanding	=1 if performance is outstanding; 0 otherwise
Female	= 1 if female employee; 0 otherwise
<i>Ethnic Background</i>	
White	=1 if white ethnic background; 0 otherwise
Asian/Asian British	=1 if Asian/Asian British ethnic background; 0 otherwise

Black/Black British	=1 if Black/Black British ethnic background; 0 otherwise
Chinese or Ethnic Background	=1 if Chinese or Ethnic background; 0 otherwise
Unknown ethnic background	=1 if ethnic background unknown; 0 otherwise

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*Table A3 continued*

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*Region*

Greater London	= 1 if employee works in Greater London; 0 otherwise
South East	= 1 if employee works in South East; 0 otherwise
East Anglia	= 1 if employee works in East Anglia; 0 otherwise
South West	= 1 if employee works in South West; 0 otherwise
West Midlands	= 1 if employee works in West Midlands; 0 otherwise
East Midlands	= 1 if employee works in East Midlands; 0 otherwise
Yorkshire & Humberside	= 1 if employee works in Yorkshire & Humberside; 0 otherwise
North West	= 1 if employee works in North West; 0 otherwise
North	= 1 if employee works in North; 0 otherwise
Wales	= 1 if employee works in Wales; 0 otherwise
Scotland	= 1 if employee works in Scotland; 0 otherwise
Northern Ireland	= 1 if employee works in Northern Ireland; 0 otherwise
Northern Ireland	= 1 if employee works in Northern Ireland; 0 otherwise

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*Internal hierarchy*

S01	=1 if employee in grade S01; 0 otherwise
S02	=1 if employee in grade S02; 0 otherwise
S03	=1 if employee in grade S03; 0 otherwise
S04	=1 if employee in grade S04; 0 otherwise
S00	=1 if employee in grade S05; 0 otherwise
M93	=1 if employee in grade M93; 0 otherwise
M94	=1 if employee in grade M94; 0 otherwise
M95	=1 if employee in grade M95; 0 otherwise
M96	=1 if employee in grade M96; 0 otherwise



M97	=1 if employee in grade M97; 0 otherwise
M98	=1 if employee in grade M98 ; 0 otherwise
M00	=1 if employee in grade M00; 0 otherwise

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