WAGE DETERMINATION IN GENERAL GOVERNMENT IN PORTUGAL*

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1. INTRODUCTION

The use of economic theory to study the internal work of organizations has raised increased interest among economists, as shown by the papers of Baker *et al*. (1994) and Lazear (1999). The main issues analysed by this literature concern the study of internal labour markets, incentives, wages, promotions, hiring procedures, workers' evaluation and internal/external mobility.

This article aims at characterizing wage determination in general government in Portugal and the main factors behind it, using data from the 2nd General Public Administration Census (2º *Recenseamento Geral da Administração Pública*), which took place in December of 1999(1). It complements, to a certain extent, the study of the wage gap between private and public sectors by Portugal and Centeno (2001). Here a more comprehensive database is used and a detailed analysis of the wage formation process in general government is carried out, against the background of the abovementioned literature.

The general government census includes information not only on the characteristics of workers, common to most labour force databases, but also job specific information, in particular concerning seniority in the job, occupational category, and scope of government to which the worker belongs. This information makes it possible, beyond analyzing the wage return associated with individual characteristics (age, gender and education, for example), to study the impact on wages of match-specific variables measuring the progression of workers within general government.

The article deals with two main issues. The first is the analysis of the wage returns to human capital endowment (in particular, education and seniority). A special attention is also devoted to the gender wage gap. The second aspect concerns the characterization of public administration as an "internal labour market", featuring careers with well-defined entry points and a rigid "bottom-top" progression. The paper investigates these issues together with the wage incentives given to workers throughout their career. The empirical evidence is mainly based on an examination of the impact of the occupational category on wages, on an analysis of the progression pattern, estimated as the average return by year of seniority, and on wage dispersion over time in various occupational categories.

It is worth noting that a full examination of the working and incentives in general government as an internal labour market requires a comparison with a reference group, typically given by the private sector. However, such comparison is not made in this article.

The article is organized as follows. Section 2 presents a brief description of the database, focusing on the variable hourly wage. Section 3 is on the

* The views expressed are those of the authors and do not necessarily coincide with those of Banco de Portugal.

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(1) The database put together using census data was provided to the Banco de Portugal by the *Direcção-Geral da Administração Pública*. The first survey of this kind took place in October of 1996.

econometric methodology. Sections 4 and 5 examine the results, highlighting the return to education and seniority and the gender wage gap. Section 6 analyses the progression pattern and rigidity in the progression for several occupational categories. Section 7 presents the conclusions.

2. DATABASE

The database comprises 677,715 civil servants(2), covering all public administration bodies except for military personnel and the regional government employees of *Região Autónoma dos Açores*. The database contains many variables normally used to study careers inside an organization.

The key variable in this study is the wage earned by each employee. This variable is measured by the hourly wage, calculated from the information on the monthly wage and the hours worked per week. The information regarding individual characteristics includes gender, age and education. The main variables concerning the position of the worker inside public administration are seniority in the job, the scope of government (central, local and regional, and, in the case of central government, information about the ministry), the occupational category and the legal nature of the work relationship(3). Appendix 1 presents some descriptive statistics that summarize the distribution of hourly wages and seniority in the job (Tables 1 and 2). The remaining tables in Appendix 1 present the distribution of employees according to other variables: education, type of contract, scope of government/ministry and occupational category (Tables 3 to 7).

The distribution of hourly wages is the starting point of this paper, and is therefore analysed in detail. Chart 1A shows an estimate of the probability density function of hourly wages in general government and in the private sector (information from the *Quadros de Pessoal* 1999 is used for the private sector(4)). The comparison between densities already points to important differences regarding location and dispersion of wages and their segmentation. Both distributions are left-skewed, that is, wages concentrate in the lower tail of the distribution. However, this characteristic is much more marked in the private sector, where a larger proportion of employees have wages close to the minimum wage(5). Consequently, the median wage in the private sector is well below the median wage in general government. On the other hand, the wage distribution in public administration is clearly multi-modal and much less smooth than in the private sector. Such characteristics reflect the marked wage segmentation that exists in the public sector, where the rigid conditions of entry and progression in careers lead to the concentration of employees at certain remuneration levels and to homogeneous progression across the wage distribution.

Charts 1B and 1C present the probability density functions for the wages of male and female workers and graduate/non-graduate workers, but only for public sector employees.

The wage distribution for graduate workers is much more symmetric than for non-graduates. In both cases the distributions are clearly multi-modal. On the other hand, given that the proportion of non-graduate workers is higher among men, the distribution of wages for the latter is also much more asymmetric. Thus, while average salaries for men and women are relatively close, median salaries are quite apart, with the male median salary considerably lower.

This first analysis reveals some features of wages in the public sector that will be investigated in the rest of the paper:

- A strong impact of education on wage differentiation;
- A clear segmentation of the wage distribution (multi-modality).

(2) The concept of "civil servant" is wider in Portugal than in other countries and includes, for instance, public doctors, nurses, teachers and local government employees.

(3) The database contains other variables that were not used in this paper, such as, geographical information about the service and entity to which the worker belongs and about the location of the workplace.

(4) The *Quadros de Pessoal* result from an annual survey carried out by the Ministry of Employment and Social Security collecting information on all private sector employees.

(5) The minimum wage does not apply to general government, but the lowest wage levels in place are close to it.

Chart 1A
PROBABILITY DENSITY FUNCTIONS FOR HOURLY WAGES IN THE GENERAL GOVERNMENT AND IN THE PRIVATE SECTOR[(a)(b)]

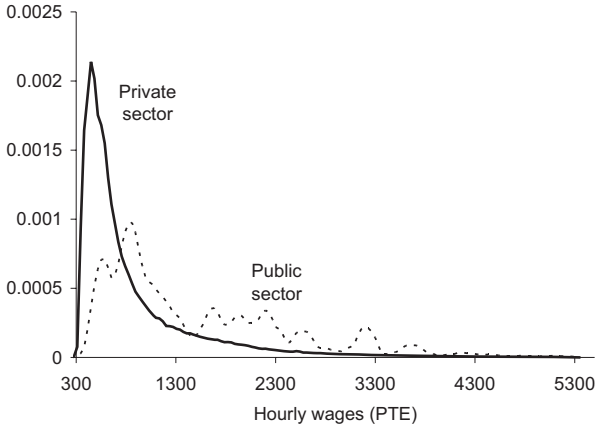


Chart 1B
PROBABILITY DENSITY FUNCTIONS FOR HOURLY WAGES IN THE GENERAL GOVERNMENT BY GENDER[(a)]

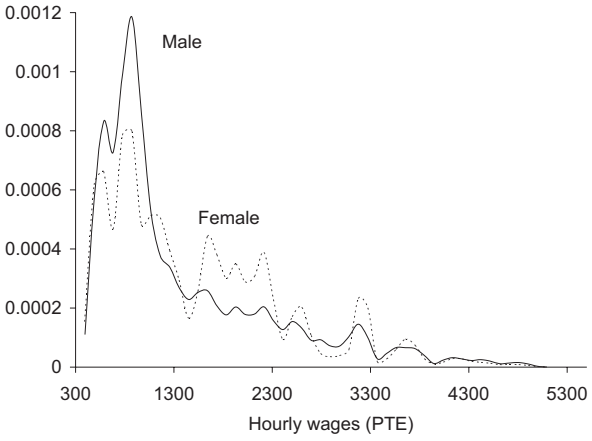
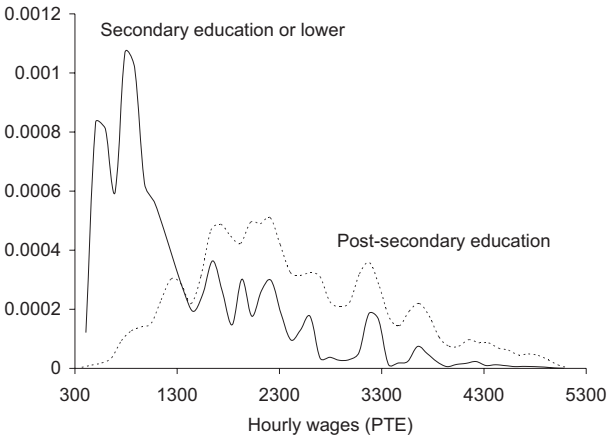


Chart 1C
PROBABILITY DENSITY FUNCTIONS FOR HOURLY WAGES IN THE GENERAL GOVERNMENT BY EDUCATION LEVEL[(a)]



Notes:
(a) Probability density functions estimated by the kernel method with the Epanechnikov kernel function.
(b) Data for the general government from the 2nd General Census, 1999, and for the private sector from the *Quadros de Pessoal*, 1999, *Ministério do Trabalho e da Segurança Social*.

3. METHODOLOGY

Wage determination analysis is usually carried out by estimating wage regression equations, where the hourly wage appears as a dependent variable, and different proxies for the stock of human capital as explanatory variables. The latter can be divided into general human capital, measured through the education level (in this paper four groups were considered: less than lower secondary education, lower secondary education, upper secondary education and post secondary education) and experience, and specific human capital, measured through seniority in the organization.

The effect of experience can be separated from the effect of seniority depending on the quality of the information for the first variable and on the incidence of long-term jobs. The database includes information about seniority in public administration but not about experience in the labour market (although a proxy for this variable can be obtained using age). However, in general government, given the high incidence on long-term jobs, both variables should have similar informational content. In fact, the proportion of workers with more than 20 years of seniority among those older than 45 is about 69 per cent. Since seniority proved to have more explanatory power, this variable was used in the wage regression equations. A non-linear term (seniority squared) was included in the model in order to capture the possibility of an increase in the wage with seniority at a non-constant rate. The model includes also variables to differentiate the gender and the type of contract (that is, permanent staff or other type of contract[(6)]). The

wage regression equation estimated was:

$$(1)\quad \ln y_i = \beta_0 + \beta_1 E9_i + \beta_2 E12_i + \beta_3 ELic_i + \beta_4 A_i + \\ + \beta_5 A_i^2 + \beta_6 M_i + \beta_7 V_i + u_i,$$

where $\ln y_i$ is the log of the hourly wage for individual *i*; $E9_i$, $E12_i$, $ELic_i$ are dummy variables for the education levels: lower secondary, upper secondary, post-secondary; A_i is seniority (in years); A_i^2 is seniority squared; M_i is a dummy variable for male; V_i is an dummy variable for non-permanent staff.

As already mentioned, the census also has information on variables concerning the position of the employees within public administration, like the scope of government/ministry and occupational category. However, the interpretation of the explanatory power of these variables has to be made with caution taking into account that its impact cannot be isolated from the impact of variables relating to individual characteristics. This aspect is particularly evident as far as the relationship between schooling and occupational category is concerned. In fact, access to most categories requires a certain education level. Thus the inclusion of variables concerning the position of the employee within public administration makes sense in order to determine their additional impact, as well as a possible change in the wage returns initially estimated in equation (1) (in particular, regarding education). Two additional specifications were estimated, one including dummy variables, for the scope of government/ministry and a second one with dummies for the occupational category.

The different specifications were estimated in the first place using the ordinary least squares method. This yields the mean impact on the hourly wage of worker *i* conditioned to a given value for the worker endowment in each of the characteristics controlled for in the equation. This method does not allow us to determine the impact of the explanatory variables over the wage distribution. That kind of information is given by an alternative estimation method: the quantile regression, which estimates the impact of each explanatory variable at different quantiles of the distribution of the dependent variable – $Q_\theta(y|X)$[7]:

$$Q_\theta(y|X) = X\beta(\theta), \theta \in (0,1)$$

If we let the quantile for which the equation is estimated to vary, it is possible to obtain a complete characterization of the distribution of *y* conditional on the values assumed by the explanatory variables, and to assess their impact at any point of the distribution of *y*. This aspect is particularly important for an analysis of wage distributions. For example, when the male/female wage gap is being assessed, it is common to find a sizeable gap only at higher quantiles, and not at intermediate and lower quantiles of the wage distribution (the so-called glass ceiling effect). In this context, quantile regression has evident merits in comparison to least squares regression.

4. EDUCATION, SENIORITY AND OCCUPATIONAL CATEGORY

The results of the estimation of equation (1) using the two methods are presented in Charts 2 and 3 for the education and seniority variables, respectively. The detailed econometric results are shown in Appendix 2. It is worth noting that the estimated coefficients are, almost without exception, statistically significant (see Appendix 2, Table 1 for the estimated coeficients).

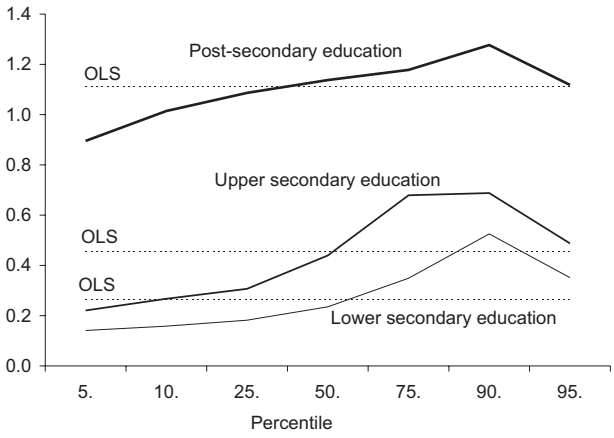
The dependent variable (hourly wage) was specified in logs, and therefore the coefficient estimates can be interpreted as the differential effect (in percentage) relative to the omitted category for the education variables in Chart 2 (the reference category being "less than secondary education") and an additional year of seniority in Chart 3[8]. For instance, workers with completed lower secondary education earn about 24 per cent more than workers without that education level, at the median of the hourly wage; and workers with 15 years of seniority receive around 25 per cent more than those with 5 years, also at the median.

(6) Mainly *contratos a termo certo e contratos administrativos de provimento*, which are both fixed-term contracts.

(7) See, for instance, Buchinsky (1998) about this estimation method. Applications in the context of the wage gap between the public and private sectors can be found, for example, in Poterba and Rueben (1994) and Melly (2003).

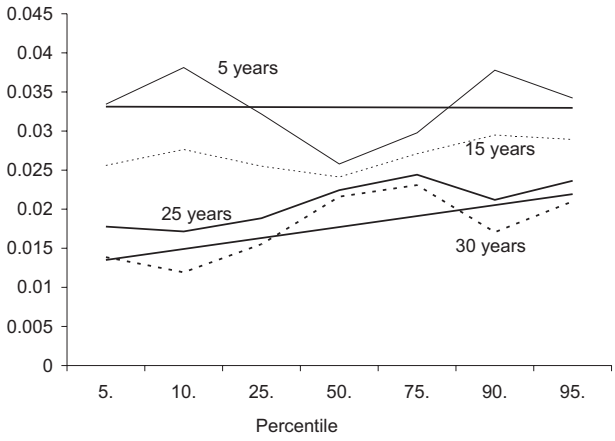
(8) The exact impact is obtained as $e^b - 1$, where b is the coefficient estimate. However, for "small" values of *b*, $e^b - 1$ is approximately equal to *b*.

Chart 2
IMPACT OF SCHOOLING ON WAGES



Note: Coefficients for the education variables in equation (1), OLS and quantile regression methods.

Chart 3
MARGINAL IMPACT OF SENIORITY ON WAGES



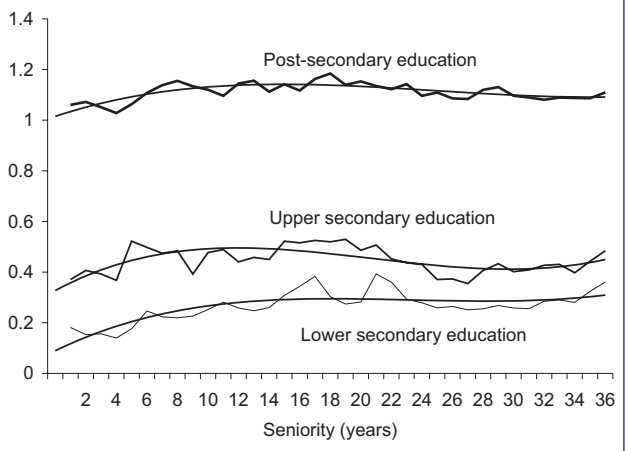
Note: Coefficients for seniority variables in equation (1), quantile regression method. Marginal impact computed as $\hat{\beta}_4 + 2\hat{\beta}_5 A_i$.

Previous papers established that the wage returns to education in Portugal, in particular as far as university education is concerned, are very high (see, for example, Portugal and Centeno (2001) and Portugal (2004)). Our results indicate that a civil servant with post-secondary education benefits from a wage premium of 75 to 100 per cent in comparison to his/her counterparts with lower secondary education. The charts show that the wage returns to schooling increase monotonically along the wage curve (approximately until the 90th percentile), with the premium at the lower [upper] percentiles being much smaller [higher] than the least squares estimate. The aforementioned papers established that wage earnings stemming from education in public administration are higher than those estimated for workers employed in the private sector.

Returns to seniority are one indicator for the existence of an internal labor market inside organizations and a measure for the reward to specific human capital. A significant seniority premium can be economically justified as the payment of efficiency wages, but in a sector with strong employment protection the justification can be the existence of rents which are not economically justified. The seniority coefficients indicate a positive linear component of around 3.5 per cent, while the quadratic component is negative, implying decreasing salary returns to seniority. Chart 3 presents the impact corresponding to an additional year of seniority, as the employees move forward in their career, for the various percentiles of the wage distribution. The impact, at each percentile, is decreasing in seniority, reflecting the decreasing marginal effect of this variable. Note, however, that while for lower seniority levels the marginal impact remains more or less constant throughout the wage distribution, for higher levels of seniority the marginal impact is clearly smaller in the left tail (reflecting a more negative non-linear term). This result captures a stronger effect of wage ceilings for workers with high seniority among the worse paid occupational categories.

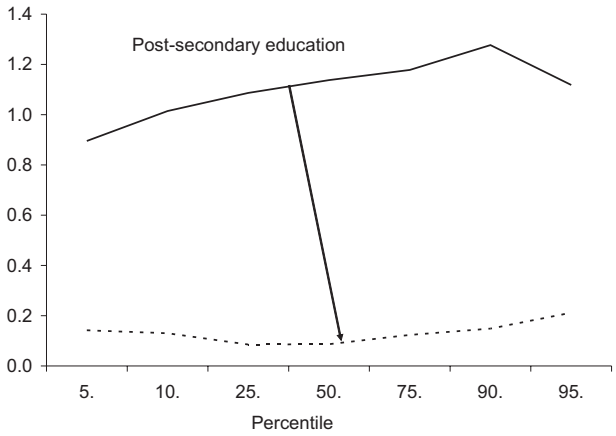
An examination of the change in education premium with seniority is an issue typically dealt with in studies such as this. Indeed one may expect that the importance of education, as a measure of general human capital, weakens as workers accumulate specific human capital. In order to investigate this issue, a specification corresponding to equation (1) was estimated, for each level of seniority. The results are shown in Chart 4. While the role of education becomes slightly less important after about 1/3 of the professional life, the coefficient remains high and significant. This result suggests a failure to reward the acquisition of specific human capital by workers and of the learning process that is usually thought to occur inside organizations. Educational attainment remains a consistently important wage-determining factor through the whole professional life.

Chart 4
IMPACT OF SCHOOLING ON WAGES AS SENIORITY INCREASES



Note: Coefficients of schooling variables in a model corresponding to equation (1), by years of seniority.

Chart 5
CHANGE IN THE IMPACT OF SCHOOLING ON WAGES IN A MODEL INCLUDING THE OCCUPATIONAL CATEGORY



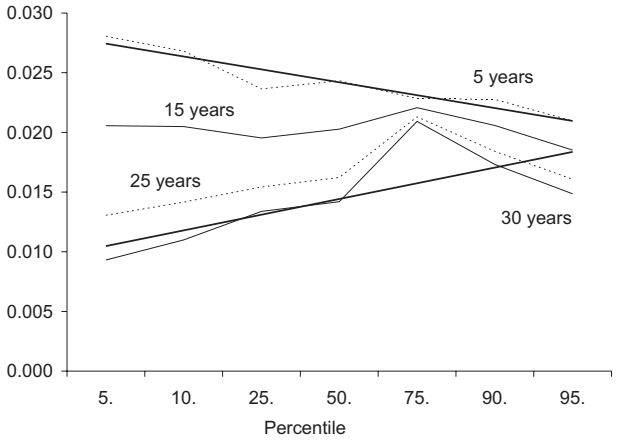
Note: Coeficient for the post-secondary school variable in equation (1) and in the equation including the occupational category (dotted), quantile regression method.

Finally, it is worth mentioning the result for the indicator of the type of contract. This variable captures workers with a non-permanent contract. The coefficient is negative at the bottom of the wage distribution and positive at the top (see Appendix 2, Table 1). This result captures, for the lower paid workers, the impact of weaker work relationships in the form of fixed-term contracts which translate into a wage penalty. For workers in the upper part of distribution, it reflects the wage premium benefitting those employees occupying managerial positions and/or in governmental offices who are not permanent workers and receive a higher wage. The coefficient for the male gender variable is positive and increases along the wage curve, indicating the existence of a gender wage gap, in particular at the top of the distribution of salaries.

As mentioned above, the estimation of two additional specifications containing variables on the employees' position within general government was carried out as a second step. Those specifications include, besides the variables in specification (1), dummy variables differentiating the scope of government/ministry and occupational category. The results of these two regressions are shown in Appendix 2, Table 2 and 3. The most important outcome is the strong negative impact of occupational category on the returns to education. In Chart 5 we show the results for the case of post-secondary education, but the same phenomenon can be observed for the other education levels (see Appendix 2, Table 3). This result indicates that the importance of the education endowment translates mainly into a requirement to reach a certain occupational category. It also shows that the significance of education as a wage-determining factor throughout the career comes down to employees' staying in the same occupational category over their professional life. Here there is again evidence of strong wage segmentation and of the existence of procedures consistent with those of an internal labour market in general government. It is worth noting that similar studies for the private sector (see Lima and Pereira (2003) for the Portuguese case) indicate a much smaller impact of occupational category on the coefficients measuring the reward to education even when internal labour markets cannot be ruled out for private firms.

As far as the coefficients for the dummy variables on the scope of government/ministry are concerned, their magnitude is small, except to the extent that they reflect the prevalence of certain occupational categories within a given ministry. This conclusion was confirmed by means of an additional regression polling all dummy variables (that is, those relating to the scope of govern-

Chart 6
CHANGE IN THE MARGINAL IMPACT OF SENIORITY ON WAGES IN A MODEL INCLUDING THE OCCUPATIONAL CATEGORY



Note: Coefficient for seniority variables in the equation including the occupational category, quantile regression method. Marginal impact computed as $\hat{\beta}_4 + 2\hat{\beta}_5 A_i$.

ment/ministry and to occupational category). The non-existence of significant wage differentiation among ministries is an indication of the lack of competition for hiring the best workers and, therefore, of incentives for internal mobility within general government.

The impact of taking into account occupational categories on the returns to seniority is shown in Chart 6. The inclusion of this variable allows us to control for the difference among the wage levels of the various occupational categories. At the bottom of the wage distribution the differences in the returns to seniority are now more pronounced than in Chart 3, with a clearer reduction of the returns to seniority for worse-paid workers at the end of their careers. At the top of the wage distribution the difference is smaller, with a more clear impact of wage ceilings for most categories.

The behaviour of the wage returns for senior workers provides an additional insight. The premium for one extra year of seniority at the end of professional life is significantly bigger between the median and the last decile of the wage distribution, compared to lower wage levels. This result, obtained after controlling for education and occupational category, points to a high wage growth for employees at the top of the wage distribution, those that had relatively more successful careers in public administration. However, such an effect vanishes in the last decile, reflecting the impact of wage ceilings.

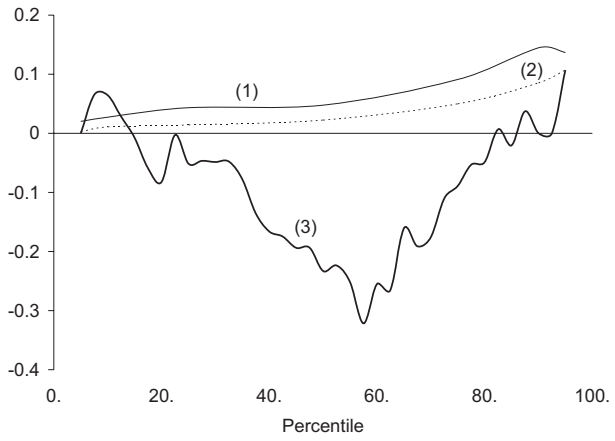
5. GENDER WAGE PREMIUM

The existence of a gender wage gap is one of the issues typically dealt with when the behaviour of wages inside organizations is being studied. This phenomenon is common to countries with different institutional regimes, but is less frequent in the public sector almost everywhere. This section examines the wage gap between men and women in Portuguese general government. Chart 7 shows the coefficient estimates for males controlling for the individual characteristics and seniority, and additionally for occupational category, as well as the raw wage difference between the two groups, at the various percentiles.

Women earn higher wages than men outside the tails of the wage distribution, the raw wage gap being negative approximately between the percentiles 15 and 85. This results fits in with the fact that the average salary for female workers is higher than that for male workers (see Appendix 1). However, adding individual characteristics as controls, the gap becomes positive over the wage distribution and its magnitude becomes larger at the upper percentiles. Therefore, the higher salaries earned by women are not enough to compensate for their larger human capital endowment, in particular in terms of schooling (see Appendix 1). Controlling also for the occupational category, the gap remains positive but lower, which means that part of the observed inequality is due to the prevalence of men in those occupational categories with higher returns to education.

The wage difference between the two groups can be decomposed into two components: one associated with the rate of return to each characteristic (that is, the price of that characteristic in the labour market), and another that reflects the endowment composition. This procedure, initially proposed by Oaxaca (1973), consists in estimating separately for each group the wage return associated with the different characteristics. The Oaxaca decomposition compares the specific wage returns at the sample average of the regressors. Machado and Mata (2005) carried out an extension of this

Chart 7
GENDER WAGE GAP



Note: (1) and (2) are the coefficients estimated for the male dummy variable, respectively, in equation (1) and in the equation including the occupational category, quantile regression method. (3) is the difference in the distribution of the log hourly wage between men and women, for the various quantiles.

approach that makes such a comparison possible at any point in the wage distribution.

Table 1 presents the Machado-Mata decomposition for the difference between salaries of men and women. The figures confirm that women have a larger human capital endowment, which significantly contributes to the raw wage gap. However, if the price of the various characteristics was the same for both groups, the difference in the education endowment would lead to an even larger gap. The inequality in the rates of return is particularly strong at the top of the wage distribution, approximately from the 80th percentile onwards. These results are a clear indication of the existence of a glass ceiling in female wage progression.

6. WAGE PROGRESSION AND DISPERSION IN SOME OCCUPATIONAL CATEGORIES

A key issue in the analysis of wage progression inside organizations is how they provide incentives to workers over the employment spell. This question plays a particularly important role in a sector where productivity is difficult to measure, such as public administration, and where wage incentives relating to progression over time are among the most important available. This section compares the progression pattern for a number of occupational categories in general government. This pattern should be understood as an observed return and not as an expected return as a function of seniority. Indeed, the current situation of workers might have been influenced by progression rules which may not be in place any more. The seniority coefficients discussed in the previous sections indicate that the returns to seniority increase at a diminishing rate. However, this aggregate analysis "hides" differentiated behaviour within general government occupational categories.

The analysis includes eight occupational categories representative of careers typically spent at low, intermediate and high wage cohorts. The occupational categories chosen also feature great homogeneity, measured by educational attainment of employees inside each category, and when this was not the case, we only considered workers with the most frequent education degree in that category. The average wage for each seniority year was estimated. The results are presented as the relative

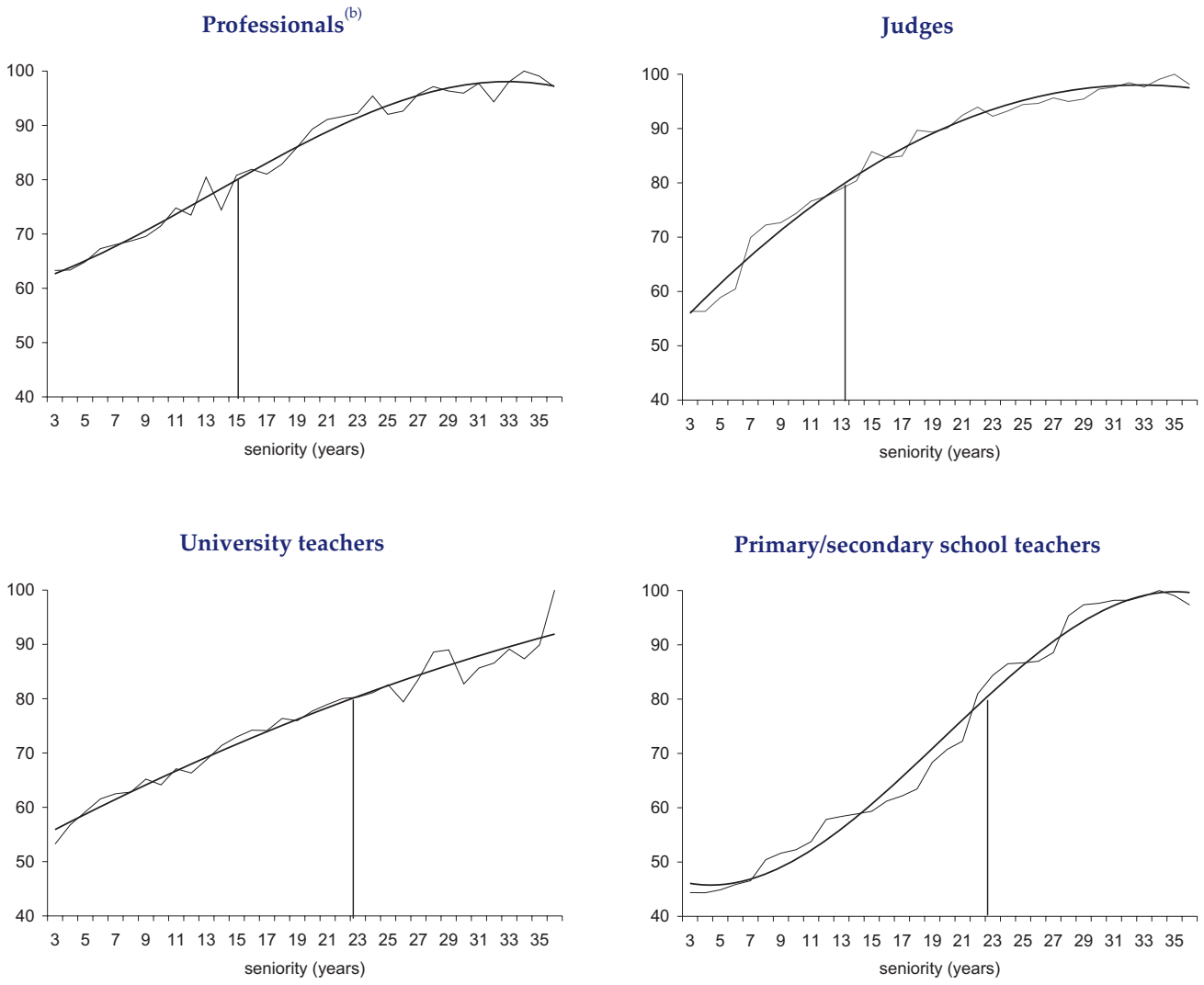
Table 1
MACHADO-MATA DECOMPOSITION OF THE DIFFERENCE IN WAGES BY GENDER

Quantile	10.	20.	30.	40.	50.	60.	70.	80.	90.	Oaxaca (OLS)
Difference in individual characteristics	-0.12	-0.18	-0.19	-0.24	-0.32	-0.31	-0.19	-0.13	-0.10	-0.17
Difference in the remuneration of individual chararacteristics	0.06	0.05	0.04	0.03	0.01	0.02	0.03	0.08	0.12	0.07

Note: Difference in the individual characteristics obtained as $Q_w(\hat{y}^{cf}) - Q_w(\hat{y}^f)$ and difference in the remuneration of the individual characteristics as $Q_w(\hat{y}^m) - Q_w(\hat{y}^{cf})$, where $Q_w(.)$ is the w decile of the distribution of the log hourly wage estimated from equation (1) for men and for women, that is $\left[\hat{y}^m = X^m\hat{\beta}^m(\theta)\right]$ and $\left[\hat{y}^f = X^f\hat{\beta}^f(\theta)\right]$ and of the counterfactual distribution that would prevail if the male endowment were remunerated at the price of the female endowment $\left[\hat{y}^{cf} = X^m\hat{\beta}^f(\theta)\right]$. Calculated using a random sample of 25000 men and 25000 women, using the variant presented in Albrecht, et al. (2003).

Chart 8 (to be continued)

WAGE PROGRESSION WITH SENIORITY IN THE GENERAL GOVERNMENT[(a)]

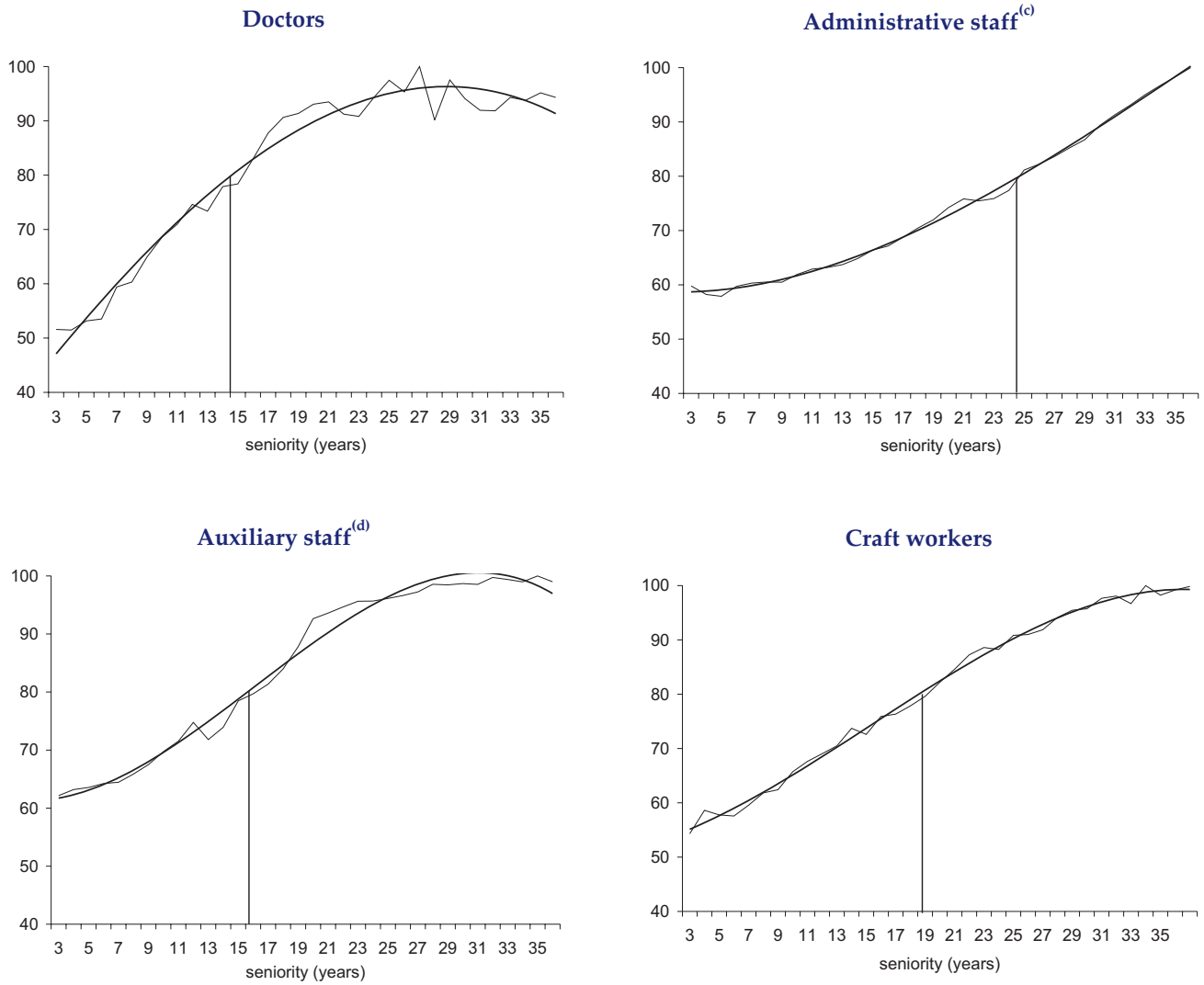


salary at each seniority level, compared to the salary prevailing at the end of the career (Chart 8). In addition, a polynomial curve was fitted in order to show the main tendency.

The progression pattern is quite different across occupational categories, even for those which require similar educational attainment. For instance, the progression for doctors and judges has a marked logarithmic pattern, with high wage increments in the initial years which afterwards tend to diminish quickly. On the contrary, primary and secondary school teachers have significant wage earnings at advanced stages in their career. This type of progression seems more common in occupational categories where employees do not have post-secondary education. A common outcome for all categories is the early attainment of a high wage level in relative terms. This is explained by quick initial progression and/or a relatively high entry point. Among categories with higher entry salaries, compared to salaries at the end of working life, are those where workers have less education (administrative and auxiliary staff). Other professionals are an exception, since they have more room for progression than other categories with the same educational requirements.

From this point of view, wage progression in some occupational categories reveals a problem of incentives at the final stages of professional life. This is the case for judges (80% of final salary after 13 years of career), doctors (after 14 years) and other professionals (after 15 years, but starting

Chart 8 (continued)
WAGE PROGRESSION WITH SENIORITY IN THE GENERAL GOVERNMENT[(a)]



Notes:
(a) Average salary by years of seniority for some occupational categories, as a percentage of the end salary.
(b) With post-secondary education.
(c) With lower secondary education.
(d) With less than lower secondary education.

from higher initial salaries). For judges and doctors, the wage increments at the end of working life are negligible. For example, for judges there are wage increments of 35 percentage points (p.p.) in the first half of professional lives and of only 10 p.p. in the remaining 18 years of their careers. These figures indicate a potential problem in terms of keeping up incentives at advanced stages in the career, which is even more serious as productivity growth tends to decrease at this career stage. This pattern does not encourage the extension of working life, and has negative consequences for the minimization of productivity losses, in particular in a sector featuring high employment protection.

In addition to the wage evolution pattern over time, it is also interesting to examine evidence about wage dispersion throughout a career in public administration. Such dispersion is particularly important as it might reveal to what extent managers are capable of rewarding the relative merit of their co-workers. If progression over time in a given category depended only on seniority (nil dispersion), the average salary determined above would coincide approximately with the observed

Table 2

WAGE CONCENTRATION IN THE GENERAL GOVERNMENT

Professionals (post-secondary educ.)	0.59
Judges	0.88
University teachers	0.51
Primary/secondary school teachers	0.85
Auxiliary staff (less than lower secondary educ.)	0.81
Administrative staff (lower secondary educ.)	0.73
Craft workers	0.78
Doctors	0.63

Note: Correlation coefficient between the average wage and the observed wage, by year of seniority.

salary, for each level of seniority. That is, the correlation coefficient would be close to 1. The bigger this coefficient is, the higher the importance of wage concentration generated by progression criteria depending only on seniority. Table 2 presents the results for the occupational categories studied above.

Wage concentration is high for almost all occupational categories. University teachers have the lowest value. This may reflect the fact that progression in their case is conditioned by the acquisition of academic degrees, the conclusion of which is subject to strong variability. The correlation coefficient for other professionals has also a relatively smaller value, possibly due to a certain degree of heterogeneity in this category and to the fact that it is common to several ministries, and this originates less uniform progression rules. Judges and primary and secondary teachers show on the contrary a very high wage concentration, which stems from the homogeneity of functions and concentration of workers in the same ministry, giving rise to very uniform progression mechanisms. This incapacity to introduce wage differentiation translates into a disincentive for the performance of workers, indicating a deficient personnel policy.

7. CONCLUSIONS

The objective of this paper is to analyse the determination of wages in public administration in Portugal, using data form the 2nd General Government Census, which took place in December 1999. The econometric analysis of the information available in the database was carried out mainly through wage regression equations.

The results can be summarized as follows:

- The wage structure in general government is strongly segmented in comparison to the private sector, reflecting more rigid conditions as far as entry and progression in the various occupational categories are concerned.
- There are high returns to education, in particular at the top of the hourly wage distribution. The impact of schooling on wages is, however, severely reduced when the occupational category is added as control. This result has no equivalent in the private sector and may also be seen as an indicator of segmentation around the occupational categories in public administration. In contrast, controlling for the scope of government/ministry does not imply a significant change in the reward associated with the characteristics of workers. This outcome reveals rigidity in the internal allocation of resources, and lack of incentives to mobility inside general government.
- Women benefit from wage returns to human capital endowment which are below those earned by men. This phenomenon is clearer in the upper cohorts of the hourly wage distribution.
- There is a non-linear relationship between salary and seniority: the associated reward exhibits decreasing returns. This phenomenon is partially explained by the tendency, in those occupational categories where workers are more qualified, for wage increases to be concentrated at early stages in the career. In general government a relatively high wage level is attained in the initial years, in comparison to the expected salary at the end of the worker's career (more than half of wage progression is made in one third of professional life). Education plays a consistently important role as regards wage determination even at later stages in the employment spell, and this fact is linked to permanency in a given occupational category. This suggests some failure to reward the acquisition of specific human capital by the employee.

- Wage dispersion with seniority increase is limited. Only in those occupational categories with a certain degree of functional heterogeneity, where workers are spread across a number of ministries, or where further advancement in the career requires additional qualifications, does there seem to exist some dispersion. Otherwise, progression seems rather uniform, pointing to an incentive problem.

These results complement those drawn by other papers on the Portuguese labour market, in particular for the public sector. Some of the questions raised, concerning the reasons why wages in the public sector are above those in the private sector, have been analysed in this paper from a general government perspective. The characterization indicates several efficiency problems concerning the functioning of general government as an internal labour market. Besides rigidity in wage structure and lack of incentives for internal mobility, also external mobility is discouraged by the quick attainment of high remuneration levels. It should also be taken into account that the civil servants' social security system has been more favourable than its private sector counterpart, which also contributes to jeopardising external mobility. Added to this is the much stronger employment protection in the public sector. The implementation of a personnel management policy in an environment with these type of characteristics has evident limitations.

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APPENDIX 1
2nd General Public Administration Census - some descriptive statistics[(a)]

Table 1

HOURLY WAGES (PTE)

	Men	Women	Non-graduate	Graduate	Total
Average	1476.2	1550.4	974.2	2353.4	1519.4
Sd	1126.4	969.6	498.5	1095.5	1038.6
Median	999.3	1261.5	855.0	2155.8	1139.3
P25	773.5	814.3	633.3	1627.8	793.5
P75	1940.8	2121.5	1119.3	2970.0	2015.0

Table 2

SENIORITY (YEARS)

	Men	Women	Total
Average	15.3	15.0	15.1
Sd	9.9	10.0	10.0
Median	15.0	14.0	15.0
P25	6.0	6.0	6.0
P75	23.0	24.0	24.0

Table 3

DISTRIBUTION OF WORKERS BY GENDER AND EDUCATION (PERCENTAGE)

	Men	Women	Total
Below lower secondary education	38.2	22.8	29.1
Lower secondary education	14.2	11.9	12.8
Upper secondary education	15.1	17.4	16.5
Post-secondary education	32.5	47.9	41.5

(a) Military personnel and regional government of *Região Autónoma dos Açores* not included

Table 4

DISTRIBUTION OF WORKERS BY THE LEGAL NATURE OF THE WORK RELATIONSHIP (PERCENTAGE)

Legal nature	
Definitive appointment	80.3
Administrative fixed-term contract	8.6
Fixed-term contract	4.2
Provisional appointment	2.4
Individual contract	1.9
Other	2.7

Table 5

DISTRIBUTION OF WORKERS BY SCOPE OF GOVERNMENT (PERCENTAGE)

Government scope	
Sovereign bodies, ministerial staff and central government	80.1
Local government	17.1
Regional government	2.9

Table 6

DISTRIBUTION OF CENTRAL GOVERNMENT WORKERS BY MINISTRY (PERCENTAGE)

Ministry	
Education	46.1
Health	21.8
Internal affairs	9.7
Employment and social security	5.2
Justice	4.7
Finance	3.4
Agriculture	2.8
Social infrastructure	1.3
Economy	1.1
Foreign affairs	0.8
Environment	0.7
Culture	0.7
Planning	0.6
Council to cabinet	0.4
Defence	0.3
Science and technology	0.3
Reform of public administration	0.2

Table 7

DISTRIBUTION OF WORKERS BY OCCUPATIONAL CATEGORY (PERCENTAGE)

Profissional category	
Primary and secondary school teachers	24.8
Auxiliary staff	20.0
Administrative staff	11.3
Security forces	7.9
Craft workers	5.8
Nurses	5.0
Technicians	3.7
Other professionals	3.5
Doctors	3.5
Other technicians	2.3
University teachers	2.1
Managers	1.5
Primary and kindergarten teachers	1.3
Administrative court staff	1.3
Polytechnical school teachers	1.0
Medical support staff	1.0
Other court staff	0.7
Prision guards	0.6
IT staff	0.5
Judges	0.4
Firemen	0.3
Research staff	0.2
Other health professionals	0.2
Criminal investigators	0.2
Diplomats	0.1
Criminal investigation support staff	0.1
Registrars and notaries	0.1
Other	0.6

APPENDIX 2
Econometric results

Table 1

ESTIMATION OF EQUATION (1) BY THE ORDINARY LEAST SQUARES AND QUANTILE REGRESSION

	5.	10.	25.	50.	75.	90.	95.	OLS
Seniority	0.037	0.043	0.036	0.027	0.031	0.042	0.037	0.036
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
$Seniority^2$	-0.039	-0.052	-0.033	-0.008	-0.013	-0.041	-0.026	-0.031
	0.001	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*	*0.001*	*0.000*
LSeducation	0.141	0.158	0.182	0.235	0.349	0.525	0.351	0.263
	0.002	*0.001*	*0.000*	*0.000*	*0.000*	*0.003*	*0.003*	*0.001*
USeducation	0.220	0.267	0.307	0.440	0.679	0.688	0.488	0.457
	0.002	*0.001*	*0.000*	*0.000*	*0.000*	*0.003*	*0.003*	*0.001*
PSeducation	0.895	1.015	1.087	1.138	1.178	1.277	1.118	1.112
	0.001	*0.001*	*0.000*	*0.000*	*0.000*	*0.002*	*0.002*	*0.001*
NP	-0.039	-0.105	-0.050	0.020	0.120	0.122	0.109	0.029
	0.002	*0.001*	*0.000*	*0.000*	*0.001*	*0.003*	*0.0032*	*0.002*
Gender M	0.020	0.027	0.043	0.048	0.091	0.145	0.137	0.068
	0.001	*0.001*	*0.000*	*0.000*	*0.000*	*0.002*	*0.002*	*0.001*
Constant	5.884	5.882	6.025	6.158	6.182	6.275	6.629	6.131
	0.002	*0.001*	*0.000*	*0.000*	*0.001*	*0.003*	*0.003*	*0.001*

Notes:
- Regression carried out using 546,468 observations. Standard deviation in italics.
- Seniority in years; $Seniority^2$ defined as (Seniority*Seniority)/100.
- Variables LSeducation, USeducation e PSeducation are equal to 1 when workers have, respectively, lower secondary, upper secondary and post-secondary education.
- NP is equal to 1 for work relationships different from appointment.
- Gender M equal to 1 for male workers.

Table 2

ESTIMATION OF EQUATION (1) WITH DUMMY VARIABLES FOR THE SCOPE OF GOVERNMENT/MINISTRY BY THE ORDINARY LEAST SQUARES AND QUANTILE REGRESSION

	10.	50.	90.	OLS
Seniority	0.042	0.028	0.030	0.035
	0.000	*0.000*	*0.00*	*0.000*
$Seniority^2$	-0.048	-0.014	-0.012	-0.029
	0.001	*0.000*	*0.000*	*0.000*
LSeducation	0.158	0.227	0.294	0.237
	0.002	*0.000*	*0.000*	*0.001*
USeducation	0.262	0.387	0.440	0.395
	0.002	*0.000*	*0.000*	*0.001*
PSeducation	1.020	1.147	1.185	1.087
	0.002	*0.000*	*0.000*	*0.001*
NP	-0.117	0.013	0.283	0.034
	0.002	*0.000*	*0.000*	*0.001*
Gender M	0.035	0.045	0.103	0.078
	0.001	*0.000*	*0.000*	*0.001*

Notes:
- Regression carried out using 545,230 observations. Standard deviation in italics.
- See notes to Table 1 for the definition of variables.
- For confidentiality reasons, coefficients for the scope of government/ministry variables not shown.

Table 3

ESTIMATION OF EQUATION (1) WITH DUMMY VARIABLES FOR THE OCCUPATIONAL CATEGORY BY THE ORDINARY LEAST SQUARES AND QUANTILE REGRESSION

	5.	10.	25.	50.	75.	90.	95.	OLS
Seniority	0.032	0.030	0.026	0.026	0.023	0.024	0.022	0.026
	0.000	*0.000*	*0.00*	*0.000*	*0.000*	*0.000*	*0.000*	*0.026*
Seniority^2	-0.037	-0.032	-0.021	-0.020	-0.004	-0.011	-0.012	-0.020
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*-0.020*
LSeducation	0.043	0.042	0.045	0.046	0.048	0.058	0.100	0.055
	0.001	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.055*
USeducation	0.061	0.064	0.060	0.066	0.077	0.058	0.096	0.074
	0.001	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.074*
PSeducation	0.142	0.130	0.085	0.087	0.124	0.149	0.212	0.147
	0.001	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.147*
NP	-0.313	-0.325	-0.149	-0.074	-0.039	-0.028	-0.031	-0.124
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*-0.124*
Gender M	0.003	0.011	0.014	0.022	0.049	0.081	0.106	0.024
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.024*

Notes:
- Regression carried out using 545,211 observations. Standard deviation in italics.
- See notes to Table 1 for the definition of variables
- For confidentiality reasons, coefficients for the occupational category variables not shown.