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# Male and Female Wage Functions: A Quantile Regression Analysis using LEED and LFS Portuguese Databases

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# Male and Female Wage Functions:
# A Quantile Regression Analysis using LEED and LFS Portuguese Databases

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## Abstract[§]

The research aims to study the distribution of hourly wages for men and women in Portugal, adopting a quantile regression (QR) approach. Two databases are used for the estimation of the wage functions: the *Quadros de Pessoal*, Linked Employer-Employee Data (QP-LEED) and the *Inquérito ao Emprego*, Portuguese Labour Force Survey (IE-LFS).

Three basic models are considered to explain the hourly wages for men and women: the first model, using each database separately, is estimated adopting education, tenure, potential experience, activity sector, and job as independent variables; the second, using data from QP-LEED, includes additional determinants related to firm (firm size and foreign social capital); and the third, using data from the IE-LFS, includes additional independent variables related to the worker's family (marital status and children).

The results indicate that: (i) Regardless of the database used, the quantile regression (QR) shows superiority over OLS approach; (ii) In general, the same model specification estimated using each database - one administrative (QP-LEED), and the other based on a survey (IE-LFS) - present convergent results; (iii) Independently of the database used, the equations for men and for women reveal that the levels of education have a higher impact on wage determination; (iv) In general, the variables related to the firm contribute to the explanation of wages of men and women while those related to family only contribute to the explanation of men's wages; and (v) the clear different returns for the same characteristics found between men and women, and the pattern of differences which increase across quantiles strongly indicates that the present study should continue in the future, with the analysis of the explanation of the gender wage gap.

JEL code: *J31, C21*
Keywords: *wage function; quantile regression; Linked Employer-Employee Data; Labour Force Survey; male-female wage differences*

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## 1. Introduction

This research intends to attain two goals: to explain and compare wages of men and women in Portugal and to contrast the results obtained from two separate databases. To achieve the first goal, a quantile regression approach is adopted. About the second goal, as far as the authors know, this is the first attempt to compare results obtained from two distinct databases, both of which provide useful information to explain wage levels and wage differences.

The Mincerian wage equation (Mincer, 1974) included as dependent variable the logarithm of the hourly wage and as explanatory variables factors associated with the human capital characteristics (e.g. years of schooling, potential experience, tenure). Since that seminal work, the list of explanatory variables has been extended with variables associated with supply like gender, marital status, number of children and children age, cognitive skills, social capital and networks, race and ethnicity, specialization between market and non-market work, beauty, psychological capital (Balcar, 2012). Variables associated with demand and institutional framework like sector of activity, firm characteristics (e.g. size, location), occupation, unionization, minimum wage, family policies, have been also added.

Most of the research on Portuguese wages and wage inequality is based on the Quadros de Pessoal (QP-LEED)[3]. In Appendix (Table A1) 37 empirical studies are identified that analyze the Portuguese case. Only ten of them use other than QP_LEED database and seven of these are based on the Labour Force Survey (Figueiredo, 2011). A previous literature review, (Pereira and Lima, 1999) also show the predominance of use of QP-LEED database. Figueiredo (2011) has studied the wage function and the gender wage gap decomposition based on *Inquérito ao Emprego*, Portuguese Labour Force Survey (IE-LFS). The present paper is a preliminary step for the study of that wage gap based on *Quadros de Pessoal* Linked Employer-Employee data (*QP*-LEED). Here the wage functions for men and women are analyzed using the two databases: (*IE*-LFS) and (*QP*-LEED).

The paper is organized as follows: in Section 2 the option for quantile regression is justified, the two data sources harmonization is presented and different specifications for

[3] Recently the Social Security records data are also used to study the labour market and wage inequality ( Centeno, Machado and Novo, 2008).

wage function are introduced. Section 3 presents and discusses the results. The last section lists the main conclusions and suggests future research avenues.

## 2. Empirical Strategy and Databases Harmonization

### 2.1. Quantile Regression (QR) Analysis

Unlike the Multiple Linear Regression model, in which it is only possible to know the effects of the explanatory variables in the mean of the conditional distribution of dependent variable, the Quantile Regression (QR) allows estimation of the effects of covariates on different points of the dependent variable distribution. Buchinsky (1998a, p.89) referred as an useful feature of QR that "... potentially different solutions at distinct quantiles may be interpreted as differences in the response of the dependent variable to changes in the regressors at various points in the conditional distribution of the dependent variable". Thus, QR permits a full characterization of the conditional distribution of wages, controlling for individual heterogeneity associated with this type of data.

The linear model of Quantile Regression is presented as:

$$y_i = x_i^{'}\beta(\theta) + u_{\theta i}\,, \quad i = 1, \dots, N \quad \text{e} \quad \theta \in (0,1) \qquad (1)$$

where $N$ is the sample size, $y_i$ is the dependent variable, $x_i$ is a vector of $(k \times 1)$ size of the explanatory variables, $\beta(\theta)$ is the vector of $(k \times 1)$ size of the regression parameters associated with the $\theta$-th percentile, and $u_{\theta i}$ corresponds to the error term.

This model assumes the following for the random residual variable ( $u_{\theta i}$ ) :

$$Q_\theta(u_{\theta i} \mid x_i) = 0,$$

Consequently the quantile of order $\theta$ of $y_i$ conditional in $x_i$ is given by

$$Q_\theta(y_i \mid x_i) = x_i^{'}\beta(\theta) \qquad \theta \in (0,1)$$

This means that it is linear in $x$. Therefore, it should be noted that the marginal effects of covariates, given by $\beta(\theta)$, in principle, differ across quantiles. From the last expression it follows that $\beta(\theta)$ is the partial derivative of the conditional quantile function in relation to the explanatory variables. As a result it is possible to obtain the marginal effects at different points of the conditional distribution.

Quantile regression does not impose assumptions about the parametric distribution errors. Consequently, the quantile regression model overcomes the restrictive assumption present in the linear regression model, where the error terms are independent and identically distributed in the conditional distribution.

The vector of estimated parameters for a given $\theta$, $\hat{\beta}(\theta)$, is obtained as a solution of a minimization problem (Buchinsky, 1998b) of the weighted sum of the absolute value of the errors.

$$\hat{\beta}(\theta) = \arg\min_{\beta} \frac{1}{n} \left\{ \sum_{i:y_i > x_i^{'}\beta} \theta \left| y_i - x_i^{'}\beta \right| + \sum_{i:y_i < x_i^{'}\beta} (1-\theta) \left| y_i - x_i^{'}\beta \right| \right\}$$

## 2.2. Databases Harmonization and Sample Characteristics

### 2.2.1. Linked Employee Employer Data and Portuguese Labor Force Survey

*Quadros de Pessoal*, LEED data is an administrative annual database collected by the Ministry of Labour/Employment. It assembles information from all workers and firms (including micro firms) and excludes the civil servants. The data presented in this paper refer to October 2007.

Portuguese Labour Force Survey-LFS (*Inquérito ao Emprego*) is a statistical database collected by Statistics Portugal and is part of the European Labour Force Survey- Eurostat[4]. Is a household sample quarterly survey collecting information on persons in the labour force and outside the labour force. The unemployment rate in EU countries is computed based on LFS data.

### 2.2.2. Sample and Sample Characteristics

The two samples selected for the present research include wage earners, between 15 and 64 years old, working between 30 and 50 hours per week, employed in private sector. Several sectors were excluded from the analysis: Agriculture, Forestry, Fishing, Public Administration Security and Social Security, Education, Health and Social Work, Construction and Domestic Services.

Table A2 presents the descriptions of the variables. Table 1 presents descriptive statistics from the two samples, obtained each from the two data sources. The main difference

[4] http://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey

between the data sources results is the mean of the hourly wage (*wagehr*): the mean obtained with the QP-LEED data is higher. This result was expectable because the wage in QP-LEED is the wage before taxes and in IE-LFS is the wage net from taxes. Potential experience (*experience_pot*) is slightly higher in the case of IE-LFS. Note that the IE-LFS has also information about the effective experience[5] (*experience_eff* ). The values for tenure (*tenure*) are higher in IE-LFS.

**Table 1 – Summary Statistics**
**(All; Male; Female; IE-LFS and QP-LEED)**

| | Source : IE-LFS | | | | | | Source : QP-LEED | | | | | | Source: IE-LFS | Source: QP-LEED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All (N=4367) | | Male (N=2299) | | Female (N=2068) | | All (N=5073) | | Male (N=2881) | | Female (N=2192) | | Male/ Female | Male/ Female |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | (mean) | (mean) |
| *wagehr*[6] | 4.2425 | 2.5306 | 4.7546 | 2.84675 | 3.6733 | 1.97514 | 6.74 | 6.4351 | 7.65 | 7.5185 | 5.5392 | 4.36244 | 1.29 | 1.38 |
| *male* | 0.53 | 0.4990 | 1.00 | 0.0000 | 0.00 | 0.0000 | 0.57 | 0.4950 | 1.00 | 0.0000 | 0.00 | 0.0000 | 1 | 1 |
| *edu1* | 0.02 | 0.1280 | 0.01 | 0.1080 | 0.02 | 0.1480 | 0.01 | 0.1090 | 0.01 | 0.1110 | 0.01 | 0.1060 | 0.50 | 1.00 |
| *edu2* | 0.24 | 0.4270 | 0.25 | 0.4310 | 0.23 | 0.4210 | 0.19 | 0.3900 | 0.18 | 0.3820 | 0.20 | 0.4000 | 1.09 | 0.90 |
| *edu3* | 0.24 | 0.4260 | 0.24 | 0.4290 | 0.23 | 0.4240 | 0.20 | 0.4010 | 0.21 | 0.4110 | 0.18 | 0.3870 | 1.04 | 1.17 |
| *edu4* | 0.24 | 0.4270 | 0.26 | 0.4410 | 0.21 | 0.4100 | 0.22 | 0.4160 | 0.24 | 0.4280 | 0.20 | 0.3990 | 1.24 | 1.20 |
| *edu5* | 0.17 | 0.3800 | 0.15 | 0.3580 | 0.20 | 0.4010 | 0.24 | 0.4280 | 0.22 | 0.4170 | 0.26 | 0.4400 | 0.75 | 0.85 |
| *edu6* | 0.02 | 0.1460 | 0.02 | 0.1370 | 0.02 | 0.1550 | 0.02 | 0.1500 | 0.02 | 0.1460 | 0.02 | 0.1550 | 1.00 | 1.00 |
| *edu7* | 0.07 | 0.2520 | 0.06 | 0.2430 | 0.07 | 0.2620 | 0.11 | 0.3166 | 0.11 | 0.3104 | 0.12 | 0.3245 | 0.86 | 0.90 |
| *experience_pot* | 22.35 | 11.9670 | 23.17 | 12.2080 | 21.44 | 11.6290 | 20.97 | 11.4200 | 21.75 | 11.6530 | 19.95 | 11.0260 | 1.08 | 1.09 |
| *experience_sq* | 642.75 | 573.3080 | 685.69 | 591.2370 | 595.02 | 548.9060 | 570.28 | 538.1340 | 608.89 | 561.0520 | 519.54 | 502.0660 | 1.15 | 1.17 |
| *tenure* | 10.76 | 10.0211 | 11.51 | 10.4964 | 9.93 | 9.3972 | 8.28 | 9.0120 | 8.82 | 9.4650 | 7.56 | 8.3280 | 1.16 | 1.17 |
| *tenure_sq* | 216.28 | 344.5091 | 242.72 | 366.3914 | 186.89 | 315.9236 | 149.70 | 277.9470 | 167.35 | 300.3160 | 126.50 | 243.5950 | 1.30 | 1.32 |
| *married* | 0.68 | 0.4660 | 0.69 | 0.4620 | 0.67 | 0.4710 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 1.03 | n.a. |
| *Child <6* | 0.03 | 0.1750 | 0.03 | 0.1730 | 0.03 | 0.1770 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 1.00 | n.a. |
| *Child 6_17* | 0.43 | 0.6650 | 0.41 | 0.6570 | 0.44 | 0.6730 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 0.93 | n.a. |
| *Child >17* | 0.28 | 0.5760 | 0.29 | 0.5790 | 0.28 | 0.5730 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 1.04 | n.a. |
| *experience_eff* | 21.85 | 13.0444 | 23.07 | 13.4587 | 20.51 | 12.4330 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 1.12 | n.a. |
| *age* | 38.56 | 11.3930 | 39.25 | 11.7640 | 37.79 | 10.9180 | 37.75 | 10.6160 | 38.43 | 10.9620 | 36.86 | 10.075 | 1.04 | 1.04 |
| *size_med* | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 0.30 | 0.4600 | 0.30 | 0.4580 | 0.31 | 0.4620 | n.a. | 0.97 |
| *size_lar* | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 0.36 | 0.4810 | 0.36 | 0.4810 | 0.37 | 0.4820 | n.a. | 0.97 |
| *capext_5* | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 0.04 | 0.1900 | 0.04 | 0.1970 | 0.03 | 0.1790 | n.a. | 1.33 |
| *capext_1* | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | 0.16 | 0.3700 | 0.16 | 0.3620 | 0.18 | 0.3800 | n.a. | 0.89 |

Source: Authors computations based on LEED-QP 2007 and LFS-IE 2007.

[5] The 2007 Portuguese Labour Force Survey (IE-LFS) includes the question: "*On what date you began working for the first time?*". In fact, this is not a perfect measure of effective experience because is not possible to identify if there were breaks after the first job and the duration of those breaks. This is a better measure of experience but is still a proxy. The models were estimated (not shown here) using the effective experience instead of potential experience without relevant differences of results.

[6] The hourly wage mean for full time workers in Portugal for males and females was 7.19 and 7.16 euros respectively, based on EU-SILC 2007 (Christofides *et al.* 2013, p.88).

The comparison of the means for male and female (the last two columns of Table 1 present the ratio of means male/female) shown that the main differences are related with hourly wages (wagehr). On average, men have a higher salary compared with women: 38% higher using the QP-LEED data, and 29% higher using the IE-LFS data. This difference could possibly be explained partially by non-proportional taxes on wages. It is likely that highest values of the standard deviations of the hourly wages (Table 2) result from the progressiveness of taxes.

Regardless of the database used, the distribution of hourly wages over the five quantiles (Table 2) is different. This different structure across quantiles can justify the need to perform the analysis not only on the average (for which the OLS regression would be suitable) but rather along the distribution.  Consequently, the Quantile Regression (QR) approach is more appropriate and is adopted.

**Table 2 – Hourly Wage Distribution**

| | Source: QP LEED [(b)] | | | Source: IE _LFS | | |
|---|---|---|---|---|---|---|
| | Total | Men | Women | Total | Men | Women |
| Mean | 6.74 | 7.65 | 5.53 | 4.24 | 4.75 | 3.67 |
| SD | 6.44 | 7.52 | 4.35 | 2.53 | 2.85 | 1.98 |
| Coefficient of variation | 95.55% | 98.30% | 78.66% | 59.67% | 60.00% | 53.95% |
| Quantile | | | | | | |
| q10 | 2.90 | 3.19 | 2.80 | 2.4 | 2.69 | 2.50 |
| q25 | 3.43 | 3.86 | 3.07 | 2.81 | 3.13 | 2.52 |
| q50 | 4.60 | 5.18 | 3.85 | 3.44 | 3.75 | 3.13 |
| q75 | 7.49 | 8.60 | 6.10 | 4.69 | 5.31 | 3.88 |
| q90 | 12.90 | 14.50 | 10.66 | 6.88 | 7.78 | 5.71 |
| Dispersion | | | | | | |
| q90-q10 | 10.00 | 11.31 | 7.86 | 4.48 | 5.09 | 3.21 |
| q75-q25 | 4.06 | 4.74 | 3.03 | 1.88 | 2.18 | 1.36 |
| q25-q10 | 0.53 | 0.67 | 0.27 | 0.41 | 0.44 | 0.02 |
| q50-q25 | 1.17 | 1.32 | 0.78 | 0.63 | 0.62 | 0.61 |
| q75-q50 | 2.89 | 3.42 | 2.25 | 1.25 | 1.56 | 0.75 |
| q90-q75 | 5.41 | 5.90 | 4.56 | 2.19 | 2.47 | 1.83 |
| N | 5073 | 2881 | 2192 | 4367 | 2299 | 2068 |

Source: Authors computations based on QP-LEED 2007 and IE-LFS  2007.

## 2. 3. QR Model Specification

The empirical strategy followed several steps. Firstly, a linear model is estimated using the OLS and the full samples (males and females) for each of the two databases (QP-LEED and IE-LFS) and using the same specification. Secondly, the wage function is estimated separately for males and females using each database, the same specification and OLS. Thirdly, the same wage function specification is estimated separately for males and females using quantile regression (QR). Fourthly, firm variables are added to both equations, based on QP-LEED data and using QR methodology. Finally family variables are added to both regressions (males and females), based on IE-LFS data and adopting QR analysis.

Initially, we used the specification of the linear model introduced by Mincer (1974). The specification of the wage functions includes experience (actual or potential) and tenure. Both, experience and tenure are specified in linear and quadratic terms to capture the nonlinear effects. For each of the two databases (QP and LFS), the traditional Mincerian wage functions were estimated first considering the pooled sample (including as explanatory the binary *male*), and then separately by gender. Table A2 presents the definitions of the variables. Considering the male and female pooled sample, it is assumed that the effect of *male* variable is independent from other individual characteristics (e.g. experience and education). However, it is likely that men are paid for their characteristics differently from women. Consequently, it is too restrictive to assume that the estimated coefficients associated with the regressors are held constant by gender. Therefore, we proceeded to estimate the wage equations separately for men and for women[7].

Because the heteroscedasticity tests performed to regressions in the mean showed that the errors are heteroscedastic, the OLS estimation was carried out with the option standard errors robust to heteroscedasticity, and the estimates for the standard errors of quantile regressions were obtained using the bootstrap technique. The calculations were carried out with 1,000 replicates, this being the usual number of replicas suggested by Davidson and Hinkley (1997). This value is acceptable taking into account that, according to the three step method presented by Andrews and Buchinsky (2000), the optimal number

[7] As reported by Verbeek (2004), another solution - that would lead to similar results – would be to consider the interaction of the variable gender, multiplying the covariates by the gender variable. Although, the standard errors are homoscedastic in the pooled sample. In the case of estimating the model separately for the two subsamples of men and women, we assume that the error terms are homoscedastic within each sub-sample.

of replicas obtained varied between 800 and 1,000, depending on the regression quantile estimate. Computations use Stata 12.0 software.

The group of models labeled as *Model 1* includes as explanatory variables: the gender (only when all the sample is used), education (taking the zero years of schooling – *edu1*- as reference category), experience, tenure, sector of activity (financial activities is the reference category), and occupation (clerk, admistritative workers is the reference category). *Model 2* additionally includes the size of the firm ( the reference category is small firms)and the percentage of foreign capital in social capital (the reference category is without foreign social capital). Model 3 additionally includes civil status and the existence of children by age group.

The models studied are the following:

**Models 1**

OLS regression (All)

$$\omega = \beta_0 + \beta_1 male + \sum_{j=2}^{7} \beta_j educ_{j-1} + \beta_8 \exp + \beta_9 \exp^2 + \beta_{10} tenure + \beta_{11} tenure^2 + + \sum_{j=12}^{32} \beta_j \sec tor_{j-11} + \sum_{j=33}^{40} \beta_j job_{j-32} + u$$

OLS regression by gender

$$\omega^g = \beta_0^g + \sum_{j=1}^{6} \beta_j^g educ_j + \beta_7^g \exp + \beta_8^g \exp^2 + \beta_9^g tenure + \beta_{10}^g tenure^2 + + \sum_{j=11}^{31} \beta_j^g \sec otr_{j-10} + \sum_{j=32}^{39} \beta_j^g job_{j-31} + u^g$$

Quantile Regression (All)

$$Q_\theta(\omega \mid x) = \beta_0(\theta) + \beta_1(\theta) male + \sum_{j=2}^{7} \beta_j(\theta) educ_{j-1} + \beta_8(\theta)\exp + \beta_9(\theta)\exp^2 + \beta_{10}(\theta) tenure + \beta_{11}(\theta) tenure^2 + \\ + \sum_{j=12}^{32} \beta_j(\theta) \sec tor_{j-11} + \sum_{j=33}^{40} \beta_j(\theta) job_{j-32} + u(\theta)$$

Quantile Regression by gender

$$Q_\theta\left(\omega^g \mid x^g\right) = \beta_0^g(\theta) + \sum_{j=1}^{6} \beta_j^g(\theta) educ_j + \beta_7^g(\theta)\exp + \beta_8^g(\theta)\exp^2 + \beta_9^g(\theta) tenure + \beta_{10}^g(\theta) tenure^2 + \\ + \sum_{j=11}^{31} \beta_j^g(\theta) \sec tor_{j-10} + \sum_{j=32}^{39} \beta_j^g(\theta) job_{j-31} + u^g(\theta)$$

**Model 2**

Quantile Regression with additional firm variables (source: QP-LEED)

$$Q_\theta\left(\omega^g \mid x^g\right) = \beta_0^g(\theta) + \sum_{j=1}^{6} \beta_j^g(\theta) educ_j + \beta_7^g(\theta)\exp + \beta_8^g(\theta)\exp^2 + \beta_9^g(\theta) tenure + \beta_{10}^g(\theta) tenure^2 + \\ + \sum_{j=11}^{31} \beta_j^g(\theta) \sec tor_{j-10} + \sum_{j=32}^{39} \beta_j^g(\theta) job_{j-31} + \sum_{j=40}^{41} \beta_j^g(\theta) capext_{j\sim 39} +_{j-31} \sum_{j=42}^{43} \beta_j^g(\theta) size_{j-41} + u^g(\theta)$$

**Model 3**

Quantile Regression with family variables (source: IE-LFS)

$$Q_\theta\left(\omega^g \mid x^g\right) = \beta_0^g(\theta) + \sum_{j=1}^{6}\beta_j^g(\theta) educ_j + \beta_7^g(\theta)\exp + \beta_8^g(\theta)\exp^2 + \beta_9^g(\theta) tenure + \beta_{10}^g(\theta) tenure^2 + \\ + \sum_{j=11}^{31}\beta_j^g(\theta)\sec tor_{j-10} + \sum_{j=32}^{39}\beta_j^g(\theta) job_{j-31} + \beta_{40}^g(\theta) child5 + \beta_{41}^g(\theta) child17 + \beta_{42}^g(\theta) child18 + u^g(\theta)$$

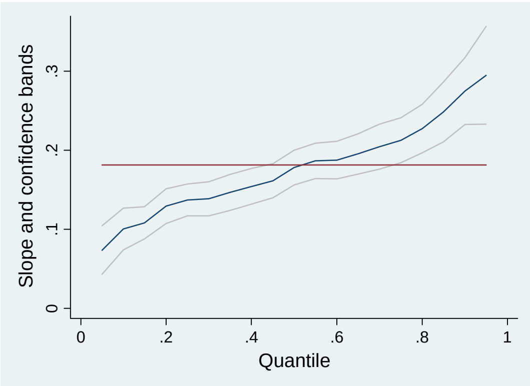
## 3. Results and Discussion

### *Model 1*

The OLS regression and the QR applied to the total samples impose the condition that the returns from the individual characteristics are assumed to be the same either for men or for women. In these regressions, the estimated coefficient associated to the dummy variable *male*, indicates the magnitude of discrimination, it means, the extent to which the wage gap between men and women remains unjustified in the *average* and in the *different quantiles*, after controlling for individual differences in the various combinations of characteristics. Cardoso (2007) draws attention to the fact that because the regression controls for a broad set of factors, it is possible that some determinants of differentiation are not being raised and the value cannot be considered an exact measure of discrimination in the labor market. Consequently, in results analysis it is important to note the set of variables included in the regression, because uncontrolled variables may exist. The first line in Table 3 shows that men earn on average wages which are 18.11% higher than women wages who own comparable individual characteristics. The results obtained using IE-LFS data are very similar (17.78%) to those obtained with QP-LEED. The estimated coefficients (0.1811 and 0.1778, respectively using QP-LEED and IE-LFS databases) do not show a real picture of the differences between men and women wages, on the contrary, they provide a biased image, because they present a central value in relation to the entire distribution.

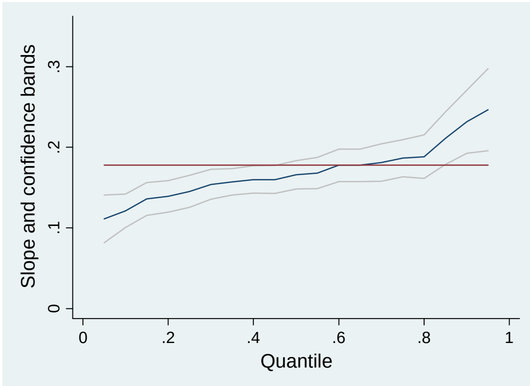
Figures 1 and 2, representing the effect of gender on hourly wages across the wage distribution, allow a better understanding of that bias. The Figure 1 (based on QP-LEED) shows that in quantile 10 men's wages are just 10.02% higher than those of women, but in quantile 50 the difference is 17.8% and in quantile 90 reaches the value of 27.5 %. Figure 2 (based on IE-LFS) also presents the impact of gender on the distribution of wages, and reveals a similar behavior across quantiles (12.1%, 16.6% and 23.2% respectively in q10, q50 and q90). The figures above illustrate the limits of the wage approach on the mean. In fact, as argued by Buchinsky (1994, p. 453) "'on the average' has never been a satisfactory statement with which to conclude a study on heterogeneous populations. Characterization of the conditional mean constitutes only a limited aspect of possibly more extensive changes involving the entire distribution"

**Figure 1 - The effect of gender on hourly wages across the wage distribution (Model 1) (Data source: QP LEED)**




Source: Authors computations based on QP-LEED 2007.

**Figure 2 – The effect of gender on hourly wages across the wage distribution (Model 1) (Data Source: IE Labour Force Survey)**




Source: Authors computations based on IE-LFS 2007.

The potential experience (linear and squared terms reveals a differential effect between men and women through the quantiles (Tables 3 to 5; *Model 1*). Once again, the return obtained by men is higher than the return obtained by women. Analyzing the tenure (*tenure* and *tenuresq* variables), it is found that the coefficients have the expected effect and are statistically significant, although low, revealing very low effect on wages for both men and women, and in both databases used. Furthermore, contrary to other variables, the tenure behavior remains in general uniform through the distribution for men and for women. The results obtained for experience and tenure converge with those obtained by Machado and Mata (2001, p. 124-125) for 1982 and 1994: the linear and the squared term of experience are significant at all quantiles and, for the tenure the squared term is non-significant at top quantiles. That is precisely what happens in IE-LFS, both for men and for women. However, using the QP-LEED that behavior does not occur.

The lower significance of squared term of tenure (*tenure_sq*) was also found by Fitzenberger and Kurtz (2003, p.494) for Germany, using the German Socioeconomic Panel (GSOEP) data. They conclude that experience shows the usual concave profiles at all quantiles, whereas the tenure effect is almost linear at all quantiles and insignificant at q90.

Making a comparison by gender, in the mean or in each quantile, the marginal effects of experience and tenure are higher for men than for women regardless the database used (Tables 3 to 5). However, the coefficients associated with tenure are different depending on the database used (Tables 3 to 5). It is likely that this result reflects the different age means within the samples (by gender) and between the samples: in QP-LEED the average age for men is 38.43 years and for women 36.86; in IE-LFS, the values are respectively 39.25 and 37.79 (Table 1).

**Table 3 - Quantile Regression Estimations Model 1 (All; Sources: QP-LEED and IE-LFS)**

| | QP-LEED_All | | | | | | | | IE-LFS_All | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | q10 | | q50 | | q90 | | OLS | | q10 | | q50 | | q90 | |
| | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD |
| *male* | 0,1811* | 0.0105 | 0,1002* | 0.0124 | 0,1779* | 0.0119 | 0,2748* | 0.0213 | 0,1778* | 0.0091 | 0,1213* | 0.0108 | 0,1658* | 0.0100 | 0,2317* | 0.0207 |
| *edu2* | 0.0570 | 0.0354 | 0.0289 | 0.0501 | 0.0779 | 0.0549 | 0.0476 | 0.0997 | 0,0721* | 0.0246 | 0,0494*** | 0.0285 | 0,0636** | 0.0307 | 0,0961*** | 0.0513 |
| *edu3* | 0,1247* | 0.0359 | 0.0778 | 0.0511 | 0,1548* | 0.0555 | 0.1388 | 0.0997 | 0,1696* | 0.0257 | 0,0868** | 0.0281 | 0,1606* | 0.0317 | 0,1935* | 0.0524 |
| *edu4* | 0,2571* | 0.0367 | 0,1932* | 0.0527 | 0,2707* | 0.0567 | 0,2397** | 0.0989 | 0,2574* | 0.0266 | 0,1515* | 0.0305 | 0,2337* | 0.0327 | 0,2932* | 0.0555 |
| *edu5* | 0,4033* | 0.0388 | 0,2637* | 0.0534 | 0,3833* | 0.0594 | 0,4818* | 0.1030 | 0,3776* | 0.0289 | 0,2391* | 0.0335 | 0,3554* | 0.0340 | 0,4105* | 0.0589 |
| *edu6* | 0,6241* | 0.0566 | 0,4422* | 0.0799 | 0,5827* | 0.0840 | 0,7835* | 0.1193 | 0,5101* | 0.0444 | 0,2946* | 0.0484 | 0,4752* | 0.0503 | 0,5623* | 0.1006 |
| *edu7* | 0,7896* | 0.0470 | 0,5726* | 0.0661 | 0,7577* | 0.0700 | 0,9136* | 0.1098 | 0,7003* | 0.0405 | 0,442* | 0.0454 | 0,6404* | 0.0464 | 0,8513* | 0.0873 |
| *experience_pot* | 0,0241* | 0.0020 | 0,0136* | 0.0027 | 0,0209* | 0.0022 | 0,0295* | 0.0037 | 0,0239* | 0.0016 | 0,017* | 0.0018 | 0,0207* | 0.0016 | 0,0279* | 0.0031 |
| *experience_sq* | -0,0004* | 0.0000 | -0,0002* | 0.0001 | -0,0003* | 0.0000 | -0,0003* | 0.0001 | -0,0003* | 0.0000 | -0,0003* | 0.0000 | -0,0003* | 0.0000 | -0,0004* | 0.0001 |
| *tenure* | 0,022* | 0.0017 | 0,0217* | 0.0022 | 0,0196* | 0.0019 | 0,0176* | 0.0040 | 0,0108* | 0.0014 | 0,0071* | 0.0014 | 0,0100* | 0.0014 | 0,0110* | 0.0030 |
| *tenure_sq* | -0,0004* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0003** | 0.0001 | -0,0001* | 0.0000 | -0,0001** | 0.0000 | -0,0001* | 0.0000 | -0,0001*** | 0.0001 |
| R^2/PseudoR^2 | 0.6717 | | 0.2705 | | 0.445 | | 0.5029 | | 0.6078 | | 0.1905 | | 0.3735 | | 0.4689 | |
| N | 5073 | | | | | | | | 4367 | | | | | | | |

Source: Authors computations based on QP-LEED 2007 and IE-LFS 2007. Note: (*) p<0.01; (**) p<0.05; (***) p<0.10

Occupations and sectors were also studied. In general, the results obtained from each data base converge (Figures A1 and A2). We plan to deepen our understanding of the reasons for the differences found among occupation and industries in future research.

**Table 4 - Quantile Regression Estimations Model 1 (Men and Women; Source: QP-LEED)**

| | QP_male | | | | | | | | QP_female | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | q10 | | q50 | | q90 | | OLS | | q10 | | q50 | | q90 | |
| | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD |
| *edu2* | 0,108** | 0.0499 | 0.0579 | 0.0903 | 0,1095*** | 0.0576 | 0,2329*** | 0.122 | -0.0035 | 0.0485 | 0.0137 | 0.0513 | -0.0148 | 0.0544 | -0.0638 | 0.0906 |
| *edu3* | 0,1559* | 0.0499 | 0.089 | 0.0896 | 0,1807* | 0.0591 | 0,2625** | 0.1229 | 0,084*** | 0.0499 | 0.0586 | 0.0534 | 0.052 | 0.0558 | 0.0488 | 0.0959 |
| *edu4* | 0,3094* | 0.0506 | 0,2298** | 0.0921 | 0,2946* | 0.0595 | 0,4021* | 0.1202 | 0,1811* | 0.0514 | 0,1279** | 0.0563 | 0,1258** | 0.0565 | 0.1517 | 0.0973 |
| *edu5* | 0,4326* | 0.0533 | 0,3* | 0.0919 | 0,4005* | 0.0629 | 0,575* | 0.1275 | 0,3451* | 0.055 | 0,2154* | 0.0605 | 0,2484* | 0.061 | 0,3543* | 0.1076 |
| *edu6* | 0,7343* | 0.0863 | 0,5695* | 0.1292 | 0,6815* | 0.133 | 0,9858* | 0.1672 | 0,4885* | 0.0707 | 0,3491* | 0.1 | 0,3942* | 0.0866 | 0,5398* | 0.1405 |
| *edu7* | 0,8618* | 0.0664 | 0,64* | 0.1055 | 0,8095* | 0.0849 | 1,0764* | 0.1451 | 0,6826* | 0.0652 | 0,5179* | 0.0832 | 0,5396* | 0.0797 | 0,7193* | 0.1205 |
| *experience_pot* | 0,0283* | 0.0029 | 0,0176* | 0.0035 | 0,0243* | 0.0029 | 0,037* | 0.006 | 0,0204* | 0.0026 | 0,0099* | 0.0031 | 0,0144P | 0.0029 | 0,0208* | 0.0044 |
| *experience_sq* | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0003* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0001** | 0.0001 | -0,0002* | 0.0001 | -0,0002** | 0.0001 |
| *tenure* | 0,0223* | 0.0024 | 0,0249* | 0.0032 | 0,0194* | 0.0027 | 0,0179* | 0.0054 | 0,0212* | 0.0023 | 0,0189* | 0.0027 | 0,0174* | 0.0022 | 0,0173* | 0.0048 |
| *tenure_sq* | -0,0004* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0004** | 0.0002 | -0,0004* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0003*** | 0.0002 |
| R2/PseudoR2 | 0.6237 | | 0.2581 | | 0,4029* | | 0.4666 | | 0.7199 | | 0.2711 | | 0.4768 | | 0.5633 | |
| N | 2881 | | | | | | | | 2192 | | | | | | | |

Source: Authors computations based on QP-LEED 2007. Note: (*) p<0.01; (**) p<0.05; (***) p<0.10

**Table 5 - Quantile Regression Estimations Model 1 (Men and Women; Source: IE-LFS)**

| | IE_male | | | | | | | | IE_female | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | q10 | | q50 | | q90 | | OLS | | q10 | | q50 | | q90 | |
| | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD |
| *edu2* | 0,1708** | 0.0324 | 0,0683*** | 0.0395 | 0,1613* | 0.0394 | 0,2662* | 0.0596 | 0.0085 | 0.0312 | 0,0093** | 0.0341 | -0.008 | 0.0324 | -0.0276 | 0.0616 |
| *edu3* | 0,282* | 0.0335 | 0,1187* | 0.0413 | 0,2819* | 0.042 | 0,3621* | 0.0565 | 0,0843** | 0.0332 | 0,0471** | 0.0337 | 0,0612*** | 0.0358 | 0.0657 | 0.0633 |
| *edu4* | 0,3818* | 0.035 | 0,2131* | 0.0457 | 0,3655* | 0.0441 | 0,4815* | 0.0617 | 0,1579* | 0.0348 | 0,0889** | 0.0361 | 0,1271* | 0.036 | 0,1115*** | 0.0645 |
| *edu5* | 0,5185* | 0.0396 | 0,293* | 0.0518 | 0,5200* | 0.0483 | 0,6658* | 0.0708 | 0,245* | 0.0374 | 0,1698* | 0.0411 | 0,2029* | 0.0405 | 0,2115* | 0.0709 |
| *edu6* | 0,6662* | 0.0622 | 0,4121* | 0.095 | 0,6390* | 0.0751 | 0,7716* | 0.1598 | 0,369* | 0.0601 | 0,2239* | 0.0703 | 0,2953* | 0.0686 | 0,381* | 0.112 |
| *edu7* | 0,8665* | 0.0595 | 0,5347* | 0.0701 | 0,8300* | 0.0693 | 1,1581* | 0.1025 | 0,5368* | 0.0524 | 0,3704* | 0.0737 | 0,4669* | 0.0633 | 0,609* | 0.1278 |
| *experience_pot* | 0,0302* | 0.0023 | 0,0208* | 0.0025 | 0,0277* | 0.0026 | 0,0396* | 0.005 | 0,0163* | 0.002 | 0,0113* | 0.002 | 0,0144* | 0.002 | 0,0179* | 0.0034 |
| *experience_sq* | -0,0004* | 0 | -0,0003* | 0.0001 | -0,0004* | 0.0001 | -0,0006* | 0.0001 | -0,0002* | 0 | -0,0002* | 0 | -0,0002* | 0 | -0,0003* | 0.0001 |
| *tenure* | 0,0096* | 0.0021 | 0,0095* | 0.0026 | 0,0088* | 0.0024 | 0,0054* | 0.0046 | 0,0116* | 0.0017 | 0,0046** | 0.002 | 0,0098* | 0.0016 | 0,0148* | 0.0037 |
| *tenure_sq* | -0,0001** | 0.0001 | -0.0001 | 0.0001 | -0.0001 | 0.0001 | 0,0000* | 0.0001 | -0,0001* | 0 | 0 | 0.0001 | -0,0001** | 0 | -0,0002** | 0.0001 |
| R^2/PseudoR^2 | 0.5727 | | 0.2257 | | 0.3449 | | 0.4362 | | 0.6026 | | 0.1531 | | 0.3507 | | 0.5087 | |
| N | 2299 | | | | | | | | 2068 | | | | | | | |

Source: Authors computations based on IE-LFS 2007. Note: (*) p<0.01; (**) p<0.05; (***) p<0.10

### Table 6 - Quantile Regression Estimations Model 2[(a)] (Men and Women; Source: QP-LEED)

| | Male (QP-LEED) | | | | | | | | Female (QP-LEED) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | q10 | | q50 | | q90 | | OLS | | q10 | | q50 | | q90 | |
| | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD |
| *edu2* | 0,0976** | 0.0472 | 0.0623 | 0.0688 | 0,1095*** | 0.0592 | 0,2013** | 0.0982 | -0.013 | 0.0495 | -0.0115 | 0.0466 | 0.0059 | 0.0492 | -0.0439 | 0.0773 |
| *edu3* | 0,1418* | 0.0471 | 0.0867 | 0.0682 | 0,1807* | 0.0603 | 0,2182** | 0.0968 | 0.0769 | 0.0508 | 0.0221 | 0.0501 | 0.0734 | 0.0526 | 0.087 | 0.0814 |
| *edu4* | 0,2695* | 0.0481 | 0,2079* | 0.0715 | 0,2946* | 0.0595 | 0,3376* | 0.0978 | 0,1649* | 0.0523 | 0.0836 | 0.0519 | 0,1372* | 0.0527 | 0,1465*** | 0.0815 |
| *edu5* | 0,3927* | 0.0505 | 0,2626* | 0.0725 | 0,4005* | 0.064 | 0,5002* | 0.1035 | 0,3244* | 0.0557 | 0,1611* | 0.056 | 0,2665* | 0.0588 | 0,3368* | 0.0942 |
| *edu6* | 0,6934* | 0.0819 | 0,4599* | 0.1071 | 0,6815* | 0.1279 | 0,9079* | 0.1501 | 0,4704* | 0.0708 | 0,2758* | 0.106 | 0,4013* | 0.0869 | 0,5446* | 0.1318 |
| *edu7* | 0,8097* | 0.0641 | 0,6395* | 0.085 | 0,8095* | 0.0846 | 0,9242* | 0.1212 | 0,6668* | 0.0654 | 0,4404* | 0.0799 | 0,5739* | 0.0773 | 0,7219* | 0.1055 |
| *experience_pot* | 0,0283* | 0.0029 | 0,0187* | 0.0043 | 0,0243* | 0.0029 | 0,0323* | 0.0059 | 0,0201* | 0.0025 | 0,0096* | 0.0032 | 0,0165* | 0.0032 | 0,0223* | 0.0046 |
| *experience_sq* | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0003* | 0.0001 | -0,0003* | 0.0001 | -0,0002* | 0.0001 | -0,0001*** | 0.0001 | -0,0002* | 0.0001 | -0,0003* | 0.0001 |
| *tenure* | 0,0203* | 0.0024 | 0,0242* | 0.0036 | 0,0194* | 0.0027 | 0,017* | 0.0047 | 0,0208* | 0.0023 | 0,0171* | 0.0026 | 0,016* | 0.0023 | 0,0136** | 0.0049 |
| *tenure_sq* | -0,0004* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0004* | 0.0001 | -0,0004* | 0.0001 | -0,0003* | 0.0001 | -0,0003* | 0.0001 | -0.0002 | 0.0002 |
| *size_med* | 0,0992* | 0.0185 | 0,0943* | 0.0267 | 0,0828* | 0.0193 | 0,1161* | 0.0389 | 0,0634* | 0.016 | 0,0336*** | 0.0203 | 0,0563* | 0.017 | 0.0291 | 0.0328 |
| *size_lar* | 0,1533* | 0.0199 | 0,1504* | 0.0298 | 0,1611* | 0.0213 | 0,1097** | 0.0459 | 0,055* | 0.0171 | 0,08* | 0.0229 | 0,0627* | 0.0173 | 0.0017 | 0.0349 |
| *capext_5* | 0,073** | 0.0349 | 0.0812 | 0.0654 | 0,0923** | 0.0463 | 0.0636 | 0.0584 | 0,0623*** | 0.0354 | 0.0693 | 0.0574 | 0.0366 | 0.0596 | -0.0247 | 0.0618 |
| *capext_1* | 0,0995* | 0.0212 | 0,0653** | 0.0273 | 0,0849* | 0.0218 | 0,1415* | 0.0482 | 0.0997 | 0.0196 | 0.0366 | 0.0259 | 0,0912* | 0.0223 | 0,1323* | 0.0389 |
| R2/PseudoR2 | 0.6385 | | 0.2781 | | 0.4171 | | 0.4744 | | 0.7281 | | 0.2834 | | 0.4848 | | 0.5694 | |
| N | 2881 | | | | | | | | 2192 | | | | | | | |

Source: Authors computations based on QP-LEED 2007. Note: (*) p<0.01; (**) p<0.05; (***) p<0.10
[(a)]Model 2 was also estimated for the pooled sample. Results not presented here, available upon request from authors.

### Table 7 - Quantile Regression Estimations Model 3 [(a)] (Men and Women; Source: IE-LFS)

| | Men (IE LFS) | | | | | | | | Women (IE LFS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | q10 | | q50 | | q90 | | OLS | | q10 | | q50 | | q90 | |
| | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD | Coef | SD |
| *edu2* | 0,1462* | 0.0315 | 0.0142 | 0.0386 | 0,138* | 0.0451 | 0,2012** | 0.0913 | 0.0076 | 0.0311 | 0.0114 | 0.0318 | -0.0173 | 0.0351 | -0.0021 | 0.0608 |
| *edu3* | 0,2508* | 0.0329 | 0.0597 | 0.0412 | 0,2517* | 0.0475 | 0,283* | 0.0921 | 0,0848** | 0.0332 | 0,0527** | 0.0314 | 0.046 | 0.0377 | 0.0824 | 0.063 |
| *edu4* | 0,3611* | 0.0344 | 0,1632* | 0.0445 | 0,3346* | 0.0494 | 0,4223* | 0.0943 | 0,1582* | 0.0347 | 0,0953* | 0.0347 | 0,1119* | 0.0385 | 0,1307** | 0.0645 |
| *edu5* | 0,4876* | 0.0391 | 0,2442* | 0.0548 | 0,4731* | 0.0551 | 0,5692* | 0.1019 | 0,2438* | 0.0374 | 0,1746* | 0.0388 | 0,1867* | 0.0418 | 0,2258* | 0.0696 |
| *edu6* | 0,6178* | 0.0621 | 0,4029* | 0.1008 | 0,5914* | 0.0757 | 0,6977* | 0.1782 | 0,3675* | 0.0603 | 0,2302* | 0.0655 | 0,2984* | 0.0685 | 0,4089* | 0.1139 |
| *edu7* | 0,8088* | 0.0587 | 0,4489* | 0.0654 | 0,7678* | 0.0746 | 1055294* | 0.1379 | 0,5338* | 0.0524 | 0,3797* | 0.0745 | 0,4533* | 0.0622 | 0,6254* | 0.1273 |
| *experience_pot* | 0,0213* | 0.0027 | 0,0119* | 0.0034 | 0,0184* | 0.003 | 0,0313* | 0.0072 | 0,0152* | 0.0024 | 0,0097* | 0.0026 | 0,0143* | 0.0025 | 0,0128* | 0.0037 |
| *experience_sq* | -0,0003* | 0.0001 | -0,0002* | 0.0001 | -0,0003* | 0.0001 | -0,0004* | 0.0001 | -0,0002* | 0.0001 | -0,0001* | 0.0001 | -0,0002* | 0.0001 | -0,0002** | 0.0001 |
| *tenure* | 0,0098* | 0.0021 | 0,0095* | 0.0025 | 0,0099* | 0.0025 | 0.0057 | 0.0052 | 0,0116* | 0.0017 | 0,0059* | 0.002 | 0,009* | 0.0016 | 0,0135* | 0.0033 |
| *tenure_sq* | -0,0001** | 0.0001 | -0.0001 | 0.0001 | -0.0001 | 0.0001 | 0 | 0.0002 | -0,0001* | 0 | -0.0001 | 0.0001 | -0,0001** | 0 | -0,0002*** | 0.0001 |
| *child >17* | 0.0175 | 0.0183 | 0.031 | 0.0228 | 0.0364 | 0.0235 | -0.0525 | 0.0416 | 0.012 | 0.0152 | 0.014 | 0.0147 | 0.0062 | 0.0153 | 0.0159 | 0.0329 |
| *child 6_17* | 0.001 | 0.0168 | -0.0055 | 0.0212 | -0.0012 | 0.0211 | 0.0055 | 0.0342 | -0.0042 | 0.0139 | -0.0028 | 0.0145 | -0.0162 | 0.013 | 0.0326 | 0.0246 |
| *child < 6* | 0.0395 | 0.0205 | 0,0468*** | 0.0241 | 0.0345 | 0.0278 | 0.0268 | 0.0403 | -0.0035 | 0.0148 | -0.0117 | 0.016 | -0.0004 | 0.0138 | -0.0219 | 0.0283 |
| *married* | 0,1084* | 0.0216 | 0,0966* | 0.0274 | 0,1185* | 0.0259 | 0.0782 | 0.0522 | 0.0202 | 0.0143 | 0.0123 | 0.0165 | 0.0198 | 0.0147 | 0.0324 | 0.0214 |
| R2/PseudoR2 | 0.5832 | | 0.2408 | | 0.3551 | | 0.441 | | 0.6031 | | 0.1548 | | 0.3516 | | 0.5104 | |
| N | 2299 | | | | | | | | 2068 | | | | | | | |

Source: Authors computations based on IE-LFS 2007. Note: (*) p<0.01; (**) p<0.05; (***) p<0.10 . [(a)]Model 3 was also estimated for the pooled sample. Results not presented here, available upon request from authors.

***Model 2 and Model 3 Results***

Firm size (*size_med* and *size_lar*) and share of foreign social capital (*capext_1* and *capext_5*), included in *Model 2* influence the wages of both men and women (Table 6). The effect of foreign capital (*capext_1*) on men's and women's wages is significant in general. Taking the category of small firms as reference, large firms (*size_lar*) positively affect the wages of men and women. However, in the case of women, there is no statistical significance for the upper quantiles of wages (q75 and q90). With the inclusion of firm characteristics related to size and foreign social capital (Table 6, *Model 2*), the effect of education on wages decreases slightly in general in comparison with *Model 1*(Tables 3 to 5).

*Model 3* results (Table 7) show that the existence of children - regardless of their age group - was not statistically significant for either gender. This result was expected since the differential effect of children on men and women is a matter of participation in the labor market (Angelov et al., 2013). In other words, children particularly affect the level of women's labor supply and the timing of their participation in the labor market. Women, in general, tend to work fewer hours and show later entry or disruption associated with the fertility cycle. Therefore, the presence of children affects an aspect (labor supply) that *precedes* the phenomenon under study in this paper: the wage level. This issue will be the subject of further research based on additional household information from the IE-LFS.

The results for *Model 3* (Table 7) show that for men, one factor significantly influences the hourly wage but is not significant in explaining the hourly earnings of women: marital status. Being married (*married*) increases men's wages by 9.7% in the first quantile, and 13.6% in the 75 quantile. This result converges with the literature, which discusses the 'male marriage premium' (Ribar, 2004).

## 4. Conclusions and Future Research

The paper analyzes the wage functions by gender based on three model specifications of wages and using two databases (QP-LEED and IE-LFS databases) for the same year (2007). The first specification (referred to as *Model 1*) is estimated, using data from QP-LEED and data from the Portuguese Labour Force Survey (LFS-IE) separately (Table 3 to 5). *Model 2* adds to *Model 1* variables relating to the firm and is estimated based on QP-LEED

(Table 6). *Model 3* adds to *Model 1* variables related to the household and is estimated based on the IE-LFS (Table 7).

From each database a sample was selected. In both cases the composition of the sample is identical: wage-earning private sector workers, aged 15-64 and working full time. Sample harmonization was ensured by excluding sectors such as Education or Administration in which the public service is the main provider. In addition, sectors with a very low proportion of female employees, such as Construction and Fishing, and those displaying seasonal variation, such as Agriculture and Forestry, were also excluded.

After the harmonization of data from the two sources of information (QP-LEED and IE-LFS) the summary of the descriptive statistics reveal, in general, convergent results (Table 1). The main descriptives of the two samples are similar, suggesting that the administrative data obtained from firms or through the household-based labor survey are comparable. However, regarding the key variable in the study, the hourly wage, an essential difference will be present throughout the analysis of the results: the IE-LFS wage is reported by respondents as a net value, while the QP LEED wage is registered by the firms as a gross value (Table A1).

Regardless of the database used, the distribution of wages across the five quantiles studied (q10, q25, q50, q75 and q90) justifies the need to perform the analysis not on the mean (in which case OLS would be suitable) but rather across the distribution. In this case, Quantile Regression (QR) is the most appropriate approach and is therefore adopted.

In the three models (*Models 1* to *3*) the variables that have statistical significance for both genders and across all quantiles are the standard human capital variables: education, potential experience, and tenure. Education has the greatest impact on hourly wages, although the effects on men and women are different. The differences between men and women increase as we progress in the quantile; the upper quantile (q90) presents the biggest differences by gender. Schooling, measured by six binary variables, was significant for six years and above for men and for nine years and above for women.

The results for *Model 2* show the relevance of firm characteristics (size and foreign capital) in particular to determine men wages. The results for *Models 3* suggest the existence of a male marriage premium.

The results now obtained recommend the extension of this analysis by *explaining both the differences found* between men's and women's wages and *their trends* across time in Portugal. This can be done adopting the QP-LEED or the IE-LFS database. Figueiredo (2011) has studied the differences found between men's and women's wages using Machado and Mata's (2005) wage decomposition methodology and the IE-LFS database. She concluded that there is gender wage discrimination, which increases across the quantile distribution.

The same method of analysis of gender differences can be applied to more recent years, expanding the models already studied with new variables relating to the household (e.g. spouse's income) and the firm (e.g. feminization rate, region). Another possible line of research could include an explanation of the differences between the results for gross wages and net wages, obtained respectively from the QP-LEED and IE-LFS databases.

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**Table A1 - Wage determinants and wage differences in Portugal: Summary (Studies; Methodologies; Data Sources; Period)**

| Study | | Method | Data Base | Years |
|---|---|---|---|---|
| [1] Psacharoupoulos (1981) | | OLS Regression | QP-LEED | 1981[8] |
| [2] Martins (1991) | | OLS Regression | QP-LEED | 1987 |
| [3] Kiker and Santos (1991) | | OLS Regression | QP-LEED | 1985 |
| [4] Vieira (1992) | | OLS Regression | QP-LEED | 1989 |
| [5] Vieira and Pereira (1993) | | OLS Regression | QP-LEED | 1989 |
| [6] Marques (1993) | | OLS Regression | IE -Labour Force Survey | 1990 (3rd Q) |
| [7] Marques and Pereira (1995a) | | OLS Regression | IE -Labour Force Survey | 1990 (3rd Q) |
| [8] Marques and Pereira (1995b) | | OLS Regression | IE -Labour Force Survey | 1990 (3rd Q) |
| [9] Santos (1999) | | OLS Regression<br>Multinomial Logit | QP-LEED | 1985-1991 |
| [10] Lima et al. (1996) | | OLS Regression | Dir. Ger. da Família | 1994 |
| [11] Ribeiro and Hill (1996) | | OLS Regression | QP-LEED | 1992 |
| [12] Pereira and Lima (1996) | | OLS Regression | Dir. Ger. da Família | 1994 |
| [13] Martins (1996) | | OLS Regression | IE -Labour Force Survey | 1991 |
| [14] Cardoso (1997) | | Inequality measures<br>Lorenz Curve | QP-LEED<br>QP-LEED | 1983-1992 |
| [15] Kiker et al. (1997) | | OLS Regression | QP-LEED | 1991 |
| [16] Vieira et al. (1997) | | OLS Regression | QP-LEED | 1982,1986 and 1992 |
| [17] Cardoso (1998) | | Inequality measures<br>Lorenz Curve | QP-LEED<br>QP-LEED | 1983,1986,1989 and 1992 |
| [18] Vieira (1999) | | OLS Regression<br>IV | QP-LEED | 1986 e 1992 |
| [19] Cardoso (1999) | | Multilevel Regression | QP-LEED | 1983 e 1992 |
| [20] Santos and Teixeira (2000) | | OLS Regression | QP-LEED | 1988-1996 |
| 21] Machado and Mata (2001) | | Quantile Regression | QP-LEED | 1982, 1994 |
| [22] Mota (2001) | | Quantile Regression | IE -Labour Force Survey | 1998-2000 |
| [23] Hartog et al. (2001) | | Quantile Regression | QP-LEED | 1982,1986 and 1992 |
| [24] Martins (2001) | | OLS Regression | IE -Labour Force Survey | 1991 |
| [25] Santos and González (2003) | | OLS Regression | QP-LEED | 1985-1997 |
| [26] Martins and Pereira (2004) | | Quantile Regression | QP-LEED | 1995 |
| [27] González et al. (2005) | | OLS Regression | QP-LEED | 1985-2000 |
| [28] Vieira et al. (2005) | | OLS Regression | QP-LEED | 1985-1999 |

Source: Figueiredo (2011).

[8] Quadros de Pessoal (QP) are available since 1982 (Centeno and Novo, 2009). However, Psacharoupoulos (1981, p. 532) refers that the database used is referred to 1981 obtained from Portuguese Ministry of Labour.

**Table A1 (cont.) - Wage determinants and wage differences in Portugal: Summary (Studies; Methodologies; Data Sources; Period)**

| Study | | Method | Data Base | Years |
|---|---|---|---|---|
| [29] Machado and Mata (2005) | | Regressão de quantis | QP-LEED | 1985-1999 |
| [30] Budria and Pereira (2005) | | Regressão de quantis | IE -Labour Force Survey | 1993-2000 |
| [31] Bastos et al. (2004) | | Regressão OLS | QP-LEED | 1997 |
| [32] Galego and Pereira (2006) | | Regressão OLS | ECHP | 2001 |
| [33] Cardoso (2007) | | Regressão OLS | QP-LEED | 1985-2005 |
| [34] Pereira and Galego (2007) | | Regressão OLS | QP-LEED | 1995-2002 |
| [35] Mendes (2008) | | Regressão OLS | QP-LEED | 2005 |
| [36] González et al. (2009) | | Regressão OLS | QP-LEED | 1991, 1995,2000 and 2005 |
| [37] Mendes (2009) | | Regressão OLS | QP-LEED | 2004 |

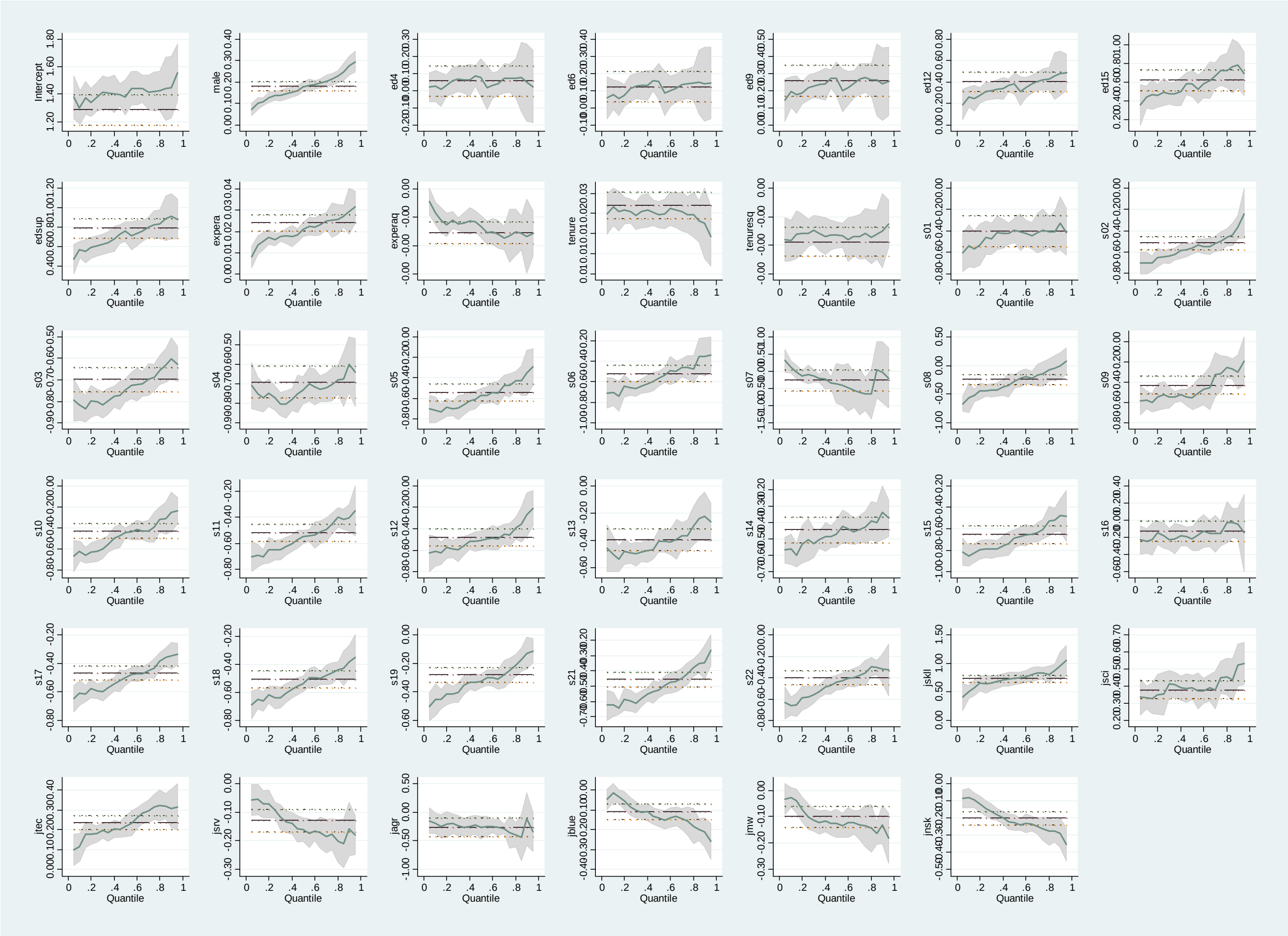
Source: Figueiredo (2011).

**Table A2- Variables Descriptions (QP-LEED and IE-LFS)**

| Variable Name | Variable Description |
|---|---|
| Dependent variable | |
| Hourly wage:<br>*wagehr*<br>*lnwagehr* | Hourly wage:<br>In QP-LEED : monthly gross wage (base) and regular bonuses and transfers (in euros)/ working time per week x 4.<br>In IE-LFS – monthly net income (in euros) / working time per week x 4. |
| Independent Variables | |
| *Individual variables* | |
| Gender:<br>*male* | =1 if a man; =0 if a woman. |
| Education: | |
| *edu1* | =1 if the years of schooling are zero, 0 otherwise |
| *edu2* | =1 if the years of schooling are 1-4, 0 otherwise |
| *edu3* | =1 if the years of schooling are 5-6, 0 otherwise |
| *edu4* | =1 if the years of schooling are 7-9, 0 otherwise |
| *edu5* | =1 if the years of schooling are 10-12, 0 otherwise |
| *edu6* | =1 if the years of schooling are13-15, 0 otherwise |
| *edu7* | =1 if the years of schooling > 15 otherwise |
| Experience: | |
| *experience_pot* (years) | Length of potential labor market experience is computed by two ways: (i) for individuals with schooling years equal or higher than 5 is computed as the age of the individual minus its years of education minus 6 years (correspondent to the period before the entrance in elementary school); (ii) for the individuals with less than 5 years of schooling is computed as age minus 15 years. |
| *experience_sq* | Squared of *experience_pot* |
| *experience_eff*[a] (years) | Years of experience based on the question: "*On what date you began working for the first time?*" (IE-LFS questionnaire). In fact, this is not a perfect measure of effective experience because is not possible to identify if there were breaks after the first job and the duration of those breaks. |
| Tenure: | |
| *tenure* | Years of tenure at the current employer. |
| *tenure_sq* | Squared of *tenure*. |
| *Firm Variables (Model 2)* | |
| Firm Size: | |
| *size_small*[b] | =1 if the firm is a medium firm (with 10-49 persons employed); 0 otherwise. |
| *size_med*[b] | =1 if the firm is a medium firm (with 50-249 persons employed); 0 otherwise. |
| *size_lar*[b] | =1 if the firm is a large firm (with 250 or more persons employed); 0 otherwise. |
| Firm Foreign Capital : | |
| *capext_0*[b] | =1 if the firm has no foreign social capital; 0 otherwise. |
| *capext_5*[b] | =1 if the foreign social capital of the firm is between 1% and 50%; 0 otherwise. |
| *capext_1*[b] | =1 if 50% or more of the social capital of the firm is foreign; 0 otherwise. |
| *Household Variables (Model 3)* | |
| Marital Status | |
| *married*[a] | =1 if the respondent is married or has a partner; 0 otherwise. |
| Children | |
| *Child <6*[a] | =1 if the respondent has at least a child less than 6 years old; 0 otherwise. |
| *Child_6_17*[a] | =1 if the respondent has at least a child between 6 and 17 years old; 0 otherwise. |
| *Child >17* [a] | =1 if the respondent has a least a child >17 years old; 0 otherwise. |
| Sector | In QP-LEED: (note: the correspondence between sectors from the two data sources is not perfect; the Authors are working on the sector harmonization):<br>Binary variables: act1, Extractive except extracting energy products; act2, Manufacture of food, beverages and tobacco; act3, Textile industry;act4, Manufacture of leather and leather products;act5, Manufacture of wood and cork and articles thereof; act6, Industry of pulp, paper and paper products; publishing and printing;act7, Manufacture of coke, refined petroleum products and nuclear fuel;act8, Manufacture of chemicals and man-made fibers;act9, Manufacture of rubber and plastic products; act10, Manufacture of other non-metallic mineral products;act11, Manufacture of basic metals and fabricated metal products; act12, Manufacture of machinery and equipment, n. and.;act13, Manufacture of electrical and optical;act14, Manufacture of transport equipment; act15, Manufacturing, n. and.; act16, Production and distribution of electricity, gas and water; act17, Wholesale and retail trade, repair of motor vehicles, motorcycles and personal effects and household; act18, Hotels and restaurants; act19, Transport, storage and communications; act20, Financial activities [reference category]; act21, Real estate, renting and business services; act22, Other services, community, social and personal. |
| Occupation | In QP-LEED and IE-LFS:<br>Binary variables: occup1, senior staff; occup2, intellectual and scientific; occup3, technicians; occup4, clerks [reference category]; occup5, sellers and personal services; occup6, farmers and fishermen; occup7, craft and related jobs; occup8, machinery operators; occup9, unskilled. |

(a) Based on data only available in Labour Force Survey (LFS) ; (b) Based on data only available in Quadros de Pessoal (QP-LEED)

**Figure A.1. (1 to 41 ) – QR and OLS coefficients and confidence intervals for each regressor as *q* varies from 0 to 1 (male; education; experience; tenure; sector; job); Source: QP-LEED**



Source: Authors computations based on QP-LEE 2007.

**Figure A.1. (1 to 39 ) – QR and OLS coefficients and confidence intervals for each regressor as *q* varies from 0 to 1 (male; education; experience; tenure; sector; job); Source: IE-LFS**


Source: Authors computations based on IE-LFS 2007.