GENDER WAGE AND PRODUCTIVITY DIFFERENTIALS IN THE PORTUGUESE TOURISM INDUSTRY[1, 2]

DESIGUALDADES DE GÉNERO NOS SALÁRIOS E NA PRODUTIVIDADE NA INDÚSTRIA DO TURISMO EM PORTUGAL

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ABSTRACT/RESUMO

The objective of this paper is to provide empirical evidence on the determinants of gender wage inequality in the Portuguese tourism industry. Relying on firm-level wage equations and production functions, gender wage and productivity differentials are estimated and then compared in order to infer whether observed gender disparities are justifiable on the grounds that women are relatively less productive than men, or instead disparities are due to gender wage discrimination. This approach is applied to tourism industry data gathered in the matched employer-employee data set *Quadros de Pessoal* (Employee Records). The main findings indicate that female employees in the tourism industry in Portugal are less productive than their male colleagues and that gender differences in wages are fully explained by gender differences in productivity.

Keywords: Gender, Productivity, Tourism, Production Function, Wage Discrimination, Wage Gap.

JEL Codes: J24, J31, J71, L83

O objetivo deste trabalho é fornecer evidência empírica sobre os determinantes da desigualdade salarial entre géneros na indústria portuguesa do turismo. Com base nas equações salariais e nas funções de produção estimadas ao nível da empresa, as diferenças salariais e de produtividade entre homens e mulheres são estimadas e comparadas de modo a inferir se as disparidades salariais observadas são justificáveis pelo facto de as mulheres serem relativamente menos produtivas do que os homens, ou se as disparidades são atribuíveis à discriminação salarial. Este método é aplicado aos dados da indústria do turismo incluídos nos Quadros de Pessoal. As principais conclusões indicam que as mulheres na indústria do turismo em Portugal são menos produtivas do que os homens e que as diferenças salariais são totalmente explicadas por diferenças na produtividade.

Palavras-chave: Género, Produtividade, Turismo, Função de Produção, Discriminação Salarial, *Gap* Salarial.

Códigos JEL: J24, J31, J71, L83

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1. INTRODUCTION

Gender equality has been on the political agenda of Portuguese governments over the past thirty years, and it is regarded as a fundamental element of the development of society and the improvement of the quality of democracy. The country's Constitution of 1976 promoted gender equality as one of its fundamental principles, ensuring women's full legal equality. From the late 1970s onwards, national legal commissions have been set up to promote equal employment opportunities, and national legislation has been passed in order to foster the equality for both sexes.

These factors have contributed to the improvement of the position of women in the Portuguese society. Female labor market participation in Portugal ranks among the highest within the European Union. Additionally, statistics reveal an upward trend in women's qualifications as a result of greater levels of tertiary education and a larger portion of women occupying jobs that require higher skills (Mendes, 2007).

Despite the evidence of female progress with regard to their role in the Portuguese labor market in most developed countries, gender inequality remains. Women have not yet attained full social and economic equality, and their productivity potential is not used at its best. Although women represent an important economic resource for the improvement of society, their role continues underdeveloped. Women are still less likely to be employed than men, and occupational gender segregation continues, with women underrepresented in positions that require higher qualifications and overrepresented in jobs that are traditionally labeled as female jobs (Mendes, 2007). Furthermore, women continue to earn less than their male counterparts. Statistics show that Portugal displays a persistent gender wage gap, particularly with regard to its private sector.

The aim of this paper is to offer new empirical evidence on the determinants of gender wage inequality in the Portuguese tourism industry. The objective is to investigate whether higher relative wages of male employees are attributable to the effects of wage discrimination, or instead relatively higher male wages are justifiable on the grounds that men are relatively more productive than their female colleagues. Based on the standard human capital wage equation framework, whereby wages are regressed on productivity-related characteristics, previous research on gender wage disparities in Portugal (Kiker and Santos, 1991; Mendes, 2009; Vieira *et al*., 2005; Vieira and Pereira, 1993) indicates substantially large unexplained wage gaps, implying that wage discrimination is a major explanation for the observed wage disparities between men and women. Given the potential limitations of the standard wage equation framework in accurately measuring gender productivity differentials and thus gender wage discrimination, an alternative empirical approach is pursued in this paper. Wage and productivity differentials between male and female labor are estimated and compared to determine if the observed wage gap reflects gender differences in the levels of productivity rather than wage discrimination against female employees. By directly exploring the relationship between wages and productivity, further insights are gained in relation to the Portuguese gender wage gap.

The approach is applied to the tourism industry data[3] gathered in the matched employer-employee data set *Quadros de Pessoal* (Employee Records). An analysis of gender wage disparities in the tourism industry is of particular interest given that the sector emerges with a predominant share of female employees (Santos and Varejão, 2007).

The remaining part of this paper is divided into five sections. Section 2 briefly describes employment in the tourism industry in Portugal. Sections 3 and 4 outline the methodological framework used to estimate firm-level wage equations and production functions that yield gender wage and productivity differentials. Section 5 presents the firm-level descriptive statistics and discusses the empirical results. Section 6 concludes the paper.

2. EMPLOYMENT IN THE TOURISM INDUSTRY

In Portugal, tourism represents a major economic activity, with an enormous growth potential, in terms of wealth and employment. According to Lopes (2010), tourism reveals its importance not only with regard to the GDP, but also in relation to total employment (representing about 10% in both cases). The tendency is for this importance to grow in coming years.

In relation to employment, the importance of tourism is revealed by the indicator "sector employment/active population", with the tendency of the occupation status of people in this sector to grow over time. "With effect, from 2000 to 2006, employment in tourism activities, measured in terms of jobs, had an average annual increase of 2,3% (56,500 more jobs in 2006 than at the beginning of the period considered)" (Lopes, 2010, p. 41).

A significant proportion of jobs in the tourism industry are occupied by women. Several studies undertaken with regard to different economies, including the United Kingdom (Doherty and Stead, 1998), Spain (Muñoz-Bullón, 2009), and Portugal (Varejão and Santos, 2007), show that the tourism industry is characterized by a higher percentage of female employees. With regard to the Portuguese tourism industry, women represent on average about 65% of the total number of employees in each firm (Ministério do Trabalho e da Solidariedade Social, 2007).

Other characteristics of this segment of the labor market, according to Campos-Soria *et al.* (2009), are the labor precariousness, the low level of education, low wages and high occupational segregation. This is clearly also the

[3] The tourism industry is represented by observations regarding the economic sector "hotels and restaurants", defined by the Portuguese classification of economic activities (Instituto Nacional de Estatística, 2003).

case with the tourism labor market in Portugal (Santos and Varejão, 2007):

- Women have a higher share in all sub-sectors of the tourism industry (e.g., accommodation, catering);
- The average duration of the on-going employment relationships is relatively short in tourism (4,2 years in tourism compared to an average of 7,3 years in the economy as a whole);
- The structure of employment by education levels is clearly dominated by low average schooling (no more than 6 years of education);
- Despite their overall higher share, women are underrepresented in top-level occupations and represent a large majority of workers in laborer positions.

3. GENDER WAGE DISCRIMINATION AND PRODUCTIVITY DIFFERENTIALS

Most studies that analyze the wage gap between men and women focus on wage equations that are estimated as a function of individual-level data. Typically, wages are regressed on human capital characteristics, such as education and experience, and on other productivity-related traits. These standard wage equations allow researchers to decompose gender wage gaps into explained and unexplained components (Oaxaca, 1973). The explained component captures the portion of the wage gap that is due to differences in the levels of male and female labor market characteristics, whereas the unexplained component represents the portion of the gap that cannot be accounted for on the basis of those differences. The unexplained component is often interpreted as a measure of wage discrimination, whereby equally productive workers are paid differently.

Caution should be taken, however, when interpreting the unexplained component of the gap as wage discrimination. This residual portion of the gap may be due to wage discrimination, but it may also be a result of unmeasured or unobserved levels of productivity that differ between male and female employees. To be an exact measure of discrimination, all factors that determine wages must be accounted for. If for some reason they are not (e.g., data set limitations), then the unexplained component will reflect these omitted determinants, and the true effect of wage discrimination will be overstated.

The possibility that the failure of these wage equations to explain the entire wage gap is due to omitted productivity-related variables rather than to wage discrimination motivates the search for more accurate measures of labor productivity. In this context, Hellerstein and Neumark (1999) use a different approach in their analysis of gender wage differentials in Israeli manufacturing. Based on direct estimations of labor productivity, this approach represents a departure from the standard individual-level wage equation framework applied in most of the existing studies on wage gaps. Relying on firm-level wage equations and production functions, the authors estimate and compare gender wage and productivity differentials to test for wage discrimination[4]. In subsequent research, Hellerstein *et al.* (1999) extend the empirical analysis to data on U.S. manufacturing. Although both studies conclude that female productivity is lower than male productivity, the evidence on wage discrimination is not consensual. Hellerstein and Neumark (1999) find that the gender wage gap corresponds to a gender productivity gap of approximately the same size. They therefore conclude that wage discrimination is not an explanation for wage disparities between male and female employees and that women's lower pay may be explained by their lower levels of productivity. In contrast to these findings, Hellerstein *et al.* (1999) report that gender wage differentials are larger than the corresponding productivity differentials, indicating that women are subject to wage discrimination in U.S. manufacturing. Hellerstein and Neumark (2007) update previous findings on wage discrimination for U.S. manufacturing based on a new matched employer-employee data set, reporting findings similar to those reported in Hellerstein *et al.* (1999).

A small body of economic literature builds on the empirical framework applied in the two studies described above, estimating and comparing wage and productivity differentials for other countries: Haegeland and Klette (1999) for Norway, Ilmakunnas and Maliranta (2005) for Finland, and McDevitt *et al.* (2009) for Canada. As in Hellerstein and Neumark (1999) and Hellerstein *et al.* (1999), the three studies conclude that women are less productive than their male co-workers. However, while Haegeland and Klette (1999) and Ilmakunnas and Maliranta (2005)[5] find no statistical evidence of gender wage discrimination, McDevitt *et al.* (2009) conclude that the wage gap between males and females is attributable to this form of labor market discrimination.

Given the standard wage equation framework's potential limitations in accurately measuring gender productivity differentials and therefore gender wage discrimination, this paper applies an empirical strategy similar to that of Hellerstein and Neumark (1999) and Hellerstein *et al.* (1999). The approach is described in the section that follows.

4. METHODOLOGICAL FRAMEWORK

The methodological approach applied in this paper is aimed at testing for gender wage discrimination in the Portuguese tourism industry. More precisely, the approach is used to investigate whether higher relative wages of male employees are justifiable on the grounds that men are relatively more productive than their female colleagues, or instead relatively higher male wages are attributable to the effects of wage discrimination.

[4] Hellerstein and Neumark (1995) use the same data and empirical framework to compare wage and productivity differentials among workers of different age groups.

[5] Ilmakunnas and Maliranta (2005) conclude that this result is not robust with regard to fixed effects estimation.

The novelty of this approach in relation to the standard wage equation methodology applied in most studies on gender wage gaps is the direct estimation of labor productivity based on a production function framework. The basic idea of the approach is to estimate and compare wage and productivity differentials between male and female employees. Firm-level production functions are used to estimate gender productivity differentials, whereas the corresponding wage differentials are estimated based on wage equations at the firm-level[6]. The comparison of the estimated wage and productivity differentials is used to test for wage discrimination against female employees. Findings of relatively larger wage differentials, whereby gender differences in the levels of productivity are not sufficiently large enough to fully explain gender differences in wages, are consistent with the discrimination hypothesis.

4.1. FIRM-LEVEL WAGE EQUATION

As referred earlier on, the current study applies an empirical framework similar to that of Hellerstein and Neumark (1999) and Hellerstein *et al.* (1999). However, rather than estimating firm-level wage equations and production functions based on non-linear regression methods, this study performs the estimations using linear methods as in McDevitt *et al.* (2009). Hence, the firm-level wage equation is derived as follows. The firm's total wage bill (W) is expressed as:

$$W = w^m M + w^f F \tag{1}$$

where M and F represent the firm's total number of male and female employees, respectively, and w^m and w^m are the average paid male and female wages[7]. To simplify derivation, it is assumed that the firm's total labor force (L) is differentiated based on only one demographic characteristic, gender. Given that $M = L - F$, it follows that:

$$W = w^m L + (w^f - w^m)F \tag{2}$$

Dividing both sides of equation (2) by L allows equation (2) to be expressed as:

$$\frac{W}{L} = w^m[1 + (\frac{w^f}{w^m} - 1)\frac{F}{L}] \tag{3}$$

By letting w stand for the firm's wage bill per employee ($w = W/L$), by allowing δ^f to represent the relative female-male wage differential [$\delta^f = (w^f / w^m) - 1$], and by using s^f to denote the female share of the firm's total labor force ($s^f = F/L$), equation (3) may be written the following way:

$$w = w^m(1 + \delta^f s^f) \tag{4}$$

The logarithmic transformation of equation (4) yields:

$$\ln w = \ln w^m + \ln(1 + \delta^f s^f) \tag{5}$$

Defining θ as the log wage of the reference group, and assuming the approximation $\ln(1 + \delta^f s^f) \approx \delta^f s^f$, it follows that:

$$\ln w = \theta + \delta^f s^f \tag{6}$$

By controlling for other determinants of the firm's wages besides labor force composition, the estimable firm-level wage equation is defined as:

$$\ln w = \theta + \delta^f s^f + \beta X + \mu \tag{7}$$

where X represents a matrix of characteristics that affect the firm's wages other than labor force composition (e.g., firm location, firm size), β is the corresponding vector of coefficients to be estimated, and μ is the error term with mean value equal to zero and constant variance.

As referred earlier on, equation (7) is derived based on the assumption that the firm's labor force is differentiated solely on the basis of gender. By relaxing this assumption, other demographic characteristics of the labor force (*e.g.*, education, age) are included in the firm-level wage equation specification. In the general case, workers have various demographic characteristics ($k = 1,\ldots K$) and are divided into different groups ($j = 1,\ldots J$) based on each one of these characteristics. The share of employees in group j in terms of characteristic k is denoted by s^{jk}, whereas δ^{jk} represents the relative wage differential between the reference group and group j in terms of characteristic k[8].

[6] By focusing on firm-level wage equations, it is possible to jointly estimate wage equations and production functions. This joint estimation allows for formal tests on the equality of the coefficients of the wage equations and production functions. Hellerstein *et al.* (1999) consider that by jointly estimating firm-level wage equations and production functions, potential biases introduced by unobservable effects regarding wages and production will affect the estimations in a similar manner.

[7] The firm's total wage bill represents the aggregation of the individual-level wage equation over all workers employed at the firm (Hellerstein *et al.*, 1999). The individual-level wage equation is expressed as $W_i = u^m M_i + u^f F_i$, where W_i represents the average wage of employee i, M_i and F_i are dummy variables for male and female employees, respectively, and u^m and u^f are the average paid male and female wages. Summing this equation over all workers employed at the firm yields the firm's total wage bill (equation 1).

[8] As in Hellerstein *et al.* (1999), it is assumed that wage differentials between two types of employees within one demographic group are equal to the wage differentials between those same two types of employees within another demographic group. For example, the wage differentials between young aged women and young aged men are assumed to be equal to the wage differentials between old aged women and old aged men. Similarly, the wage differentials between young aged women and old aged women are assumed to be equal to the wage differentials between young aged men and old aged men. It is also assumed that the share of employees in a firm defined by one demographic group is constant across all other demographic groups.

The group j=1 corresponds to the reference group. Thus, the firm-level wage equation estimated for the empirical analysis undertaken in this study is equal to:

$$\ln w = \theta + \sum_{k=1}^{K} (\delta^{2k} s^{2k} + \ldots + \delta^{Jk} s^{Jk}) + \beta X + \mu \qquad (8)$$

4.2. FIRM-LEVEL PRODUCTION FUNCTION

Assuming the Cobb-Douglas functional form, the production function can be expressed in logarithms as:

$$\ln Y = \ln A + \alpha_L \ln L^* + \alpha_K \ln K \qquad (9)$$

where Y is value added, L^* is effective labor input, K is capital input, and A represents determinants of value added other than labor and capital.

The effective labor input term (L^*) allows for quality and quantity dimensions of labor. For simplicity, this term is derived assuming that labor inputs are differentiated exclusively on a gender basis. It is also assumed that different types of labor are perfectly substitutable inputs, but with potentially different marginal productivities. Defining males as the reference group and scaling its marginal productivity equal to 1, it follows that:

$$L^* = M + \frac{p^f}{p^m} F \qquad (10)$$

where M and F represent the firm's total number of male and female employees, respectively, and p^f/p^m is the relative marginal productivity of females[9]. Given that $M = L - F$, the effective labor input may be further written as:

$$L^* = L[1 + (\frac{p^f}{p^m} - 1)\frac{F}{L}] \qquad (11)$$

Letting the term φ^f represent the relative female-male productivity differential $[\varphi^f = (p^f / p^m) - 1]$, and using s^f to denote the female share of the firm's total labor input ($s^f = F/L$), it results that:

$$L^* = L(1 + \varphi^f s^f) \qquad (12)$$

Substituting equation (12) into equation (9) yields:

$$\ln Y = \ln A + \alpha_L \ln L + \alpha_L \ln(1 + \varphi^f s^f) + \alpha_K \ln K \qquad (13)$$

A few additional steps are needed to derive the firm-level production function estimated in this paper. Given that data on capital input is not available in the data set *Quadros de Pessoal*, the corresponding term is dropped. Constant returns to labor are imposed, and it is assumed that $\ln(1 + \varphi^f s^f) \approx \varphi^f s^f$. Considering that the term A represents all other determinants of the firm's value added, the production function is further written:

$$\ln Y = \ln L + \varphi^f s^f + \gamma Z + \upsilon \qquad (14)$$

where Z is a matrix of other determinants of value added (e.g., firm location, firm size), γ represents the corresponding vector of coefficients to be estimated and ν is the error term.

In order to make the productivity differential analysis more directly comparable to the wage differential analysis, production is modeled on a per employee basis. Hence, by subtracting the term $\ln L$ from both sides of equation (14), it results that:

$$\ln \frac{Y}{L} = \varphi^f s^f + \gamma Z + \upsilon \qquad (15)$$

Finally, the assumption that labor inputs are differentiated based on gender alone is relaxed, and other demographic characteristics (e.g., education, age) are taken into account. Hence, employees are divided into different groups (j = 1,…J) based on each one of the various demographic characteristics (k = 1,…K). The group j = 1 corresponds to the reference group. The estimable firm-level production function applied in the empirical analysis is defined as:

$$\ln y = \sum_{k=1}^{K} (\varphi^{2k} s^{2k} + \ldots + \varphi^{Jk} s^{Jk}) + \gamma Z + \upsilon \qquad (16)$$

where y represents the firm's value added per employee, s^{jk} represents the share of employees in group j in terms of characteristic k, and φ^{jk} represents the relative productivity differential between the reference group and group j in terms of characteristic k.

The estimation of equations (8) and (16) yields comparable measures of wage and productivity differentials. Given the specific objective of testing for gender wage discrimination, the key parameters to be estimated and compared are the relative female-male wage differentials (δ^f) and the relative female-male productivity differentials (φ^f). Statistical evidence of relatively larger gender wage differentials is consistent with the wage discrimination theory, whereby gender differences in wages cannot be fully accounted for on the basis of gender differences in the levels of productivity.

5. EMPIRICAL EVIDENCE ON PORTUGUESE GENDER WAGE AND PRODUCTIVITY DIFFERENTIALS IN THE TOURISM INDUSTRY

5.1. DATA

The current study relies on micro data from the *Quadros de Pessoal* (Employee Records). The *Quadros de Pessoal* is an extensive data set provided by the Portuguese

[9] In this case, labor input is measured in male equivalent units.

Ministry of Labor and Social Solidarity. The data set is based on an annual employment survey that each firm in the Portuguese economy with paid personnel is legally obliged to fill in. Excluded from the legal obligation of answering the annual survey are both public administration and employers of domestic related services. For the remaining cases, firms are legally required to answer the employment survey in November of every year, based on information regarding the reference month of October.

The micro data gathered in the *Quadros de Pessoal* cover information at three different levels: the firm level, the establishment level, and the worker level. At the firm level, there is information on each firm's location, legal setting, establishments, employment, economic activity, year of constitution, and turnover. At the establishment level, the data cover information on the location, employment, and economic activity of each one of the firm's establishments. Reported data at the worker level include information on each worker's gender, nationality, occupation, professional situation, qualification, schooling, age, monthly wages (divided into several components), hours worked, and employment duration regime.

Several constraints were imposed on the total number of observations of the original data set. In relation to the worker's professional status, only wage earners were included in the analysis. Firm owners, unpaid family members, and active members of cooperatives were, therefore, dropped. Employers engaged in the firm's activities and members of cooperatives were not considered since the distinction between wages and profits may not be sufficiently clear and non-subjective. Given that wage inequality is the main theme of this paper, unpaid family members were also dropped from the original data set. Furthermore, only wage earners aged 15 to 64 were retained for the analysis undertaken.

Due to their low representation in the data set *Quadros de Pessoal*, observations related to the economic sectors of agriculture, forestry, fishery, mining, public administration, domestic service, and extra-territorial organizations were not included in the analysis. These economic sectors are not adequately covered by the annual survey since either they correspond to economic sectors explicitly excluded from the legal obligation to answer the annual survey, or they correspond to economic sectors that have a very low share of workers in total employment.

From a geographical point of view, the empirical study is focused on the Portuguese mainland and the autonomous regions of Azores and Madeira. Finally, and given the problems that the existence of missing values in the data set can bring to the computations to be performed, observations with missing data were also dropped from the original data set.

The current analysis is based on micro data from the *Quadros de Pessoal* for the year 2007. Table 1 presents firm-level descriptive statistics with regard to the tourism industry. The summarized statistics provide information for several variables used for the estimation of firm-level wage equations and production functions. Among the reported data are statistics for the firm's labor force composition (gender, education, age, tenure, and occupation), size, and location.

TABLE 1. FIRM-LEVEL DESCRIPTIVE STATISTICS, 2007

Characteristics (N = 23,338)	**Mean**
Ln wage bill per employee	6,21
Ln sales per employee	10,77
Gender (%)	
Male	35,00
Female	65,00
Education (%)	
≤ 4 years	85,17
6 years	13,36
9 years	0,18
12 years	0,37
≥ 15 years	0,92
Age (%)	
≤ 29 years	27,38
30 to 54 years	63,44
≥ 55 years	9,18
Tenure (%)	
≤ 4 years	61,93
5 to 9 years	22,21
≥ 10 years	15,86
Occupation (%)	
Executive civil servants, industrial directors, and executives	5,56
Professionals and scientists	0,18
Middle management and technicians	0,92
Administrative and related workers	5,01
Service and sales workers	73,51
Skilled workers, craftsmen, and similar	2,35
Machine operators and assembly workers	0,23
Unskilled workers	12,24
Region (%)	
North	27,28
Center	19,33
Lisbon	30,38
Alentejo	7,01
Algarve	10,46
Azores and Madeira	5,54

Source: Computations based on Ministério do Trabalho e da Solidariedade Social (2007).

In relation to gender, the statistics reveal that the firm's share of female employees in the tourism industry is higher than the male share. On average, women represent about 65% of the total number of employees in each firm.

With regard to educational attainment, a substantial portion of the firm's employees has no more than lower secondary education[10]. Also, employment in each firm is on average higher for workers aged 30 to 54, whereas a high share of the firm's employees has less than 5 years of tenure.

As for occupational distribution, the reported data for the tourism industry reveal that on average the occupation group "service and sales workers" accounts for the vast majority of employment in each firm, whereas the group "professionals and scientists" represents the lowest share of the firm's employees. Geographically, the majority of the firms are located in the Lisbon and Northern regions.

5.2. ESTIMATION OF WAGE AND PRODUCTIVITY DIFFERENTIALS

Table 2 presents the OLS joint estimation of the firm-level wage equation (equation 8) and firm-level production function (equation 16) for the tourism industry in 2007. The first column displayed represents the wage equation estimates, whereas the second column corresponds to the production function estimates. The dependent variable used for the wage equation is the natural logarithm of the wage bill per employee, whereas the dependent variable for the production function is the natural logarithm of turnover per employee[11].

In order to ensure the exact comparability of the two sets of estimated coefficients, both specifications include identical independent variables. These variables reflect various demographic characteristics of the firm's labor force, as well as other determinants of the firm's wage bill and turnover, such as firm size and firm location[12]. The Appendix provides the description of the independent variables. Given the specific aim of testing for gender wage discrimination, the key parameters of interest for the current analysis are the coefficients on the share of female employees.

For the firm-level wage equation, the female coefficient represents the relative female-male wage differential (δ^f). According to the estimated results, this differential is negative. This indicates that female employees are paid less than their male colleagues. The results therefore reveal that firms with relatively higher shares of female employees have lower wage bills per employee. According to the female coefficient (–0,059), if the share of female workers increases by 10 percentage points, the firm's wage bill per employee will decrease by about 0,6 percent.

TABLE 2. OLS WAGE EQUATION AND PRODUCTION FUNCTION ESTIMATES, 2007

Independent variable	**ln(*W/L*)**	**ln(*T/L*)**
Constant	6,150** (755,27)	10,803** (409,59)
Gender (Shmale omitted)		
Shfemale	–0,059** (–16,01)	–0,105** (–8,80)
Education (Shed4 omitted)		
Shed6	0,065** (13,56)	0,088** (5,61)
Shed9	0,170** (4,67)	0,115 (0,97)
Shed12	0,264** (8,46)	0,223* (2,21)
Shed15	0,453** (22,38)	0,404** (6,16)
Age (Shyoung omitted)		
Shprime	0,024** (5,76)	–0,123** (–9,19)
Shold	0,066** (9,68)	–0,253** (–11,52)
Tenure (Shorten omitted)		
Shmedten	0,003 (0,69)	0,028* (2,20)
Shlongten	0,029** (6,21)	–0,032* (–2,16)
Occupation (Shtopman omitted)		
Shprofscien	0,244** (6,11)	0,574** (4,43)
Shmidmantec	0,032 (1,79)	0,427** (7,47)
Shadminist	–0,029** (–2,93)	0,121** (3,84)
Shservsales	–0,092** (–12,87)	0,166** (7,18)
Shskllcrfts	–0,059** (–4,65)	0,120** (2,92)
Shmachassem	0,085* (2,27)	0,571** (4,73)
Shunskllwrk	–0,079** (–9,49)	0,042 (1,56)
Number of observations	23,388	
Adjusted R^2	0,302	0,068

Source: Computations based on Ministério do Trabalho e da Solidariedade Social (2007).

Notes: The values in parenthesis are t-statistics derived from standard errors; *statistically significant at the 0,05 significance level; **statistically significant at the 0,01 significance level. The wage equation and production function specifications also include controls for firm size and firm location (6 dummies). A test for the joint significance of the coefficients is performed. The null hypothesis is rejected with a p-value of 0,000.

With regard to the firm-level production function, the female coefficient corresponds to the relative female-male productivity differential (φ^f). The results reported

[10] Secondary education corresponds to 12 years of schooling.

[11] Haltiwanger *et al.* (1999, 2007) also use the variable turnover as a proxy for value added in the production function specification applied in their investigation of the relationship between the firm's productivity levels and labor force composition.

[12] The firm's employees are divided into different groups based on five demographic characteristics: gender, education, age, tenure, and occupation. Hence, the employees are classified into two gender groups, five education groups, three age groups, three tenure groups, and eight occupation groups.

in Table 2 show that the productivity differential is also negative, implying that women are less productive than men. In other words, the results reveal that labor is less productive in firms with relatively higher shares of female employees.

Considering the estimated female coefficient (–0,105), a 10 percentage point increase in the female share of the firm's labor force will result in a 1,1 percent decrease in the firm's turnover per employee.

By directly comparing the estimated gender wage differentials with the gender productivity differentials, it is possible to determine whether the observed gender wage gap is justifiable on the grounds that female employees are relatively less productive than their male counterparts, or if instead the gap is attributable to wage discrimination against women. The cross-sectional estimations suggest that the gender wage differential is smaller than the gender productivity differential[13]. These findings are consistent with the no wage discrimination theory, whereby gender differences in earnings are fully accounted for on the basis of gender differences in productivity.

6. CONCLUSION

The purpose of this paper was to provide new empirical evidence on the determinants of gender wage inequality in the Portuguese tourism industry. Given the potential limitations of the standard individual-level wage equation framework in accurately measuring the gender productivity gap and therefore gender wage discrimination, an alternative empirical approach was applied. Based on direct estimations of labor productivity, this approach represents a departure from the standard wage equation methodology applied in most of the studies on gender wage gaps. The approach was applied to the tourism industry data from the *Quadros de Pessoal*.

Gender wage and productivity differentials were estimated relying on firm-level wage equations and production functions. The estimates were then directly compared in order to determine whether the observed wage gap reflects gender differences in productivity, or instead the gap is attributable to the effects of wage discrimination against female employees.

The results indicate that female employees earn less and are less productive than male employees. Furthermore, the results reveal that gender differences in wages are fully explained by gender differences in productivity levels. In sum, the results indicate that women in the tourism industry in Portugal earn less than men because they are relatively less productive.

[13] Given the joint estimation of the firm-level wage equation and production function, a formal test on the equality of the female coefficients (that is, a formal test on the equality of gender wage and productivity differentials) is performed. The null hypothesis of equal coefficients is rejected with a p-value of 0,000.

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APPENDIX

Variable	Description
Shmale:	Share of male employees.
Shfemale:	Share of female employees.
Shed4:	Share of employees with highest completed degree of education ≤ 4 years.
Shed6:	Share of employees with highest completed degree of education = 6 years.
Shed9:	Share of employees with highest completed degree of education = 9 years.
Shed12:	Share of employees with highest completed degree of education = 12 years.
Shed15:	Share of employees with highest completed degree of education ≥ 15 years.
Shyoung:	Share of young aged employees (age ≤ 29 years).
Shprime:	Share of prime aged employees (30 years ≤ age ≤ 54 years).
Shold:	Share of old aged employees (age ≥ 55 years).
Shorten:	Share of employees with short tenure (tenure ≤ 4 years).
Shmedten:	Share of employees with medium tenure (5 years ≤ tenure ≤ 9 years).
Shlongten:	Share of employees with long tenure (tenure ≥ 10 years).
Shtopman:	Share of executive civil servants, industrial directors, and executives.
Shprofscien:	Share of professionals and scientists.
Shmidmantec:	Share of middle managers and technicians.
Shadminist:	Share of administrative and related workers.
Shservsales:	Share of service and sales workers.
Shskllcrfts:	Share of skilled workers, craftsmen, and similar.
Shmachassem:	Share of machine operators and assembly workers.
Shunskllwrk:	Share of unskilled workers.