Could gender wage discrimination explain regional differences in productivity?

September 7, 2012

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Abstract

Human capital and productive structure could account for an important part of the differences in productivity between Spanish regions; nevertheless we consider that gender wage discrimination could also have effects on it. The existence of a degree of discrimination means that there is a wage differential in which employer prefer to hire less productive workers instead of discriminated workers. Thus, the cost of producing a unit of product would be higher than the cost of producing without discrimination, i.e. discrimination could has effects on productivity. Based on Becker (1957) we develop a maximization problem with discrimination using an aggregate production function with constant elasticity of substitution (CES). As a result, we get a productivity function depending on discrimination and other traditional factors such as wages or production. Our results show that the discrimination growth hast a negative and significant effect on productivity for the Spanish regions.

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Introduction

In last the last decade, overall before the financial crises, European policy-makers have focused on competitiveness and gender equality as independent targets or even as opposite forces. Nevertheless, are these two concepts complete independent?

Even if national competitiveness could be an ambiguous concept,[3] we are able to argue that one of its main determinants is productivity, and this will be one of the main focus of this paper. As a result European institutions are worry about the productivity of their Member States, especially about those countries such as Spain which have not shown any productivity growth in last years. Gómez-Salvador, R. et al. (2006) and Sibert, A. (2007) confirm a decline of the labour productivity growth in Spain since the mid-1990s. Nevertheless, this fact hides important differences between Spanish regions.[4]

Figure 1: Productivity growth for the Spanish regions (1995-2002)
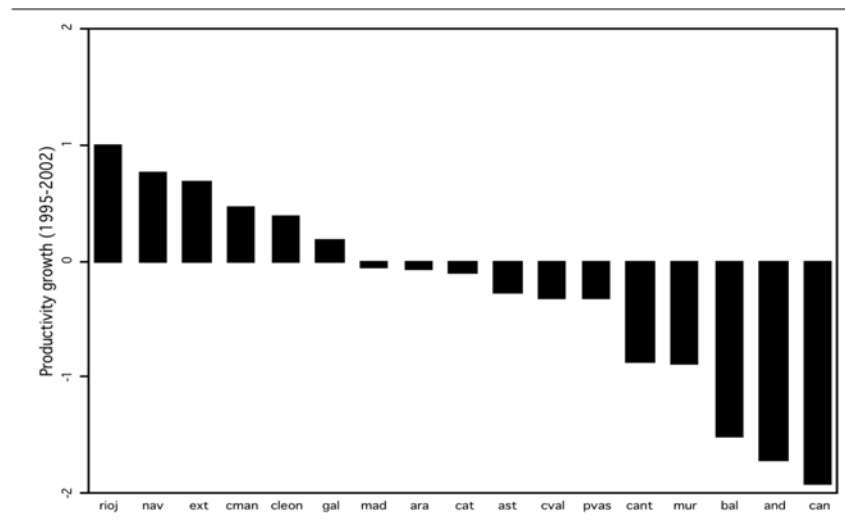
Actually, regions such as La Rioja or Navarra show positive growth rates during the period 1995-2002 while other regions as Andalucía or Canary Islands show an even negative productivity growth (see figure 1). The opposite performance of Spanish regions gives to Spain (in average) a productivity growth close to zero. How could explain theses differences? Human capital and productive structure could account for an important part of these productivity differences

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[3]In fact, Krugman (1996) points out several reasons against the idea of national competitiveness. He argues that firm success would often be at the expense of another, while the success of one country could creates rather than destroys opportunities for others.

[4]Spain is constituted by 17 regions which show important economic, cultural and social differences among them. The economic differences have been analysed many times and the different public administrations have made an important legislative and economic effort in order to reduce them (Cohesion Policy, European and Spanish regional policy)

between Spanish regions (Cuadrado Roura, et al. 1999). Nevertheless, in this paper we attempt to underline the importance of other possible factor: the gender wage discrimination. Thus, we base on discrimination literature in order to show that a loss of productivity is one of the mains outcomes of discrimination. Consequently, different degrees of discrimination between spanish regions could result on different levels of productivity.

Following neoclassic theory, where preferences are the main consequence of discrimination, there is neither inefficiency nor effects on labour markets.[5] An employer with preferences not related to productive efficiency would show higher costs than other employers. Consequently, this disadvantage relative to other employers would drop him out from the market due to the free market forces. For this reason, under the neoclassic theory, discrimination disappears in the long term and differences in preferences explain gender wage differential. Nevertheless, theories such as the monopsony power assert that frictions in the labour market may avoid the disappearance of discrimination. In fact, empirical studies show that discrimination has not decreased over time as neoclassic authors supposed. Actually, in Spain discrimination has not decreased, and in regions as Galicia it has even increased (Pena-Boquete, 2009). Moreover, similar to productivity, nor the gender pay gap neither the gender wage discrimination is homogeneous between Spanish regions. In fact, the degree of gender wage discrimination in 1995 goes from 14.32 for Castilla La Mancha to 27.29 for Murcia (Aláez and Ullibarri, 2000)

Since empirical research shows an important magnitude and persistence of discrimination in labour market, it is important to determine the effects of discrimination not only for an individual (at a microeconomic level) but also for the whole labour market (at a macroeconomic level). We argue that discrimination has consequences for the whole labour market, especially on productivity, and policymakers should realize about the need of correct this inefficiency. In order to check the possible effect of the discrimination on productivity for the Spanish regions, we estimate a productivity function with discrimination. Thus, we develop a profit maximization problem with discrimination using an aggregate production function with constant elasticity of substitution (CES).

The structure of this paper is as follows: first, we explain the effects of a discriminatory behaviour, in order to show the relationship between discrimination and productivity. Second, we develop the theoretical problem of profit maximization including discrimination in order to get the productivity function. In the third section, we show the results of our estimations for the Spanish regions. Finally, we draw some conclusions.

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[5]Taking individuals preferences as given make the automatic translation of different prices (wages) for the same good (job) in a loss of total utility is impossible.

1   Background: The relationship between productivity and discrimination

Based on Becker (1957, 1971) if an individual has a "taste for discrimination", he must act as if he were willing to pay something, either directly or in the form of reduced income, to be associated with some persons instead of others. Thus, when actual discrimination occurs, he must either pay or forfeit income for this privilege. Different agents, such as employers, co-workers, customers, unions, government may have this "taste for discrimination" and their consequences are different in the labour market.[6] In this case we focus on the employers "taste for discrimination" because the aim in next section is to develop a maximizing problem with discrimination.

Suppose an employer were faced with the money wage rate (w_i) of a particular factor; he is assumed to act as $w_i(1 + d_i)$ is were the net wage rate, with d_i as his discrimination coefficient against this factor. An employer discriminates by refusing to hire someone with a marginal value product greater than marginal cost. Thus, employer discrimination does not alter the criterion of profit maximization, and the ratio of any two marginal products (MP_i) still equals the ratio of their net factor prices.

$$\frac{MP_i}{MP_J} = \frac{w_i(1 + d_i)}{w_j(1 + d_j)}$$

However, equilibrium factor combinations would be quite different in situations of discrimination from those obtained with classical assumptions: there would be a smaller demand for discriminated factors. Moreover, the cost of producing each unit of output would be greater than the minimum cost (without discrimination).[7]

As I said before, some researchers argue competitive forces eliminate discrimination since discrimination has effects on productivity. In this way, Arrow (1973) argues that competitive markets forces tend to drive discrimination toward zero in Becker's model: "only the least discriminatory firms survive." In the same line, Aigner and Cain (1977) may doubt that a mistaken behaviour, systematically overpay men relative to women, will persist in competitive markets.

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[6]Based on the Becker theory, consequence of co-workers "taste for discrimination" is segregation and not wage discrimination. Nevertheless, perhaps segregation will not permit equal wages between groups since discriminated workers are too few to allow economies of scale in production, recognizing that their numbers must staff all skill levels (e.g., women in construction sector).

[7]Although we based on Becker's model, we could extend similar conclusion using the statistical discrimination or the monopsony power. Moreover, as we said before, based on "taste for discrimination" or "statistical discrimination" there are a share of equally productive women, which are not hired due to discrimination, i.e. there is a share of less productive workers which are hired. Consequently, an increase of discrimination causes a loss of productivity. In the theory of monopsony this loss of productivity could be cause by lack of motivation. Moreover the those theories are not incompatible and they could coexist, Black (1995) develops a search model where a share of firms discriminates against minorities (women in our case) and the others have a certain monopsony power to pay less

Nevertheless, Becker (1957, 1971) points out the possibility of the existence of discrimination in the long run because the generality of entrepreneurial skills and the long run elasticity of other factors determine the persistence of a discriminating cost differential in the long run under competitive conditions. Since empirical researcher show a persistent and significant magnitude of wage discrimination, we should be able to notice its consequences on aggregated labour productivity. Up to my knowledge, authors such Esteve-Volard or Klasen have tested the effects of gender disparities on labour market and growth but not the effects of discrimination. Its is important to distinguish between gender disparities and gender discrimination since they result in different policy implications.

The analyses attempting to analyses the consequences of gender disparities on growth focus on education equity and the misallocation of labour. In addition to education, those analyses have placed in the foreground the indirect effects of the women's entrance to the labour market on growth through changes in fertility.[8] In any case, results are not very conclusive. While Esteve-Volard (2004) in a model applied to India, argues that in the short run, discrimination may act as a brake on economic growth and development,[9] other authors such as Seguino (2002) argue exactly the opposite.[10] Different authors such as Esteve-Volart (2000, 2004) and García-Miguez et al. (2003) point out the importance of estimating a macroeconomic model about the cost of discrimination on the aggregated output. The main idea is that gender discrimination is macroeconomically inefficient because the firms do not maximize its productive capacity. They find that these costs are indeed quite substantial. In this case they not measure wage discrimination but the "discrimination" in managerial positions using the share of women relative to men.[11] These authors attempt to include the effects of discrimination on growth; nevertheless, they use gender differences instead of gender discrimination for testing their theories due to the

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[8]Dollar and Gatti (1999) comment on the strongly negative coefficient of fertility and they emphasize that "female education may well contribute to per capita income growth by reducing fertility and hence population growth"

[9]Her hypothesis is that gender discrimination against women in the market place reduces the available talent in an economy, which has negative economic consequences. Concentrating on the labour market, she examines three possible scenarios: the labour market equilibrium without discrimination; gender discrimination as an exogenous exclusion of females from managerial positions and gender discrimination as a complete exclusion of females from the labour market.

[10]Seguino (2000) analyses the empirical impact of gender inequality on economic growth and he finds a positive relationship between gender inequalities and income growth. Confining the analysis to a set of semi-industrialized countries over twenty-one years (1975 to 1995), the data capture countries that have adopted an export orientation with a large share of exports produced in female-dominated manufacturing industries. The main hypothesis tested is that gender inequality which works to lower women's wages relative to men's is a stimulus to growth in export-oriented economies. Gender inequality leads to export expansion that leads to technical change resulting in economic growth. Busse and Spielmann (2006) confirm the same result.

[11]Their assumption is that in absence of discrimination the share of women in managerical positions would be equally to men. It is not a very accurate measure, sice differences in the proportions of men and women in managerical positions could be due to human capital differences or preferences.

difficult for measure discrimination.

2   Methodology

In order to estimate the productivity function with discrimination we are going to develop the cost minimization problem describe by Becker (1957) but in aggregate terms. We assume an aggregate production function with constant elasticity of substitution (CES), with constant returns to scale and two types of labour factors (women and men):[12]

$$Q = A \left[\alpha_m L_m^\rho + \alpha_f L_f^\rho + (1 - \alpha_m - \alpha_f) K^\rho \right]^{\frac{1}{\rho}} \tag{1}$$

being Q the value added of the industry i at the region j,[13] A the technological change, L_m the labour input for males, L_f labour input for females, K the non-labour input , and α the productivity of one input relative to the other. Note that, $\rho = \frac{\sigma - 1}{\sigma}$, where σ is the elasticity of substitution among inputs.

The marginal products can be expressed as:

$$MP_{L_m} = A^{\rho - 1} \alpha_m \left(\frac{Q}{L_m} \right)^{1 - \rho} \tag{2}$$

$$MP_{L_f} = A^{\rho - 1} \alpha_f \left(\frac{Q}{L_f} \right)^{1 - \rho} \tag{3}$$

$$MP_k = A^{\rho - 1} (1 - \alpha_m - \alpha_f) \left(\frac{Q}{K} \right)^{1 - \rho} \tag{4}$$

Assuming profit maximization, the marginal products will be equated with the factor input price (being w labour price and r capital price). Since we want to include the discrimination (or unexplained gap) as in Becker (1957), the wage (input price of labour) will be equated to the marginal product of labour but discounted the discrimination $(1 + d)$:

$$w = \frac{MP_L}{(1 + d)} \tag{5}$$

Note that we are assuming men's prices as a not discriminatory scheme,[14] i.e. the coefficient of discrimination for men d is 0 by definition. Assuming constant returns to scale, retaining the assumption the log linearity and rearranging the equations we get:

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[12]We do not include time in our model since we just have data for 3 points in time. Nevertheless, we are aware of the possible influence of non-neutral technological change effects (Lup Tick and Oaxaca, 2010)

[13]To simplify the notation we not include the subindices i and j nor for the value added neither for the input factors

[14]In absence of discrimination women attributes are pay at mens prices

$$ln\left(\frac{Q}{L_m}\right) = ln\left(A\right) - \sigma ln\left(\alpha_m\right) + \sigma ln\left(w_m\right) \tag{6}$$

$$ln\left(\frac{Q}{L_f}\right) = ln\left(A\right) - \sigma ln\left(\alpha_f\right) + \sigma ln\left(w_f\right) + \sigma ln\left(1+d\right) \tag{7}$$

$$ln\left(\frac{Q}{K}\right) = ln\left(A\right) - \sigma ln\left(\alpha_m\right) + \sigma ln\left(r\right) \tag{8}$$

Using equations 5, 6 and 7, we are able to calculate the effect of discrimination on productivity

Lets now get the equations that show the relationship between the discrimination and relative employment rates between men and women. Assuming cost minimization, relative inputs prices equated their relative marginal productivities, as follows:

$$\frac{\alpha_f}{1-\alpha_f-\alpha_m}\left(\frac{K}{L_f}\right)^{1-\rho} = \frac{W_f\left(1+d\right)}{R} \tag{9}$$

$$\frac{\alpha_m}{1-\alpha_f-\alpha_m}\left(\frac{K}{L_m}\right)^{1-\rho} = \frac{W_m}{R} \tag{10}$$

$$\frac{\alpha_f}{\alpha_m}\left(\frac{L_m}{L_f}\right)^{1-\rho} = \frac{W_f\left(1+d\right)}{W_m} \tag{11}$$

Taking logarithms, and the definition of the elasticity of substitution we get:

$$ln\left(\frac{K}{L_f}\right) = -\sigma ln\left(\frac{1-\alpha_f-\alpha_m}{\alpha_f}\right) + \sigma ln\left(\frac{W_f}{R}\right) + \sigma ln\left(1+d\right) \tag{12}$$

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$$ln\left(\frac{K}{L_m}\right) = -\sigma ln\left(\frac{1-\alpha_f-\alpha_m}{\alpha_m}\right) + \sigma ln\left(\frac{W_m}{R}\right) \tag{13}$$

$$ln\left(\frac{L_m}{L_f}\right) = -\sigma ln\left(\frac{\alpha_m}{\alpha_f}\right) + \sigma ln\left(\frac{W_f}{W_m}\right) + \sigma ln\left(1+d\right) \tag{14}$$

3 Empirical approximation

We analyse the case of gender discrimination since in our database the share of foreign people in labour market is minuscule; nevertheless, we could do the same exercise with race discrimination.[15] The most difficult aspect of the empirical

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[15]Although the phenomenon of discrimination has common features, there are some differences depending on the group that suffers discrimination. For example women do not face the geographical concentration (ghettos) that ethnic groups suffer. In this case, we adapt the theoretical framework to gender discrimination, taking into account constraints imposed on women by the traditional time allocation due to domestic responsibilities.

approximation is to calculate discrimination. Difficulties for measuring discrimination[16] in the labour market arise because workers are not homogeneous and the characteristics that determine their individual performance, as cognitive and non-cognitive abilities (motivation, trust) or the scholar and familiar environment, are not observable. Additionally, observed differences between groups could appear as a result of free choice. There is not an agreement between researchers, and some consider that gender differences are due to discriminatory practices while others attribute them to differences in tastes or human capital investments. Different treatment based on different levels of productivity is not discriminatory. Some workers and occupations are more productive than others, reflecting different skills, qualifications and abilities. This leads to different returns at work which is fair and efficient. Thus, a different treatment based on individual merit, such as talents, knowledge and skill is not discriminatory.[17] From a technical point of view, we will say that wage discrimination exists when the gender wage gap cannot be attributed to differences in productivity. The traditional method to distinguish between wage differences due to productivity (attributes) or discrimination is the decomposition of Oaxaca (1973) and Blinder (1973). Nevertheless, we need to calculate the discrimination industries in addition to industries, so we calculate individual discrimination and we aggregate it, as we need.[18] We estimate the individual discrimination[19] relative to the wage a woman should earn is her attributes are paid at men's prices $\left(\hat{\omega}_{fi}^m \right)$, i.e. we estimate relative discrimination (d_{fi}) such that:

$$d_{fi} = \left(\frac{\hat{w}_{fi}^m - \hat{w}_{fi}^f}{\hat{w}_{fi}^m} \right)$$

Being $\hat{w}_{ji} = exp\left(X_{JI}' \hat{\beta}_J + \hat{\theta}_j \right)$ and $\hat{\theta}_j = 0.5\sigma_\epsilon^2$.[20] After estimating the relative individual discrimination we have to use a measure in order to sum up

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[16]Before analysing the effects of discrimination on labour market outcomes, we should delimit the concept of discrimination. Discrimination in labour market means treating people differently because of characteristics that are not related to their merit or job requirements. These features include race, color, sex, religion, political opinion, nationality and social origin. The International Labour Organization (ILO) defines discrimination in employment and occupation as "to treat people differently because of certain characteristics, such as race, color or sex, which results in the impairment of equality of opportunity and treatment". In other words, there is discrimination in labour market when two people are treated differently due to its race or sex, when race and sex do not have an effect on the productivity (Altonji and Blank, 1999).

[17]From a legal point of view, a different treatment to meet the special needs of some individuals – and make sure that they have equal opportunities – is neither discriminatory. This is often known as affirmative action.

[18]This method allow us to use the whole sample information to calculate the different returns instead of to break the sample in small pieces to make the calculations

[19]Wage that a woman should earn if her attributes are paid at men's prices $(\hat{w}_f^m)$ minus the wage she earn at women's prices $(\hat{w}_f^f)$

[20]We estimate two ordinary Mincer wage equations by OLS, one for each sex, $ln\omega_i = Z_I' \beta + \epsilon_I$ being i each individual, ω_i the hourly wage, Z_I' the vector of characteristics, β the estimated coefficients vector, and ϵ_i the error term. In the Mincerian equations we include

all information to the indexes for industries and regions. Thus, we adapt the poverty indexes of Foster, Greer and Thorbecke (1984) using the individual discrimination, as Del Rio et al. (2006) have proposed. These indexes show very desirable properties like continuity, dominion, symmetry, invariance to population replications, weak monotonocity and the weak principle of transferences and decomposability. The last property enables one to compute the indexes for subpopulations, allowing the estimation of degrees of discrimination for socioeconomic groups (industries in our case).

$$dr_\alpha\left(v_{fi}\right) = \left(\frac{1}{n}\right)\sum_{i=1}^{k^*}(d_{fi})^\alpha$$

where k* would be the number of discriminated women and α a coefficient of "aversion to discrimination". We use $\alpha = 1$, so we aggregate individual degrees of discrimination in a simple way, i.e. all women have the same weight (in fact, this is equivalent to the second term of Oaxaca's decomposition). Details of the databases used to estimate discrimination , productivity, wages and production are showed in the Annex.

Before showing the results of the estimation, we would like to give some intuitive evidence from the relationship between degree of discrimination and productivity. Figure 2 shows a clear relationship between the growth rate of the degree of gender wage discrimination and productivity for the Spanish regions.[21] This relationship is negative and it appears to be significant, i.e. and increase of the degree of discrimination results in a loss of productivity. But, does this relationship exist if we control for other variables?

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both characteristics related to employees (potential experience, tenure and the level of studies completed) and job characteristics (occupation, time status, type of contract, firm size, type of agreement and economic activity). In the annex we explain the variables in detail and the source, EES.

[21] Besides, the data has been standardized in order to avoid bias due to the magnitude of the variables. We standardized data as following: $E_{ji} = (S_{ji} - min_i S_{ji})/(max_i S_{ij} - min_i S_{ji})$, being E_{ij} the standardized value which corresponds to the variable i for the region j, S_{ji} the correspondent value not standardized, and min_i and max_i correspond to the minimum and maximum.

Figure 2: Relationship between the discrimination and productivity growth for the Spanish regions (1995-2002)
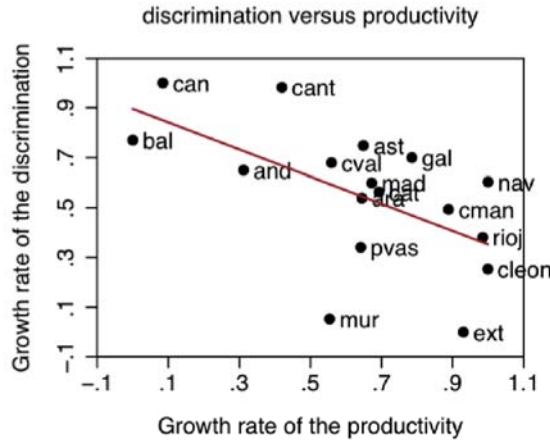
We estimate equations 5, 6 and 7 together using three stages least squares including cross-equations restrictions (results in table 1), and we did the same for equations 12, 13 and 14 (results in table 2). In some estimations we have included regional, industry and/or year dummies to control the productivity effect due to differences in technology of different regions, industries or years and to asses the robustness of the results.

Table 1 show the results for productivity equation (equation 6).[22] In our model we do not get the aggregated labour productivity, but we show two proxies: the valued added produced by the female workers and the value added produce by male workers. In both cases, if the labour cost of women w_f or of men w_m increase, productivity decreases, and the same occurs with the capital productivity if its price increases. In the same line, if gender wage discrimination increases, the proxy of productivity decreases and consequently, the aggregated productivity decreases too. In this case, gender wage discrimination works as an extra cost for the producer. These results are corroborated in the five equations although fixed effect for industry and sector cause some changes on magnitudes. Note that Spain show important and persistent differences in regional labour markets. In fact, we have assumed regions as independents markets for the discrimination calculations. Also industry dummies are important an improve the model fit.

Thus, aggregated results would be consistent with the discrimination litera-

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[22] Even if we have estimate equation 5, 6 and 7 together we just report the result for equation 6. Nevertheless, as we can observed in the equations the coefficients of $ln(w_m)$ and $ln(r)$ are equal to the coefficients of $ln(w_f)$ and $ln(1 + d_f)$ reported in table 1 due to cross-equation restrictions.

ture. As theory indicates the degree of discrimination has a negative impact on productivity for the Spanish regions, i.e. discrimination could have effects on competitiveness

Table 1: Results of the productivity function for Spanish regions

	dependent variable: $ln\left(\frac{Q}{L_f}\right)$				
Independent variables	(1)	(2)	(3)	(4)	(5)
$ln\left(w_f\right)$	-0.074***	-0.137***	-0.043***	-0.127***	-0.163***
$ln\left(1+d_f\right)$	-0.074***	-0.137***	-0.043***	-0.127***	-0.163***
Constant	13.216***		11.956***	13.160***	13.693***
Regional Dummies	NO	YES	NO	YES	YES
Industry Dummies	NO	NO	YES	YES	YES
Year dummies	NO	NO	NO	NO	YES
Observations	810	810	810	810	810
R-squared	0.102	0.173	0.834	0.874	0.882

* p<.1, ** p<.05, *** p<.01

Table 2 show results for the relative employment function (equation 14).[23]

The relative impact factor functions show that as the price of an input increase relative to other the employability of this factor decrease relative to the other. In fact, as we can see in our results, as the cost of employed women (w_f) increase relative to men (w_m), the female employability decrease relative to the male one. And the same occurs with any pair of two factors. In the same line, discrimination represents an extra cost for women, so it decreases their employability relative to men. As in the productivity results, regional and industry fixed cause changes in the coefficients in the same direction. Thus, results show that discrimination cause a change in factor allocation, in this case, women relative to men.

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[23]Similar to the previous table, we just reported equation 14 although we have estimated the three equations together. Nevertheless, the coefficients of $ln\left(\frac{w_f}{r}\right)$ and $ln\left(\frac{w_m}{r}\right)$ are equivalent to the coefficients of $ln\left(\frac{w_f}{w_m}\right)$ and $ln\left(1+d_f\right)$

| Independent variables | dependent variable: $ln\left(\frac{L_m}{L_f}\right)$ | | | | |
	(1)	(2)	(3)	(4)	(5)
$ln\left(\frac{w_f}{w_m}\right)$	-0.287***	-0.423***	-0.089***	-0.165***	-0.267***
$ln\left(1+d_f\right)$	-0.287***	-0.423***	-0.089***	-0.165***	-0.267***
constant	1.026***	0.579***	-0.276***	-0.580***	
Regional Dummies	NO	YES	NO	YES	YES
Industry Dummies	NO	NO	YES	YES	YES
Year dummies	NO	NO	NO	NO	YES
Observations	810	810	810	810	810
R-squared	0.450	0.635	0.786	0.856	0.903

* p<.1, ** p<.05, *** p<.01

4 Conclusions

A worry of the European Institutions is the low productivity growth of some member states such as Spain. Nevertheless, on the one hand, there are important differences in the productivity growth rates of the Spanish regions. On the other hand, discrimination theories point out productivity as an outcome of discrimination. For this reason the main aim of this paper was to show the linkage between productivity and gender wage discrimination.

Following the "taste for discrimination" by Becker (1957, 1971), an employer who has a taste for discrimination does not change their criterion of maximization profit, they include the disutility of hiring people from some groups (women) in their function. Although, the criterion of profit maximization has been not altered, the equal allocation of resources is different from neoclassic assumptions. Thus, on the one hand, the factor of demand of discriminated workers would be lower. On the other hand, the cost of producing a unit of product would be higher than the cost of producing without discrimination. Consequently, both the product by worker (productivity) and the female employment rate (discriminated group) would be lower. Preliminary results show a negative relationship between discrimination and productivity for the Spanish regions. But, does this result exist if we control for other variables? Following this idea, we develop this maximization problem using a CES production function in order to get a productivity function, and to estimate if discrimination has effects on productivity. Results are in line with the literature and on the one hand, discrimination has a negative effect on our proxy of productivity (value added by female employee) and consequently, in the aggregated productivity. On the other hand, an increase on the degree of discrimination affects the relative number of female worker relative to male one, i. e. women employability decrease relative to men.

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Annex

Estructura Salarial (EES, Wage Sructure Survey)

In order to calculate wage discrimination, the main source used is the Encuesta de Estructura Salarial (EES, Wage Structure Survey) elaborated by the INE for 1995, 2002 and 2006. It is a survey with a large number of observations, even

though it does not represent the whole employed population. In fact, the reference population is constituted by employees working in establishments with at least ten workers[24] involved in any economic activity other than agriculture, farming, fishing, Public Administration, Defence, Social Security, private households and extra-territorial organizations and bodies.[25] We use this survey because it has a large sample size and it includes detailed information about wage-earners and the establishments where they are employed. The Survey comprises a sample of workers at each firm and it consists of matched employer–employee data with a wealth of basic information used for our analysis on factors concerning the characteristics of the individual, job and workplace. Alternative surveys with individual level information on wages, like the ECHP, are all household surveys, thereby lacking the necessary matched employer-employee information. Their samples are significantly smaller and they don't provide us with a regional dimension (with the only exception of ECHP in 2000). The richness of information in the EES data allows us to analyse the wage-determination process from both the demand and the supply side of the labour market. Nevertheless, the use of this survey for the analysis of wage discrimination presents us with two main disadvantages. The first one is the lack of data concerning variables like working experience or marital status which are potentially significant for explaining the gender wage differential. However, the inclusion of marital status as a determining factor of wage differentials is not widely accepted. Regarding working experience, we have calculated a proxy variable using age and education. A second disadvantage is that EES is limited to private sector wage-earners employed by medium and large size companies, excluding sectors such as agriculture, fishing or several services.[26]

Contabilidad Regional de España (CRE, Spanish Regional Accounts)

Regional Accounts are a specification of the National Accounts, i.e. Contabilidad Nacional de España (CNE, Spanish National Accounts) constitutes the conceptual and quantitative reference framework for the Contabilidad Regional de España (CRE). The CRE is a statistical operation that the Instituto Nacional de Estadística (INE, National Statistical Institute) has been carrying out since 1986. Its main objective is to offer a quantified, systematic and as complete

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[24]In 2006, they have enlarged the sample including small firms, nevertheless we dropped them from the sample to keep the homogeneity.

[25]The 1995 EES does not include the following activity groups: M (education), N (health and social work) and O (other community, social and personal service activities). All of these groups have been excluded from the analysis in order to maintain homogeneity between the three periods used in this work. Moreover, we have aggregated DB-DC activities and removed DF, since they had few observations.

[26]The influence of these characteristics on the degree of wage discrimination is unclear. Not including public sector employees could lead to overestimating the degree of wage discrimination. Nevertheless, the lack of small-firm data and the inclusion of some private services sectors in which discrimination can be higher than average, could underrate the degree of wage discrimination.

as possible description of the regional economic activity in Spain. CRE does not have data about workers, but rather about jobs. It defines a full time job equivalent as the total number of hours worked divided by the annual average of hours worked in full time jobs. These concepts are considered more appropriate than the number of employees in order to approximate work factor consumption used in productive processes. Thus, it is more precise for estimating productivity because there are not problems about the equivalence of a part-time worker to a full-time worker and about double accounting of the workers employed in several jobs.