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Department of Economics

THE WAGE GAP BETWEEN IMMIGRANT AND NATIVE WORKERS IN SPAIN: AN ANALYSIS USING MATCHED EMPLOYER-EMPLOYEE DATA *

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ABSTRACT

The fact that Spain has witnessed a sharp increase in the number of immigrants over the past decade has generated considerable interest, particularly as regards wages earned by immigrants in host industries. We analyze whether controlling for both observable and unobservable characteristics of employers—in addition to individual variables and the economic context—makes any difference as regards the debate regarding the existence of wage differences between immigrant and native workers in Spain. As we show, doing this considerably reduces (or even eliminates) the inequalities found in previous research, thereby questioning the results attained by previous studies on this issue.

Key Words: Immigration, salaries, assimilation

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1. Introduction

The past decade has seen a significant increase in the number of immigrants arriving in Spain. The percentage of immigrants with respect to the total population has risen from 1.6% in 1998 to 11.4% in 2008 – *Spanish Statistics Institute* (INE). This increase has attracted a growing interest² in this country given the short period of time during which it has occurred and the changes in the migrants' individual characteristics over this period.³ As a result, there has been a proliferation of academic studies from several disciplines (anthropology, sociology, economic demography, law, etc.) seeking to provide answers to a wide range of questions related to immigration.

In general, the literature on immigration has focused on the following four issues (Amuedo-Dorantes and de la Rica, 2007a): the effects of immigration on the native population, immigration policy, factors regarding the decision to migrate, and, finally, the assimilation of immigrants in host industries. Within this framework, our study deals with the assimilation of immigrants in the Spanish labour market from an economic perspective. In particular, our objective is to determine whether immigrants in Spain suffer wage differences when compared to native workers with the same characteristics, and —should these differences exist— we seek to verify the extent to which the latter might be explained by their individual characteristics, the aspects of the jobs held, or the characteristics of the firms where they are employed. In particular, we address the following question: Are there any wage differences between native and immigrant workers employed by the same company in Spain, once we have controlled for their individual characteristics, the economic context and the nature of their jobs?

² According to surveys conducted by the *Sociological Research Centre* (CIS), from 1998 (0%) to 2008 (19.5%) there was a dramatic increase in the number of Spanish people who considered immigration to be one of the three main problems in Spain. See, in this respect, Ahn & Vázquez (2007).

³ The percentage of migrants from developing countries increased by more than 46% from 1998 to 2008. In addition, the percentage of immigrants aged between 20 and 29 increased by more than 48% (INE, 2008) over the same time period.

For this purpose, we use a large, administratively matched employer-employee dataset that contains a representative sample of companies in Spain. We are able to calculate the monthly wages of workers employed in these companies for a six-year interval (from 1998 to 2003), when the main boom in immigration occurred specifically in Spain⁴. Apart from allowing us to broaden the wage equations suggested by Mincer (1974) —introducing variables related to the company and job position (in addition to the classic variables related to the workers' human capital) — this dataset is uniquely suited to explaining wage differences among workers hired by the same company since it includes the individual labour history of every worker hired by the same company. No other dataset in Spain currently meets this criterion. Without it, gathering comparable data from every worker hired by a representative sample of companies in this country simply would not have been feasible. Thus, although the assimilation of immigrants has been widely analyzed in the literature⁵, no previous study in Spain has accounted for the possible existence of unobservable heterogeneity associated with the employing companies, thereby making this control our main contribution to the debate on the possible existence of wage differences between natives and immigrants.

Our results show that when both observable and unobservable characteristics of companies are controlled for, the evidence for wage differences between immigrants and natives provided by previous studies becomes questionable. First, controlling for unobservable heterogeneity at firm level (two-limit Tobit model) fewer groups of immigrants are revealed to suffer wage inequality relative to natives in comparison with the results obtained when these characteristics are not

⁴ For instance, according to INE, the growth rate in the number of immigrants in Spain rose from 17% in 1998 to 34% in 2003. From 2004 onwards, this rate substantially decreased (with the only exceptions being 2005 and 2008).

⁵ An excellent review can be found in Pekkala, (2005). See, in addition, Chiswick (1978), Massey (1987) and Borjas (1985) for the US; Bell (1997) for the UK; Baldacci et al. (1999) for Italy; Grant (1999) for Canada; Constants and Massey (2005) for Germany; Hammarstedt (2003) for Sweden; Büchel and Frick (2005) for the European Union; and Simón et al. (2008), Navarro and Rueda (2008), Izquierdo et al. (2009) and Sanromán et al. (2009) for Spain.

controlled for (double-censored regression models). In particular, only African and Asian workers are penalised by the former model, whereas in addition to them, in double-censored regression, South Americans and workers from EU-15 and other rich countries (such as USA, Canada and Japan) also suffer wage penalties. We should stress that our results also show these differences when individual characteristics (such as work experience, type of contract, professional category, etc) are included as explanatory variables. Second, the differences encountered when controlling for unobservable heterogeneity are always lower than the wage differences found by our two-limit Tobit model results. For instance, when controlling for unobservable variables the wage difference for an average worker varies between 13% and -12% (depending on the individual characteristics under consideration), whereas in double-censored regression this fluctuation ranges between 15% and -22%.

The rest of this paper is structured as follows: first, we describe the dataset and variables used in our estimations process; a different section then presents the econometric model we will use to deal with unobservable heterogeneity; finally, the empirical results are presented, and the paper concludes.

2. Dataset and Variables: descriptive statistics

The dataset used involves a sample taken from the Social Security records in Spain (known as *Fichero Técnico de Afiliados y Empresas*). It was constructed as follows: the companies included are a 1% representative random sample of the companies belonging to the General Social Security system on 31 December 2000.⁶ We have accessed the six-year labour history in these

⁶ Registration with the Social Security is obligatory for all firms and workers. Therefore, individuals are registered when they begin their working life and are included under one of the following three systems: “General Social Security” (*Régimen General de la Seguridad Social*, or RGSS), “Special Social Security” (*Regímenes Especiales de la Seguridad Social*, or RESS), and the Civil Service (*Régimen de Clases Pasivas*, or RCP).

companies, from 1998 to 2003, of the individuals who were employed by them at any time from 31 December 2000 to 31 December 2003. This is the only dataset in Spain in which data on workers and firms are jointly available. This allows us to explain wage differences between workers employed at the same company by taking into account the panel-level variance component (see below). The dataset provides information on individual characteristics of workers (age, gender, nationality), on aspects of their jobs (type of contract, Social Security contribution group and monthly Social Security contributions), in addition to characteristics related to employers (sector of activity, firm size and location). Furthermore, we control for company unobserved heterogeneity, which allows us to ensure that the results do not reflect spurious correlations between the variables included in the model and idiosyncratic (and/or institutional) company characteristics. Moreover, the administrative origin of the database guarantees that the information included has been accurately collated.

Despite these advantages, the following three limitations are worth noting. First, only information on legal immigrants in Spain is available (i.e., undocumented migrants are not considered in this dataset). This is common to other datasets in Spain, such as the *Muestra Continua de Vidas Laborales* (MCVL) (see, e.g., Navarro et al., 2008). Our results must therefore be interpreted with care, since there are some collectives that are poorly represented (for example, the women). Second, this dataset does not include the educational level, which would measure the individuals' human capital independently of their job. In view of this, qualification level is used as a proxy for individual skill level (as it captures a mix of the occupation and educational level required for the job). Third, an individual's overall experience in the labour market is missing, since the available data refer to the six-year labour history at the companies included in the sample (as explained above). Thus, we use age as a proxy for experience in the labour market.

The original sample contains 610,946 observations —12,046 companies and 122,032 workers— over the period 1998 to 2003. However, we have used only the wage corresponding to the month of June each year (due to the large size of the dataset). We have also excluded agriculture because individuals in this sector do not usually belong to the General Social Security system. Therefore, the wage pattern of workers belonging to agriculture in our sample is not representative of the main group of workers in this sector.⁷

The variable of overriding interest in this paper is monthly wage. Since explicit information on hours of work is not available, the monthly wage with a Social Security contribution (henceforth, monthly wage) will be used as a proxy (in constant 2003 euros). However, these contributory wages are subject to both a maximum and a minimum level to determine the contribution to the General Social Security system for each professional category. Out of the total sample, 15% of observations are censored, 31.23% of which exceed the maximum limit and the remaining 68.77% correspond to the minimum contribution level.⁸ This censoring renders the mean useless as a measurement of the central position in the descriptive analysis of the database and explains why the median is used instead (apart from the fact that this latter measurement is more suitable in wage studies).

2.1. Main variables: Descriptive statistics

The main variables used in our analysis are the following:

a) *Origin*. Dummy variables for nationals, South Americans, East Europeans, Asians, and the remainder of immigrants (immigrants from EU-15, USA, Canada and Japan). The criterion used

⁷ Workers belonging to the agriculture sector usually belong to the Special Social Security system (RESS).

⁸ In some studies - see, e.g., Navarro et al. (2008) or Clemente et al. (2007) - left-censored data are either treated to eliminate censoring or directly discarded. In this paper, we have restricted our analysis to full-time employees. That is, we have discarded part-time workers in order to avoid left-censoring being due to factors for which we have little information.

for classifying a worker as an immigrant was the nationality declared to the Social Security. Although an alternative would have been the country of birth, this variable is missing for the majority of individuals in this dataset (García-Pérez, 2008).

b) *Size of the company*. Dummy variables for the following intervals: 10 workers or less, between 11 and 50 workers, between 51 and 250 workers, both figures inclusive, and more than 250 workers.⁹

c) *Professional Category*. It refers to the level of qualification required for the job held, as reflected by the Social Security contribution group. Four categories apply: High, Medium-high, Medium-low and Low.¹⁰

d) *Age*. It refers to the worker's initial age (i.e., the worker's age when first appearing as part of the sample) in order to avoid the correlation of this variable with the variable covering the experience of workers in their jobs.

As shown in Table 1, our sample includes 306,505 observations and 119,957 workers. In general, these individuals remain in the sample for three years or less (out of the total of six years under consideration). This specifically applies to 71% of native workers under consideration and 90% of immigrants. Only 5% of natives and 1.5% of immigrants remained in the sample for the entire time period. This finding does not mean that those workers who leave the sample abandon the job market. Instead, it is likely they left simply to work in another company not included in our

⁹ In the dataset, 11% of companies have no information on the number of workers. In order to use these observations, we ordered the sample by firm and year. Then, for each year when size is missing for a given company, we computed as firm size the average of workers *in the sample* belonging to this in such a year.

¹⁰ This classification has been used by, amongst others, García Fontes and Hopenhayn (1996) and García Pérez (1997). Table 1 in Appendix A describes each category.

dataset¹¹. As regards other personal characteristics, the majority of workers are Spanish nationals (95%), mainly men (61% in the case of natives and around 70% of immigrants). Workers are mostly aged between 20 and 44 (80% of natives and over 86% of immigrants).

[Insert Table 1]

Table 2 shows that most workers hold temporary contracts, which is true for both natives and migrants alike, independently of whether we focus on the first or the last year in which each individual appears in the sample. However, the effects of temporality are far more dramatic on immigrants.

[Insert Table 2]

During their first job stint in our sample, most workers belong to the professional categories of “Medium-low” and “Low” (accounting for over 71% of natives). The next major category is “Medium-high” (approximately 16% of workers), followed by “High” (with approximately 12% of natives). Compared to natives, no significant differences are apparent among immigrants regarding their qualifications, although it is worth noting the large representation of immigrants in the “Low” professional category (53% of immigrants vs. 36% of natives). This tendency is repeated again in a worker’s final year in the sample, although there is a slight process of professional promotion between the moment of entering and the moment of leaving the sample (which is more apparent among natives than among immigrants).

In addition, in their first job stint in our sample most of the natives (87.91%) and immigrants (93.38%) work in the sample companies for fewer than 12 months. Over the course of time, workers gain experience in their jobs. Accordingly, table 2 shows that in the final year that the workers appear in our sample a larger group of these have more than 12 months' experience in

¹¹ Nonetheless, remaining in the sample for six years does not mean job seniority. Instead, it is possible that job seniority is achieved after more than six years.

their jobs (53% of natives and 33.46% of immigrants). Moreover, it should be noted that in the final year that the workers appear in our sample there is a significant increase in the percentage of worker who have more than 36 months' experience. So, we can conclude that there was an upward trend in job stability.

There are also differences between natives and immigrants as regards their sector of activity. In *Catering*, immigrants outnumber natives by more than 13 percentage points (19% vs. 6%); in *Retail*, natives outnumber immigrants by approximately 7 percentage points; in *Administration, education and health*, the participation of nationals outpaces that of immigrants by 7 percentage points. Finally, immigrants outnumber natives by 6% in *Construction*.

The distribution of each group according to firm size is rather similar: both collectives record high percentages of concentration (near 74% for nationals and 80% for foreigners) in small companies (with fewer than 50 employees). Nevertheless, natives are relatively more numerous in companies with more than 51 workers.

As regards firms (Table 3), 26% of them remained in the sample throughout the entire timeframe used in the dataset (6 years), and more than 60% remained for more than half that period (i.e., 3 years). *Retail* (27%), *Transport and business services* (19%), *Mining and industry* (15%), and *Construction* (15%) are the main sectors of activity. In particular, *Construction*, *Retail*, *Catering* and *Personal and domestic services*—that is, the sectors traditionally employing immigrants in Spain (Cuadrado et al., 2007)—make up more than 59% of the sample. As regards firm size, more than 75% of them are relatively small (i.e., with 10 or fewer workers), followed by companies employing between 11 and 50 workers (which represent more than 20% of the total). Indeed, large companies account for less than 5% of the total. This dataset accurately reproduces the population of companies in Spain: according to INE's Central Business Directory in 2003,

99.11% of firms in Spain had fewer than 50 employees, which is fairly close to our sample (95.23%).

[Insert Table 3]

2.2 A first look at the data: the wage gap between immigrants and natives

In this section, we aim to analyze the differences in real mean wages between natives and immigrants. As shown in Table 4, immigrants earn around 9% less than natives. By gender, this difference is greater among men (-13%) than women (-6%). We also find the same result by age of entry into the labour market, except for the group of immigrants who entered between the ages of 16 and 19.

[Insert Table 4]

As shown in Table 5, immigrants holding an open-ended contract earn around 7% less than their native counterparts; whereas among those with temporary contracts the difference is lower (around 5%). In addition, independently of the professional category, immigrants also earn lower wages than natives, with the largest difference being recorded in the “Medium-low” category (-7.49%) whereas the lowest one occurs in the “High” category (-1.58%). Finally, except for the category of workers with more than 3 years’ experience, the difference in wages is favourable to natives.

[Insert Table 5]

Immigrants earn less than nationals, regardless of firm size (Table 6). As regards sectors of activity, this difference in favour of natives occurs in every sector except for *Public Administration, education and health* and *Personal and domestic services*. The largest differences affect immigrants in *Mining and industry* (-12.66%), *Construction* (-8.76%), and *Transport*,

communications, financial intermediation, real estate and rental activities and business services (-8.15%). On the other hand, immigrants earn higher wages than natives in *Administration, education and health* (2.11%) and in *Personal and domestic services* (7.62%).

[Insert Table 6]

3. The model

As the General Social Security system establishes upper and lower limits for monthly wages in terms of the contributions to be made, the wage variable in our dataset is censored. For this reason, we have specified a two-limit Tobit model for panel data (Rosett & Nelson, 1975).¹²

This model has the following analytic expression:

$$y_{ij} = \begin{cases} \tau_L & \text{if } y_{ij}^* \leq \tau_L \\ y_{ij}^* = x_{ij}\beta + \varepsilon_{ij} & \text{if } \tau_L \leq y_{ij}^* \leq \tau_U \\ \tau_U & \text{if } y_{ij}^* \geq \tau_U \end{cases}$$

where y_{ij} is the dependent variable (the logarithm of the real wage), y_{ij}^* is the unobserved (latent) variable that measures the effective salary of the worker, τ_L is its lower limit (i.e., the minimum Social Security contribution of each worker), and τ_U is the upper limit (i.e., the maximum Social Security contribution). Each individual is represented by the suffix i , and each company by j . The explanatory variables are contained in vector x , while β is the vector of

¹² Using ordinary least squares (OLS) regression on censored data is inappropriate. It results in biased and inconsistent estimates because the standard OLS assumption that the error term and the independent variables are uncorrelated is breached (Maddala, 1983; Wooldridge, 2008). On the other hand, a fixed-effects model, in which unmeasured company- and/or time-specific influences are treated as constants rather than random variables, represents an alternative to variance components. This approach has not been pursued given that no consistent estimator exists for fixed-effects Tobit models (Maddala, 1987).

coefficients. The sampling error in this equation is represented by ε_{ij} and is defined as the sum of the following components:

$$\varepsilon_{ij} = v_{ij} + u_j$$

The first component, v_{ij} , varies from one individual to another as well as from one company to another. However, the second component, u_j , varies only from one company to another, and thus measures the unobserved characteristics of companies, which may be affecting wages. It is assumed that both components are independent and are distributed according to a normal of mean zero, so that:

$$\text{Var}[\varepsilon_{ij}] = \sigma_v^2 + \sigma_u^2$$

where the parameter σ_v^2 is the variance of the sampling error v_{ij} and σ_u^2 the variance of the error related to unobserved corporate heterogeneity. We therefore control for unobserved firm-specific factors likely to affect the magnitude of the gender wage gap between immigrants and natives. This will ensure the estimation of β clearly reflects the influence of regressors on the dependent variable, given that idiosyncratic corporate factors might be behind unobserved heterogeneity. For instance, low pay is usually linked to a wide range of factors, many of which are specific to the establishment and its competitive strategy (which is immeasurable). Thus, it is important to avoid the possible correlation between regressors and unobservable heterogeneity.

If y^* can be assumed to be normally distributed, the Tobit model will provide consistent and efficient estimates of parameters. Maximum likelihood estimation for the model involves dividing the observations into three sets. One contains uncensored observations, which maximum likelihood treats in the same way as the linear regression model. The other two contain left-

censored and right-censored observations, respectively, for which the specific value of y^* is not known. The probability of being left-censored is computed as:

$$\Pr(y^* \leq \tau_L / x) = \Phi\left(\frac{\tau_L - x\beta}{\sigma}\right)$$

and the probability of being right-censored as:

$$\Pr(y^* \geq \tau_U / x) = 1 - \Phi\left(\frac{\tau_U - x\beta}{\sigma}\right) = \Phi\left(\frac{x\beta - \tau_U}{\sigma}\right)$$

The likelihood function for all three sets of observations is then:

$$\ln L = \sum_{i=\text{left censored}} \ln \Phi\left(\frac{\tau_L - x\beta}{\sigma}\right) + \sum_{i=\text{no censored}} \ln \frac{1}{\sigma} \phi\left(\frac{y - x\beta}{\sigma}\right) + \sum_{i=\text{right censored}} \ln \Phi\left(\frac{x\beta - \tau_U}{\sigma}\right)$$

where ϕ and Φ are the probability density and the cumulative density functions, respectively, for standard normal distribution, and σ is the standard deviation of ε . Expected values for the latent outcome, $E(y^* | x) = x\beta$, are the primary focus of interest.

4. Results

This section presents the results obtained both from the two-limit Tobit model presented in the previous section (Table 7), and those from a double-censored regression model. The latter model is the more appropriate if there is no need to control for unobserved heterogeneity. By comparing the results from both models, we are able to gauge whether results are sensitive to the control for unobserved heterogeneity at firm level. As can be observed in table 7, 39.4% of the error is attributable to unobservable company characteristics. Thus, it is clear that the former is the more suitable approach for analyzing wage differentials in our sample.

[Insert Tables 7 and 8]

The first result in table 7 is that a worker's wages rises 1.7% per year up to the age of 42. From then on, by contrast, wages begin a small decline in real terms. This turning point is detected also in the double-censored regression model (Table 8), where the relationship between wage and age is even stronger —wages increase by more than 3% per year of age (and the turning point is reached at such an advanced age that it can be considered irrelevant). In addition, control of unobservable heterogeneity affects not only the wage-age relationship, but also the relationship between wage and experience.

Gender is a very important variable influencing wages. According to the Tobit model, men's wages are 11% higher than women's (whereas in the double-censored regression model, this difference is above 16%). Here again, not considering unobserved corporate heterogeneity introduces a bias in these estimates.

A firm's sector of activity is another factor that traditionally determines individual wages. Workers earn less in *Mining and industry* than in every other sector. This differential is, in general, between 7% and 18% (according to the Tobit model). The results are lower than those obtained in double-censored regression, where the wage differential ranges between 14% and 28%. The sole exception is *Construction*: there is no appreciable wage difference between this sector and *Mining and industry* in the Tobit model, whereas in double-censored regression it is approximately 2%. Note that the largest wage gaps occur in the sectors in which immigrants are mainly employed. For instance, in *Personal and domestic services*, where the largest wage differences are recorded — over 18% in the Tobit model and 27% in the double-censored regression model— in *Health* — with differences exceeding 14% in the Tobit model and reaching almost 20% in double-censored regression—, and, finally, in *Retail* —with differences close to 10% in the first model and 19% in the second one.

Another important finding in these tables is the relationship between wage and firm size. In the Tobit model, companies with more than 50 workers pay more than companies with fewer than 10 workers. This difference is highest, 5%, when considering workers in companies with more than 250 employees. Double-censored regression also produces the same result, although (once again) the differences recorded are greater than those revealed in the Tobit model.

The focus of our study, however, is the relationship between wages and an individual's nationality. In this regard, according to the Tobit model (Table 7), only Africans and Asians have a different wage pattern to natives: these two groups earn lower wages than natives (the differences being -4% for Africans and -8% for Asians). The double-censored regression model not only increases these differences (-10% and -20%, respectively), but also points to the existence of wage differences in the cases of South Americans (approximately -12%) and immigrants from EU-15 and rich countries (approximately -4%). All the latter differences disappear once firm unobservable heterogeneity is properly controlled for.

We have introduced certain interactions between the variable that measures a worker's nationality and other explanatory variables (i.e., type of contract, labour market experience...), in order to check whether the wage differentials shown in the double regression model for some collectives —such as South Americans, and non-economic immigrants— appear also in the Tobit model, albeit just for specific worker categories¹³. The interpretation of these interactions is not immediate. For this reason, we have used the estimates to predict the wages of an average worker (according to country of origin). The results obtained by the Tobit model are shown in table 9¹⁴.

¹³ These results reflect the wage differences between foreign workers and the workers considered in the constant term. Later, when we refer to these interactions, by contrast, we focus on the wage differences between the average workers of each nationality considered.

¹⁴ Table 1 and Table 2 in the Appendix B show the results obtained by double-censored regression.

The interaction between the variables *Experience* and *Open-ended contract* has been introduced in an attempt to observe whether the slight influence of experience in determining wage increases remains when the workers hold open-ended contracts.

[Insert Table 9]

The analysis of these interactions provides some interesting findings. First, immigrants with open-ended contracts suffer greater wage inequalities when compared to their national counterparts.¹⁵ These inequalities can be positive or negative (Table 9). In particular, workers from EU-15 and rich countries with open-ended contracts earn around 13% more than Spanish nationals with the same characteristics. Conversely, African and Eastern Europeans earn roughly 10% less than natives. Finally, South Americans and Asians receive lower wages than natives (although only by less than -2.6%). Applying double-censored regression, the findings show even greater inequalities, yet as explained before, these larger wage differences are due to firm unobservable heterogeneity not being properly controlled for.

[Insert Table 10]

The influence that professional experience exerts on wages is also conditioned by the worker's country of origin. In this sense, according to the Tobit model, one additional year of experience for a native increases wages by 2.5% (Table 7). However, this figure is reduced if the worker has an open-ended contract: in this case, each year of additional experience implies a wage increase of only 0.6%. Although these results seem somewhat illogical, one possible explanation is that the experience of workers with open-ended contracts is remunerated through other variables (e.g., experience) apart from the specific nature of the contract that implies more lasting security

¹⁵ We have calculated the jointly significant test for all of these interactions, and they are all significant. They are available upon request.

for workers and a guaranteed salary for a longer period of time, as opposed to temporary contracts (see Dolado & Felgueroso, 2010). In the case of foreign workers (Table 10), this pattern is repeated: wages increase with experience. The geographic origins for which experience is rewarded the least are EU-15 and rich countries, where jumping from one category to another implies a wage increase of 1% in the Tobit model, and of between 2% and 3% in the case of double-censored regression. Africans, South Americans and Eastern Europeans record larger wage variations with increasing experience. In this case, jumping from one category to other implies a wage increase of around 2-4% in the Tobit model. This tendency is broken only with Asian workers: an increase in experience entails a reduction in wage of about 2-3% in both models.

Another interesting aspect is that the largest rewards are gained when workers exceed three years' experience (with the sole exception of Asians). This may be attributed, on the one hand, to conversions of temporary into open-ended contracts after the initial three-year period and, on the other, to the immigrants' acquisition of permanent residence status (as explained above). Nevertheless, it should be stressed that although the increase in experience is accompanied by a wage increase, according to the Tobit model (Table 7) immigrants receive lower wages than natives independently of their experience (the only exception is for workers from EU-15, rich countries and South America). In this last case, this holds true when workers' experience exceeds 24 months (Table 9). Finally, we should bear in mind that the level of these inequalities is always larger with the double-censored regression model.

Finally, wage increases when jumping from an inferior professional category to a superior one are shown in table 7. In particular, the largest increases in this sense are recorded when the worker moves from the "Medium-high" to the "High" category (26% increase according to the Tobit model and 38.5% according to double-censored regression). In the remaining cases, when

moving from the professional category “Low” to “Medium-low”, or when moving from “Medium-low” to “Medium-high”, the variations are much lower (between 10-11% in the Tobit model). In addition, in the case of the “Low” professional category (since this variable is interacted with the variable of origin), natives seem to be penalized, as they earn 47% less than “High” category workers (see Table 10). Among immigrants, these differences are lower, fluctuating between -35% and -37% according to our preferred estimation procedure, depending on their nationality.

5. Conclusions

The objective of this study has been to determine whether controlling for the unobservable characteristics of firms records different results to those obtained in previous studies on wage inequality between national and foreign workers. Two main conclusions have been reached. First, when these unobservable firm characteristics are controlled for, wage inequalities between natives and immigrants almost disappear, except amongst Asian and African workers. Second, when other characteristics (experience, type of contract, etc.) are associated with the immigrant-native wage differential, these differences reappear.

In particular, these differences are significant for workers from EU-15 and other rich countries with open-ended contracts. In this case, the differences in wages are favourable to this group in comparison to native workers by more than 13%. Another interesting result is that South American workers have a similar wage pattern to natives despite other characteristics associated with these workers. Only the low qualified ones earn more than native workers, by more than 6.5%. Africans and Eastern Europeans have larger negative variations in wages in comparison with native workers. The largest wage differences appear among Africans with job experience of more than 12 months (-12%), and among Eastern Europeans holding open-ended contracts (-9%). The wage pattern of Asians is completely different from other workers. To take a specific example in

this group, workers with open-ended contracts earn less than temporary workers. Moreover, wages decrease with job experience in this group. Other studies reach a similar conclusion using other statistical methods, albeit always of less magnitude.¹⁶

Thus, our model allows us to make a contribution to the debate on the existence of wage differences between native and immigrant workers in Spain: the magnitude of the wage gap due to an individual's nationality is lower than has been previously estimated. However, it is significant for workers with temporary contracts and for the lowest qualified, for instance. This finding is relevant for policy-making considerations in order to target those policies designed to reduce wage inequalities between natives and immigrants in this country. Given that these differences are not equally distributed throughout the immigrant worker population, they have to be redesigned in order to focus on these specific groups.

¹⁶ An excellent review can be found in Pekkala, (2005). See, in addition, among others, Simón et al. (2008), and Navarro and Rueda (2008) for Spain.

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Table 1: Number of observations and workers by years worked during the period 1998-2003 and certain personal characteristics						
	Total	%	Natives	%	Immigrants	%
Observations						
Total	306,505	100.00	297,399	100.00	9,106	100.00
Non-censored	260,166	84.88	252,725	84.98	7,441	81.72
Censored:						
Right-censored	14,474	4.72	14,098	4.74	376	4.13
Left-censored	31,866	10.40	30,577	10.28	1,289	14.16
Workers						
Total	119,957	100.00	114,853	100.00	5,104	100.00
Tenure (years):						
1	42,312	35.27	39,376	34.28	2,936	57.52
2	26,645	22.21	25,488	22.19	1,157	22.67
3	17,908	14.93	17,405	15.15	503	9.86
4	14,694	12.25	14,427	12.56	267	5.23
5	11,985	9.99	11,818	10.29	167	3.27
6	6,413	5.35	6,339	5.52	74	1.45
Gender						
Man	73,887	61.59	70,320	61.23	3,567	69.89
Woman	46,070	38.41	44,533	38.77	1,537	30.11
Initial age						
16 -19	4,621	3.85	4,543	3.96	78	1.53
20 - 29	49,101	40.93	47,285	41.17	1,816	35.58
30 - 44	47,256	39.39	44,684	38.91	2,572	50.39
45 - 65	18,979	15.82	18,341	15.97	638	12.50
Origin						
Spain	114,853	95.75	-	-	-	-
South America	1,603	1.34	-	-	-	-
Africa	1,363	1.14	-	-	-	-
Eastern Europe	554	0.46	-	-	-	-
Asia	211	0.18	-	-	-	-
Rest	1,373	1.14	-	-	-	-

Source: Author's elaboration.

Table 2: Number of workers by individual characteristics related to the labour market and to their employer

Initial situation						
	Total	%	Natives	%	Immigrants	%
Type of contract						
Permanent	49,968	41.65	48,303	42.06	1,665	32.62
Temporary	69,989	58.35	66,550	57.94	3,439	67.38
Experience (months)						
0 - 12	105,728	88.14	100,962	87.91	4,766	93.38
13 - 24	8,663	7.22	8,369	7.29	294	5.76
25 - 36	2,199	1.83	2,179	1.90	20	0.39
> 36	3,367	2.81	3,343	2.91	24	0.47
Qualification level:						
High	14,285	11.91	13,840	12.05	445	8.72
Upper-intermediate	18,608	15.51	18,161	15.81	447	8.76
Lower-intermediate	42,525	35.45	41,021	35.72	1,504	29.47
Low	44,539	37.13	41,831	36.42	2,708	53.06
Sector of activity						
Mining and industry	21,948	18.30	21,198	18.46	750	14.69
Construction	22,086	18.41	20,875	18.18	1,211	23.73
Retail	25,268	21.06	24,521	21.35	747	14.64
Catering	7,762	6.47	6,812	5.93	950	18.61
Transport and Business services	23,350	19.47	22,484	19.58	866	16.97
Administration, education and health	14,827	12.36	14,519	12.64	308	6.03
Personal and domestic services	4,716	3.93	4,444	3.87	272	5.33
Firm size (number of workers)						
≤ 10	61,309	51.11	58,576	51.00	2,733	53.55
11 - 50	28,848	24.05	27,268	23.74	1,580	30.96
51 - 250	18,171	15.15	17,582	15.31	589	11.54
> 250	11,629	9.69	11,427	9.95	202	3.96
Final situation						
	Total	%	Natives	%	Immigrants	%
Type of contract						
Permanent	58,743	48.97	56,801	49.46	1,942	38.05
Temporary	61,214	51.03	58,052	50.54	3,162	61.95
Experience						
0 - 12	56,126	46.79	52,730	45.91	3,396	66.54
13 - 24	26,040	21.71	25,080	21.84	960	18.81
25 - 36	12,798	10.67	12,420	10.81	378	7.41
> 36	24,993	20.83	24,623	21.44	370	7.25
Qualification level:						
High	14,608	12.18	14,149	12.32	459	8.99
Upper-intermediate	19,227	16.03	18,774	16.35	453	8.88
Lower-intermediate	43,469	36.24	41,928	36.51	1,541	30.19
Low	42,653	35.56	40,002	34.83	2,651	51.94
Sector of activity						
Mining and industry	21,948	18.30	21,199	18.46	749	14.67
Construction	22,080	18.41	20,870	18.17	1,210	23.71
Retail	25,277	21.07	24,528	21.36	749	14.67
Catering	7,751	6.46	6,803	5.92	948	18.57
Transport and Business services	23,351	19.47	22,486	19.58	865	16.95
Administration, education and health	14,837	12.37	14,527	12.65	310	6.07
Personal and domestic services	4,713	3.93	4,440	3.87	273	5.35
Firm size (number of workers)						
≤ 10	58,756	48.98	56,058	48.81	2,698	52.86
11 - 50	29,594	24.67	27,992	24.37	1,602	31.39
51 - 250	18,767	15.64	18,176	15.83	591	11.58
> 250	12,840	10.70	12,627	10.99	213	4.17

Source: Author's elaboration.

Table 3: Number of firms by several characteristics

	Total	%
Total	11,887	100.00
Firm age (years)		
1	1,366	11.49
2	1,598	13.44
3	1,773	14.92
4	2,005	16.87
5	2,010	16.91
6	3,135	26.37
Sector of activity		
Mining and industry	1,830	15.39
Construction	1,808	15.21
Retail	3,249	27.33
Catering	1,139	9.58
Transport and Business services	2,276	19.15
Administration, education and health	688	5.79
Personal and domestic services	897	7.55
Initial firm size (number of workers)		
≤ 10	10,697	89.99
11 - 50	1,005	8.45
51 - 250	162	1.36
> 250	23	0.19
Final firm size (number of workers)		
≤ 10	8,974	75.49
11 - 50	2,346	19.74
51 - 250	499	4.20
> 250	68	0.57

Source: Author's elaboration.

Table 4: Distribution of monthly wages by several individual characteristics

	Median			Interquartile Range (IQR)					
	Natives	Immigrants	Diff. (%)	P75-P25	P75-P25	Diff. (p.p.)	P50-P25	P50-P25	Diff. (p.p.)
				Natives	Immigrants		Natives	Immigrants	
Total	1,081	984	-8.98	55.96	51.00	-4.96	25.10	25.99	0.89
Gender									
Man	1,145	1,000	-12.63	58.23	46.85	-11.38	23.73	23.19	-0.54
Woman	978	920	-5.91	53.73	59.63	5.90	25.82	27.81	1.99
Age (years)									
16-19	758	840	10.86	60.93	63.39	2.46	34.01	42.83	8.82
20-29	1,015	960	-5.41	48.69	48.65	-0.04	23.09	25.52	2.43
30-44	1,164	990	-14.94	62.67	51.51	-11.16	27.05	25.09	-1.96
45-65	1,164	1,030	-11.54	63.46	55.70	-7.76	26.44	27.11	0.67

Source: Author's elaboration.

Table 5: Distribution of monthly wages by characteristics related to the labour market

	Median			Interquartile Range (IQR)					
	Natives	Immigrants	Diff. (%)	P75-P25	P75-P25	Diff. (p.p.)	P50-P25	P50-P25	Diff. (p.p.)
				Natives	Immigrants		Natives	Immigrants	
Total	1,081	984	-8.98			-4.96	25.10	25.99	0.89
Type of contract									
Permanent	1,158	1,077	-7.03	60.57	61.19	0.62	23.87	26.83	2.96
Temporary	977	927	-5.08	56.63	52.57	-4.06	29.42	34.11	4.69
Qualification level									
High	1,955	1,924	-1.58	65.90	69.32	3.42	38.31	37.53	-0.78
Upper-intermediate	1,190	1,133	-4.80	59.42	79.02	19.6	25.79	36.67	10.88
Lower-intermediate	1,072	992	-7.49	46.02	46.89	0.87	21.87	28.05	6.18
Low	932	912	-2.18	46.61	41.33	-5.28	25.00	25.20	0.20
Experience (months)									
0-12	1,013	944	-6.79	53.19	50.66	-2.53	25.67	30.23	4.56
13-24	1,131	1,046	-7.49	56.41	49.52	-6.89	23.73	22.52	-1.21
25-36	1,132	1,127	-0.43	58.44	63.50	5.06	24.65	27.93	3.28
> 36	1,196	1,267	5.96	64.62	87.54	22.92	26.98	34.14	7.16

Source: Author's elaboration.

Table 6: Distribution of monthly wages by characteristics of the employer

	Median			Interquartile Range (IQR)					
	Natives	Immigrants	Diff. (%)	P75-P25	P75-P25	Diff. (p.p.)	P50-P25	P50-P25	Diff. (p.p.)
				Natives	Immigrants		Natives	Immigrants	
Total	1,081	984	-8.98	55.96	51.00	-4.96	25.10	25.99	0.89
Sector of activity									
Mining and industry	1,169	1,021	-12.66	59.47	45.8	-13.67	24.04	21.18	-2.86
Construction	1,081	986	-8.76	47.91	36.07	-11.84	18	19.06	1.06
Retail	1,026	1,001	-2.42	50.97	61.24	10.27	23.52	28.67	5.15
Catering	953	920	-3.47	43.08	38.7	-4.38	24.39	22.45	-1.94
Transport and Business services	1,066	979	-8.15	64.44	71.24	6.8	28.16	39.20	11.04
Administration, Education and Health	1,250	1,276	2.11	65.45	70.12	4.67	36.7	41.72	5.02
Personal and domestic services	872	938	7.62	73.23	64.2	-9.03	39.4	41.37	1.97
Firm size (number of workers)									
≤ 10	933	912	-2.29	50.02	48.31	-1.71	26.78	29.78	3.00
11 - 50	1,042	976	-6.30	48.47	46.28	-2.19	22.08	23.44	1.36
51 - 250	1,169	1,080	-7.65	58.69	58.6	-0.09	26.19	26.43	0.24
> 250	1,264	1,190	-5.84	69.31	69.37	0.06	28.12	25.62	-2.50

Source: Authors' elaboration.

Notes: "p.p." stands for percentage points.

Table 7: Estimation results from random-effects Tobit model

Dependent variable:	Ln (monthly real wage)		
Maximum likelihood:	110,220.76		
No. observations:	306,505		
	Coeff.	t	Sig.
Individual characteristics			
Initial age	0.0169	38.7900	***
Initial age ²	-0.0002	-30.1400	***
Gender (1=men)	0.1078	66.9500	***
Professional characteristics			
Permanent contract	0.2017	94.8300	***
Experience	0.0021	23.3600	***
Experience * Open-ended contract	-0.0016	-15.9800	***
Sector of activity			
Construction	0.0066	1.7700	*
Retail	-0.0998	-29.8200	***
Catering	-0.1521	-30.9300	***
Transport and Business services ¹	-0.0705	-21.7800	***
Administration, Education and Health	-0.0809	-21.8900	***
Personal and domestic services	-0.1802	-25.2800	***
Firm size (number of workers)			
11 - 50	-0.0016	-0.5100	-
51 - 250	0.0102	4.6500	***
> 250	0.0484	10.5500	***
Qualification level			
Upper-intermediate	-0.2640	-98.5300	***
Lower-intermediate	-0.3743	-149.5900	***
Low	-0.4736	-179.9700	***
Origin			
South and Central America	-0.0034	-0.2500	-
Africa	-0.0390	-2.5900	***
Eastern Europe	-0.0036	-0.1800	-
Asia	-0.0802	-2.2400	**
Immigrants from EU and rich countries	-0.0064	-0.5300	-
Interaction terms (Origin – Type of contract)			
Central and South America * permanent contract	-0.0738	-4.8600	***
Africa * permanent contract	-0.0469	-2.9600	***
Eastern Europe * permanent contract	-0.0643	-2.6400	***
Asia * permanent contract	0.0575	1.5000	-
Immigrants from EU and rich countries * permanent contract	0.0713	4.9300	***
Interaction terms (Origin – Experience)			
Central and South America * Experience	0.0015	2.3200	**
Africa * Experience	0.0020	3.1700	***
Eastern Europe * Experience	0.0011	1.0100	-
Asia * Experience	-0.0008	-0.5900	-
Immigrants from EU and rich countries * Experience	0.0000	0.0800	-
Interaction terms (Origin – Qualification level)			
Central and South America * Low	0.0415	2.9600	***
Africa * Low	0.0388	2.5400	**
Eastern Europe * Low	0.0312	1.4000	-
Asia * Low	0.0223	0.6500	-
Immigrants from EU and rich countries * Low	0.0079	0.4600	-
Trend			
T	-0.0234	-52.8800	***
Constant term			
Constant	6.7796	758.9300	***
Error associated with fixed effect (%)			
σ_u / σ_v	39.39	-	-
Std. Err.	0.0020	-	-

*** indicates significance at 1 per cent; ** indicates significance at 5 per cent; * indicates significance at 10 per cent.

(1): Transport and Business services = transport, warehousing, communication, financial intermediation, real estate activities, renting and business services.

Source: Author's elaboration

Table 8: Estimation results from two-limit censored regression model

Dependent variable:	Ln(monthly real wage)		
Maximum likelihood:	182,029.95		
N. observations:	306,505		
	Coeff.	t	Signif.
Individual characteristics			
Initial age	0.0322	65.1800	***
Initial age ²	-0.0003	-53.4500	***
Gender (1=men)	0.1651	99.4900	***
Professional characteristics			
Permanent contract	0.2370	100.8500	***
Experience	0.0024	24.6200	***
Experience * Permanent contract	-0.0018	-16.8400	***
Sector of activity			
Construction	-0.0261	-10.4100	***
Retail	-0.1918	-81.4200	***
Catering	-0.1971	-55.5400	***
Transport and Business services ¹	-0.1457	-61.6000	***
Administration, Education and Health	-0.1471	-47.2300	***
Personal and domestic services	-0.2748	-65.3900	***
Firm size (number of workers)			
11 - 50	0.0025	1.3700	-
51 - 250	0.1735	80.9300	***
> 250	0.2837	106.5700	***
Qualification level			
Upper-intermediate	-0.3853	-137.1900	***
Lower-intermediate	-0.5130	-200.6700	***
Low	-0.6497	-242.3200	***
Origin			
South and Central America	-0.1168	-6.8800	***
Africa	-0.1027	-5.5400	***
Eastern Europe	-0.0098	-0.3800	-
Asia	-0.2099	-4.8800	***
Immigrants from EU and rich countries	-0.0388	-2.6900	***
Interaction terms (Origin – Type of contract)			
Central and South America * permanent contract	-0.0940	-5.0400	***
Africa * permanent contract	-0.1187	-6.0100	***
Eastern Europe * permanent contract	-0.1261	-4.1900	***
Asia * permanent contract	-0.0030	-0.0600	-
Immigrants from EU and rich countries * permanent contract	0.0900	5.1300	***
Interaction terms (Origin – Experience)			
Central and South America * Experience	0.0026	3.2000	***
Africa * Experience	0.0028	3.5600	***
Eastern Europe * Experience	0.0027	2.0000	**
Asia * Experience	-0.0016	-0.9800	-
Immigrants from EU and rich countries * Experience	0.0009	1.7900	*
Interaction terms (Origin – Qualification level)			
Central and South America * Low	0.1194	6.9600	***
Africa * Low	0.0837	4.4600	***
East Europe * Low	-0.0019	-0.0700	-
Asia * Low	0.1520	3.6900	***
Immigrants from EU and rich countries * Low	0.0187	0.9200	-
Trend			
T	-0.0273	-54.6800	***
Constant term			
Constant	6.7300	688.7900	***
Error			
σ	0.3990	-	-
Std. Err.	0.0006	-	-

*** indicates significance at 1 per cent; ** indicates significance at 5 per cent; * indicates significance at 10 per cent.

(1): Transport and Business services = transport, warehousing, communication, financial intermediation, real estate activities, renting and business services.

Source: Author's elaboration

Table 9: Inter-group effect of the interaction of *Origin* with *Type of contract*, *Experience* and *Low qualification level* results from random-effects Tobit model

	EU + Rich countries	SOUTH AMERICA	AFRICA	EASTERN EUROPE	ASIA
	% Diff.	% Diff.	% Diff.	% Diff.	% Diff.
Median	11.08	-2.59	-11.75	-9.10	-2.41
Type of contract					
Temporary	5.26	2.57	-7.02	-5.20	-7.08
Permanent	13.41	-3.45	-10.14	-10.04	-0.78
Experience (months)					
1 - 12	11.40	-2.94	-12.41	-9.22	-2.06
13 - 24	11.15	-0.98	-9.92	-8.17	-4.93
25 - 36	11.01	0.72	-7.60	-7.04	-7.40
> 36	10.99	4.15	-5.08	-4.97	-10.79
Qualification level:					
Low	2.48	6.41	-1.41	-2.52	3.36

Source: Author's elaboration, using wages estimated by the Tobit model and taking into account the average values for all the explanatory variables, except for those reflected in the table.

Table 10: Intra-group effect of the interaction of *Origin* with *Type of contract*, *Experience* and *Low qualification level* results from random-effects Tobit model

	Natives	EU + Rich countries	SOUTH AMERICA	AFRICA	EASTERN EUROPE	ASIA
	% Diff.	% Diff.	% Diff.	% Diff.	% Diff.	Penalisation (%)
Type of contract						
Temporary	-	-	-	-	-	-
Permanent	18.81	28.01	11.83	14.82	12.74	26.87
Experience (months)						
1 - 12	-	-	-	-	-	-
13 - 24	0.96	0.73	3.00	3.83	2.13	-1.99
25 - 36	1.77	1.41	5.60	7.35	4.20	-3.78
> 36	2.81	2.43	10.32	11.41	7.62	-6.34
Qualification level:						
High	-	-	-	-	-	57.04
Low	-37.73	-37.23	-35.09	-35.26	-35.75	-36.32

Source: Author's elaboration, using wages estimated by the Tobit model and taking into account the average values for all the explanatory variables, except for those reflected in the table.

APPENDIX A

Table 1: Income subject to contribution for workers' regular contingencies to Social Security	
Qualification group	Professional category
High	<ol style="list-style-type: none"> 1. Engineers and graduates, Top management not included in art. 1.3. c) of Worker's Charter 2. Technical engineers and other skilled workers 3. Supervisors and departmental heads
Upper-intermediate	<ol style="list-style-type: none"> 4. Other semi-skilled workers 5. Skilled clerks 6. Auxiliary workers
Lower-intermediate	<ol style="list-style-type: none"> 7. Semi-skilled clerks 8. Skilled labourers
Low	<ol style="list-style-type: none"> 9. Semi-skilled labourers 10. Unskilled labourers 11. Workers under 18, independently of their professional category

Source: Authors' elaboration from Social Security data.

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APPENDIX B

Table 1: Inter-group effect of the interaction of *Origin* with *Type of contract*, *Experience* and *Low qualification level* results two-limit censored regression model

	EU + Rich countries	SOUTH AMERICA	AFRICA	EASTERN EUROPE	ASIA
	% Diff.	% Diff.	% Diff.	% Diff.	% Diff.
Median	11.99	-10.73	-19.07	-15.55	-14.55
Type of contract					
Temporary	4.73	-4.85	-12.06	-9.12	-15.68
Permanent	15.03	-12.03	-20.74	-18.76	-15.14
Experience (months)					
1 - 12	11.24	-11.57	-20.05	-16.45	-13.41
13 - 24	12.17	-8.54	-16.88	-13.90	-16.32
25 - 36	13.28	-5.76	-13.86	-11.02	-18.80
> 36	15.24	-0.44	-10.31	-6.20	-22.16
Qualification level:					
Low	0.89	3.23	-5.31	-9.52	-1.69

Source: Author's elaboration, using wages estimated by the Tobit model and taking into account the average values for all the explanatory variables, except for those reflected in the table.

Table 2: Intra-group effect of the interaction of *Origin* with *Type of contract*, *Experience* and *Low qualification level* results from two-limit censored regression model

	Natives	EU + Rich countries	SOUTH AMERICA	AFRICA	EASTERN EUROPE	ASIA
	% Diff.	% Diff.	% Diff.	% Diff.	% Diff.	% Diff.
Type of contract						
Temporary	-	-	-	-	-	-
Permanent	22.46	34.51	13.22	10.39	9.47	23.26
Experience (months)						
1 - 12	-	-	-	-	-	-
13 - 24	1.04	1.89	4.50	5.04	4.13	-2.36
25 - 36	1.89	3.76	8.58	9.78	8.51	-4.46
> 36	2.97	6.67	15.93	15.52	15.61	-7.43
Qualification level:						
High	-	-	-	-	-	-
Low	-47.79	-46.80	-41.16	-43.22	-47.89	-39.21

Source: Author's elaboration, using wages estimated by the Tobit model and taking into account the average values for all the explanatory variables, except for those reflected in the table.