Immigrant relative wages at the Great Recession: Evidence with matched employer-employee data for Spain*

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Abstract

The article examines the impact of the Great Recession on relative wages of immigrants in Spain. The empirical analysis is restricted to men and is based on matched employer-employee microdata, using the decomposition techniques of Fortin, Lemieux and Firpo (2011) and Juhn, Murphy and Pierce (1991, 1993). Our results show that the significant native-immigrant wage gap that exist both in terms of average wages and of differentials along the wage distribution are essentially explained by differences in the endowments of observed characteristics so that, in general, immigrants tend to receive a similar wage treatment than Spaniards with analogous attributes. On the other hand, the Great Recession has had a remarkable impact on the relative wages of immigrants. Thus, the composition effects resulting from the severe employment destruction have mitigated the increase of the native-immigrant wage gap observed during the previous expansionary period.

Keywords: native-inmigrant wage gap; matched employer-employee microdata; Fortin-Lemieux-Firpo decomposition; Juhn-Murphy-Pierce decomposition.
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1. Introduction

The analysis of the economic behaviour of immigrants has attracted long-standing attention among researchers (see, e.g., Borjas, 1999). Focusing particularly on immigrants´ labour market potential assimilation in host countries, a good deal of interest has been devoted to analyze whether immigrants´ average wages differ from those corresponding to equally productive native workers (see Constant and Zimmermann, 2013 for an authoritative review). Related to the above, in a context of major concern regarding the socio-economic impact of the Great Recession on minorities that could suffer from discrimination (Honeys et al., 2012; Johnston and Lordan, 2014), arguments on whether the economic cycle affects in a different degree to immigrants and natives in terms of wages are of paramount interest.

The effects of the economic cycle on the immigrant-native wage differential have been traditionally overlooked in the literature, with very few exceptions (see e.g. Ashenfelter, 1970). Later studies suggest, however, that changes in the business cycle might significantly affect immigrants´ labour market relative outcomes (see, e.g., Chiswick et al., 1997 and Aydemir, 2003). Thus, the decomposition of workers´ labour market outcomes into a secular trend and an economic cycle component reveals that immigrants and natives appear to differ in their response to macroeconomic conditions, even when differences in educational levels are controlled for (Dustmann et al., 2010). Moreover, immigrant-native wage differentials tend to vary along the business cycle on account of the higher responsiveness of the immigrants to changes in labour market conditions (Barth et al., 2004). Focusing particularly on the effects of the Great Recession on minority workers, Biddle and Hammermesh (2013) show that negative shocks have a significant impact on racial and ethnical wage discrimination. In the same line, Orrenius and Zavodni (2010) conclude that the Great Recession has been especially harmful for immigrants, who have experience more frequently job losses due, among other factors, to their higher sensitiveness to the business cycle, especially for those with lower educational levels.

With the main purpose of providing some additional insight into the question of whether immigrants´ earnings tend to respond differently to economic downturns, this study examines the immigrant-native wage differential before and during the Great Recession in Spain. As compared to those corresponding to other advanced economies, the Spanish labour market has been particularly hard hit during the Great Recession (see, e.g., European Commission, 2013 and Bentolila et al., 2012). Moreover, immigrants in Spain are likely to be particularly affected by a severe economic worsening during the crisis, as employment destruction has been especially sharp in those manual, low-skilled sectors where immigrants tend to be occupied. Consequently, immigrant unemployment rates have dramatically risen, reaching 36.5% at the end of 2012 (the figure corresponding to natives is 24.2%: OECD, 2013a). In addition, Spain constitutes an atypical

case in terms of migration patterns. By contrast to other typical immigrant-receiving countries, it faced remarkable outflows of workers for a long time. In the 90s, however, the Spanish labour market witnessed its immigrant rates increasing at an outstanding pace, thus comparing to (and even heading the list of) other nations with longer immigrant tradition (United Nations, 2009). Nonetheless, the dramatic impact of the Great Recession on the Spanish labour market has changed greatly this picture. Thus, Spain shows nowadays a negative migration balance, with important reductions in the number of immigrants arriving to the country and notable increases in the out-migration flows (OECD, 2013 and Larramona, 2013).

Although a number of studies have dealt with the earnings assimilation of immigrants in Spain (see, e.g., Amuedo-Dorantes and de la Rica, 2007; Fernández and Ortega, 2008 and Izquierdo et al., 2009) none of them has considered how immigrant workers perform, as compared to natives, during the Great Recession. The objective of this article is to analyze the wage differential between immigrants and natives before and during this economic crisis. For this purpose, a matched employer-employee cross-sectional database providing observations for years 2002, 2006 and 2010 is used. These temporal references allow for a comparative analysis in periods of economic up- and downturns where dramatically different migration patterns have been observed, as the migratory flows have shifted from massive immigrant influx to increasing immigrant departures in a short period of time. In order to assess whether native-immigrant wage gaps are due either to differences in their productive endowments or to a different labour market treatment an extension of the methodology proposed by Juhn et al. (1991, 1993) adapted for its use with matched employer-employee data is applied. As compared to other techniques, this methodology has the advantage of allowing the identification of workplace segregation on both the average immigrant-native wage differential and its evolution over time. Moreover, in order to extend the analysis to wage differentials all over the wage distribution, the decomposition methodology proposed by Fortin, Lemieux and Firpo (2011) is also employed. This technique is based on the unconditional quantile regression and permits to quantify the individual impact of each explanatory variable on the wage differential between natives and immigrants throughout the wage distribution.

The rest of the article is organized as follows. Section two compiles a brief overview of the main contributions dealing with natives-immigrants wage gap in an international context. The database is described in section three. Section four is devoted to outline the econometric techniques involved in the decomposition of the native-immigrant wage differential. Section five discusses the main empirical results and, finally, section six concludes.

2. Literature review

The vast literature dealing with the economic performance of immigrants in host countries has typically focused on the comparison between foreign-born and native workers with similar observed characteristics. Following Chiswick (1978) and Carliner (1980) seminal contributions, the potential assimilation of immigrants over time in their destination countries has been the core of this research. In this vein, a good deal of studies relying on cross-sectional data show that although the wages of newly arrived immigrants are significantly lower than those corresponding to comparable native workers, as immigrants stay and accumulate destination country´s specific human capital their wages tend to catch, and even to exceed in some cases, those earned by natives[1] (see, as representative contributions of the extensive empirical evidence regarding this topic, Baker and Benjamin, 1994, Borjas, 1994, Friedberg, 2000 or LaLonde and Topel, 1991). In contrast to this assimilation perspective, it has also been argued that persistent wage differentials between natives and immigrants might arise as a result of discriminatory treatment of the latter (see more details in Chiswick et al., 2005). Thus, if employers perform on their dislike of immigrants -in the spirit of Becker (1957) "taste for discrimination"- or treat immigrants following statistical discrimination criteria (Phelps, 1972), then observed wages for natives and immigrants with the same productive endowments would differ, even although the gap narrows with the number of years since migrating of the latter. In this regard, empirical evidence from studies that examine the origin of differences in average wages between natives and immigrants suggests that other elements different than the length of the stay of immigrants in the host country, such as the age of the immigrants at the arrival, their national origin or the particular year of arrival are important factors in explaining why immigrants´ average wages lay behind those corresponding to equally productive native workers (Constant and Zimmermann, 2013).

A particularly important element for its contribution to the existing disadvantages in immigrants´ earnings is their occupational and workplace segregation (Kaufman, 2010). The availability of matched employer-employee databases over the last few decades has allowed to obtain empirical evidence on the relevant impact of the relative segregation of immigrants in certain segments of the labour market on their wages (see, e.g. Bayard et al., 1999 and, among the most recent contributions, Barth et al., 2012 and Carneiro et al., 2012). Thus, for example, Aslund and Skans (2010) conclude that immigrants in Sweden are not randomly sorted across establishments and occupations and that they are overexposed to foreign-born counterparts, with

[1] As noted by Borjas (1985), studies relying on cross-sectional data are prevented from disentangling assimilation and cohort effects. As a consequence, estimations about how immigrant wages evolve over time might be upward biased if a decrease in the skills of successive arrival cohorts occurs. To allay this concern, the focus in this literature shifted to the use of longitudinal and panel datasets. In this regard, empirical studies conclude that wages corresponding to natives and those earned by latest cohorts of immigrants with equal endowments might never converge –see, for example, Dowhan and Duleep (2002) for USA, or Constant and Massey (2003) for Germany-.

this feature leading to statistical significant effect on average wages. Similarly, Barret et al. (2012) provide evidence on the significant wage effects of the unequal distribution by occupations of natives and immigrants from the European Union´s New Member States in the Irish labour market. Likewise, native-immigrant wage differentials in Canada are notably influenced by immigrant sorting between and within establishments, as well as by the type of jobs they are able to get access to (Aydemir and Skuterud, 2008 and Yoshida and Smith, 2005). Finally, wage differentials between French native workers and national-born workers with foreign-born parents are also primarily due to occupational segregation of the latter (Aeberhardt and Pouget, 2010).

The relevance of labour segregation also underlies much of the current concern on how foreign-born workers fare in the Spanish labour market. Empirical studies for Spain suggest in particular that immigrants experience significant occupational segregation from the native-born population and that this segregation tends to persist over time (Alcobendas and Rodríguez-Planas, 2009; Alonso-Villar and del Río, 2013; Amuedo-Dorantes and De la Rica, 2011). Moreover, evidence is provided on the important obstacles that immigrants encounter in their attempt to achieve skilled occupations (Bernardi et al., 2011) and on the severe occupational downgrading they usually witness with respect to their countries of origin (Simón et al., 2014). These findings are of salient interest insofar as, consistent with other studies on this topic, occupational and workplace segregation has been found to explain to a considerable degree the existing wage differentials between natives and immigrants in Spain (García-Pérez et al., 2012 and Simón et al., 2008).

Differences in responses of immigrants and natives to the business cycle are also of major interest in order to properly understand the nature of immigrant-native wage differentials (see, e.g. Barth et al., 2004). Earlier studies focusing on the cyclicality of immigrants´ relative earnings conclude that changes in the phase of the economic cycle do not seem to derive in changes in wage discrimination once the composition effect has been controlled for (see, e.g., Ashenfelter, 1970). Moreover, the phase of the economic cycle at the entry as well as at the survey year have been proved to significantly affect immigrants´ labour force participation, employment and wages (Aydemir, 2003). In the same line, it has also been documented that immigrant responses to macroeconomic conditions are unequal than those of native workers (Chiswick et al., 1997) and that their relative wages are tied to host countries´ unemployment trends (Barth et al., 2006). For the particular case of the effects of the Great Recession, Orrenius and Zavodni (2010) show that male immigrants in the United States seem to be more sensitive to the economic cycle than natives, mainly due to their productive characteristics and their overrepresentation in pro-cyclical sectors. On the other hand, Dustmann et al. (2010) provide evidence on the larger unemployment cyclical responses for immigrants relative to natives within skill groups, albeit no substantial

different patterns apparently exist with regard to wages. Focusing particularly on the Spanish case, De la Rica and Polonyankina (2014) demonstrate that the impact of immigrants on native workers´ employment prospects varies with the business cycle. Thus, the displacement effect in terms of occupational specialization of the native workers in response to immigrantion observed during the previous expansionary period does not seem to persist during the Great Recession, being the earlier immigrant workers those who adjust their employment options to absorb new immigrants in the economic recession.

3. Data

This research is based on the microdata of the 2002, 2006 and 2010 waves of the *Encuesta de Estructura Salarial* (Survey of Earnings Structure; hereafter, EES). This survey is conducted by the Spanish National Statistics Institute and is the sample for Spain of the *European Structure of Earnings Survey*, a survey conducted in the member countries of the European Union in accordance with a harmonized methodology. It is a nationally representative survey on firms which covers employees registered in the Social Security system throughout the month of October at establishments of any size belonging to the general scheme of the Social Security system and whose economic activity is framed in sections B to S of the sectoral classification NACE 2009. Therefore, it does not cover certain sectors such as agriculture and domestic service (and, to the wave of 2010, the public sector).[2] The design of the survey corresponds to a two-stage sampling of employees working in firms registered in the Social Security system, so one of its most important features is the inclusion of matched employer-employee microdata (i.e. observations for various employees in each establishment).

The EES has been designed as independent cross-section databases which are conducted every four years, being currently four available waves (1995, 2002, 2006 and 2010). The information on the characteristics of workers has been increasing over time and the wave of 2002 included for the first time variables regarding their nationality and the performance of supervisory tasks. Similarly, the coverage has also been growing with time, as the wave of 2002 included for the first time non-market services (education, health and other social activities); the wave of 2006 establishments with fewer than 10 employees and the wave of 2010 public administration and defense and compulsory social security. Due to these circumstances, the empirical analysis is

[2] The lack of information in the survey about non-employed workers precludes the application of standard techniques of selection bias correction à la Heckman in the estimates (Heckman, 1979) and, therefore, to examine the influence of selection on employment on the wage gap. Nonetheless, this issue is usually more relevant for women, being this empirical analysis restricted to men. In addition, this limitation may be negligible in the context of the study developed in this research, given that participation rates of native and immigrant males are relatively high in Spain. Thus, according to De la Rica et al. (2014), activity rates are around 85% for male immigrants being 80% for native males.

restricted to the waves of 2002, 2006 and 2010 (those with a greater wealth of information and, especially, a more complete coverage of the whole Spanish economy).

The survey provides detailed information on wages and worker characteristics (nationality, gender, age and education); jobs (occupation, tenure, type of contract, full- or part-time work and supervisory tasks) and firms (sector, size, type collective agreement and region). Wage information includes various components and covers different time references. The wage concept used in this research is the gross hourly wage, calculated from the wage corresponding to a representative month (October), divided by the number of hours worked in that month. In its calculation any payment by companies, including commissions, bonuses for night work and weekends, as well as overtime work, has been incorporated.

The explanatory variables considered in the empirical analysis include characteristics of both individuals and their jobs and firms. Regarding the former, they are controls related to gender; the highest level of education (primary, secondary or tertiary education) and age (less than 30 years, between 30 and 45 years and more than 45 years). The characteristics of the jobs are occupation (nine categories for major occupational groups); years of tenure in the current job and its quadratic form; type of contract (permanent or fixed-term); full time or part time job and the performance supervisory tasks. Finally, firm attributes are sector (twelve categories); size (six strata); region and the type of collective agreement (distinguishing between firm agreement, national sectoral agreement and infra-national sectoral agreement).

On the other hand, certain shortcomings of the ESS could potentially affect the results of the empirical analysis. Thus, it contains exclusively workers with legal status and it does not cover certain segments of the labor market where the presence of immigrants is significant, as the primary sector and domestic service. As a result, the ESS apparently tends to underestimate, albeit not in a very severe form, the average wage differential between native and immigrant workers (Simon et al., 2008), a circumstance to be considered in the interpretation of results. Despite all these limitations, the EES has some advantages over other surveys also used in the analysis of the gender wage gap between natives and immigrants for the Spanish case, such as the *Muestra Continua de Vidas Laborales* (Continuous Sample of Working Lives) - see for example, Nicodemo and Ramos (2012) -. Thus, in addition to providing matched employer-employee data, the ESS permits the calculation of hourly wages, given that it includes complete and uncensored information about the number of hours worked and the different wage components.

Those observations with missing values on key variables as well as those for individuals aged over 65 years or with hourly wages less than one euro or greater than two hundred euros were filtered. Moreover, firms with less than two observations were excluded from the sample, in order to allow the correct identification of firm fixed effects in the econometric estimates. Finally,

in order to use a homogeneous sectoral coverage, observations corresponding to section O of NACE-2009 (Public administration and defense, compulsory social security) have been removed from the 2010 wave. As is usual in the literature, workers with nationality other than Spanish are considered to be immigrants. The final samples are formed by 2,875 immigrant men and 75,549 native men in 2002, 6,876 and 75,319 in 2006 and 6,584 and 87,875 in 2010.

4. Methodology

In the empirical analysis two econometric methodologies were used in order to decompose wage differences between natives and immigrants males for the Spanish case. The first is an extension of the Juhn-Murphy-Pierce methodology (Juhn et al., 1971) adapted to its use with matched employer-employee data, which permits a detailed decomposition of the differential between the average wage of native workers and immigrants, as well as of its evolution over time. The second is the methodology proposed by Fortin, Lemieux and Firpo (2011) which provides a detailed decomposition of the wage differences throughout the wage distribution. Both techniques are described below.

4.1. Juhn-Murphy-Pierce decomposition

First, we use an extension of the Juhn *et al.* (1991) decomposition suggested by Blau and Kahn (1992), specifically adapted to be used with matched employer-employee data, following the hints of Gartner and Stephan (2004). This technique departs from the estimation of the following semi-logarithmic wage equation:

$$w_{ij} = X_i \beta + \varepsilon_{ij} + a_j \qquad (1)$$

wherein w_{ij} is the natural log of hourly wage of individual i in workplace j; X_i is a vector of controls including individuals' characteristics and those of their jobs and the companies employing them; β is a vector of parameters to be estimated (including an intercept); ε_{ij} is a stochastic error term and a_j is an error component corresponding to workplace j and invariant for all the individuals working in the same workplace.[3]

Equation (1) is estimated for the pool of workers (i.e. natives and immigrants).[4] Identification of the workplace effects is guaranteed, given that there is more than one observation per workplace in the dataset. Since the result of the Hausman's contrast indicates that workplace specific effects are correlated with the rest of the explanatory variables in equation (1), it is

[3] Given that workplace specific effects also capture unobserved individual effects common to all employees in a workplace and that it is not possible to identify this effect in ESES cross-section microdata, they are relegated to the residual. Existing evidence for several countries suggests that unobserved individual effects tend in general to be weakly correlated with workplace specific effects (Abowd *et al.*, 2001 and Lane, 2009).

[4] Thus, we follow Oaxaca and Ransom (1994) and Neumark's (1988) recommendation to use as the reference wage structure in the decomposition that corresponding to the pool of individuals of both groups.

estimated by fixed effects (which is equivalent to estimating by ordinary least squares with a set of workplace dummies). Relying on the properties of the ordinary least squares estimator, after the estimation of equation (1) with the pooled data of year A and having obtained the values of $\hat{\beta}^A$, σ^A y η^A, the average wage of the subgroup of workers s (s=natives or immigrants) in year A can be expressed as:

$$\overline{w}_s^A = \overline{X}_s^A \hat{\beta}^A + \sigma^A \overline{\theta}_s^A + \eta^A \overline{\lambda}_s^A \qquad \text{where } \overline{\theta}^A \sim (0,1),\ \overline{\lambda}^A \sim (0,1) \qquad (2)$$

where the superscript A is for year A (note that subscripts i and j have been omitted in the equation for ease of presentation); $\overline{w}_s^A$ stands for the mean natural log of the hourly wage of a given group s; $\overline{X}_s^A$ is a vector of the average of the set of explanatory variables for group s; $\hat{\beta}_s^A$ is the vector of coefficients estimated with equation (1) and the pooled data of year A; σ^A is the standard deviation of wage residuals of the pool of workers; $\overline{\theta}_s^A$ is the average standardized residual of group s; η^A is the standard deviation of workplace effects of the pool of natives and immigrants and $\overline{\lambda}_s^A$ is the average standardized workplace effect of group s.

Using the pooled wage structure as the market price references in the decomposition, the wage gap between natives and immigrants in year A can be written as follows:

$$D^A = w_n^A - w_i^A = (X_n^A - X_i^A)\beta^A + (\theta_n^A - \theta_i^A)\sigma^A + (\lambda_n^A - \lambda_i^A)\eta^A = \Delta X^A \beta^A + \Delta\theta^A \sigma^A + \Delta\lambda^A \eta \qquad (3)$$

where the subscript n is for natives and i for immigrants and a Δ prefix denotes the average difference between natives and immigrants in the subsequent variable.

In brief, equation (3) provides a decomposition of the native-immigrant wage gap that quantifies the extent to which average wage differences between natives and immigrants are related to (a) differences in observed characteristics, (b) the influence of unobserved elements and (c) the influence of workplace-related factors. More specifically, the first term on the right-hand side of the equation corresponds to the portion of the wage differential attributable to differences in the observed characteristics between the two groups ($\overline{X}_m^A - \overline{X}_f^A$), valued at market prices ($\hat{\beta}^A$), which coincides with the 'explained' component of the standard Oaxaca-Blinder decomposition. The second term measures the influence of the unobserved factors in the model. This component comprises the effect of unobserved ability, motivation and discrimination, among others, and corresponds to the impact of differences by nationality on the average standardized residual ($\overline{\theta}_m^A - \overline{\theta}_f^A$) multiplied by the money value per unit difference in the standardized residual (σ^A), which determines the specific wage penalty suffered by the disadvantaged group. Finally, the third term estimates the influence of workplace-related factors. This term is taken as a product of the

difference in the average standardized workplace effect of natives and immigrants ($\bar{\gamma}_m^A - \bar{\gamma}_f^A$) - which measures the intensity of immigrant segregation into comparatively low-wage workplaces - and the dispersion of wage differentials across workplaces (η^A) - which determines the degree of the wage penalty for immigrants resulting from this segregation -.

On the other hand, the difference in the magnitude of the native-immigrant wage gap between two years (A and B) may be expressed as follows:

$$D^A - D^B = (\Delta\bar{X}^A - \Delta\bar{X}^B)\hat{\beta}^A + \Delta\bar{X}^B(\hat{\beta}^A - \hat{\beta}^B) + (\Delta\bar{\theta}^A - \Delta\bar{\theta}^B)\sigma^A + \Delta\bar{\theta}^B(\sigma^A - \sigma^B) + (\Delta\bar{\lambda}^A - \Delta\bar{\lambda}^B)\eta^A + \Delta\bar{\lambda}^B(\eta^A - \eta^B) \quad (4)$$

According to equation (4), temporal discrepancies in the magnitude of the immigrant-natives wage gap can be explained by inter-temporal differences in six different factors. The first one captures the effect in the gap of changes over time in the relative observed characteristics of natives and immigrants. The second term reflects the contribution of differences over time in the market prices of those characteristics. The third term measures the impact of inter-temporal differences on the relative positions of natives and immigrants within the residual wage distribution (after controlling for measured characteristics and workplace effects). The fourth term isolates the impact of temporal changes in wage residual dispersion (remaining constant the relative position of the average native and immigrant worker in the residual distribution). The fifth term captures the impact of temporal differences in the extent of native workplace segregation. Finally, the sixth term measures the effect of differences in the dispersion of workplace wage differentials.

4.2. Fortin-Lemieux-Firpo decomposition

Fortin, Lemieux and Firpo (2011) have recently proposed a technique which enhances the development of the empirical decompositions of differences between two distributions of a variable. In the end, this technique provides a breakdown of the differences between distributions in the value of any distributional statistic (as the value of a quantile or an inequality index) based on the differences in the endowments of characteristics and in its returns respectively. This is a procedure which has considerable advantages compared to other techniques previously proposed in literature which also permit the decomposition of differences between distributions based on construction of counterfactual distributions (DiNardo, Fortin and Lemieux, 1996, Juhn, Murphy and Pierce, 1993, Machado and Mata, 2005 and Melly, 2005, 2006). Thus, whereas the latter techniques consist of aggregated decompositions which, aside from partial exceptions, provide exclusively the separate effects of the characteristics and returns components, Fortin, Lemieux and Firpo's methodology provides a detailed decomposition which allows, in addition, to ascertain the individual contribution of each explanatory variable to both components.

This methodology is based on the estimation of a regression in which the independent variable (the wage) is substituted by a transformation of the same, the *recentered influence function*; hereinafter RIF) so that subsequently a standard Oaxaca-Blinder decomposition can be developed for any distributional statistic based on the regression results.

The influence function measures the effect on distributional statistics of small changes in the underlying distribution. Thus, for a given distributional statistic of the distribution F_W, $v(F)$, this function measures the importance of each observation in shaping the value of this statistic. Fortin, Lemieux and Firpo (2011) suggested using a recentred version of the influence function having added the statistic of interest, $RIF(W)=v(F)+IF(W)$, since it has as expected value the actual statistic $v(F)$ (insofar as the expectation of the function of influence with respect to distribution of W is, by definition, zero).

In the case of the quantiles Q_θ of the unconditioned marginal distribution F_W, the function of influence, $IF(W, Q_\theta)$, is defined in the following way:

$$IF(W / Q_\theta) = \frac{\theta - I\{W < Q_\theta\}}{f_W(Q_\theta)} \tag{5}$$

Where $I\{\cdot\}$ is an indicator function and f_W is the function of density of the marginal distribution of W evaluated in Q_θ.

Given that the function of recentered influence, $RIF(W, Q_\theta)$, is equal to $Q_\theta + IF(W, Q_\theta)$, then the following is fulfilled:

$$RIF(W / Q_\theta) = Q_\theta + \frac{\theta - I\{W < Q_\theta\}}{f_W(Q_\theta)} \tag{6}$$

The RIF function may be computed empirically in the case of the quantiles by means of a local inversion following calculation of the dummy variable $I\{W < Q_\theta\}$ (which specifies whether the value W is higher or lower than Q_θ), the estimation of the quantile of the sample Q_θ and the estimation by means of kernel density functions of the corresponding density function f_W evaluated in Q_θ.

Following calculation of the RIF function for the quantile,[5] a value is provided for the transformed variable for each observation of the sample. Insofar as the effect of the change in distribution of an explanatory variable in the quantile may be expressed *ceteris paribus*, as the average partial effect of that variable in the conditioned expectation on its RIF function, and

assuming that the conditioned expectation of the RIF function may be modelled as a linear function of the explanatory variables, these values may be used for estimation by means of ordinary least squares of a regression of the RIF variable in a vector of explanatory variables. The estimated coefficients may be interpreted then as the effect of an increase in the average value of an explanatory variable in the distribution quantile (Firpo, Fortin and Lemieux, 2009).

The estimated coefficients of that regression may be used for calculation of a standard Oaxaca-Blinder decomposition of different quantiles of the distribution. In the development of the decomposition the wage structure of the pool of the two groups involved in the comparison has been used as the reference wage structure. As the choice of a specific reference in each group of binary variables can affect the outcome of the detailed decomposition through the relative contribution of each explanatory variable to the returns component (Oaxaca and Ransom, 1999), the strategy of normalization of dummy variables suggested by Yun (2005) has been adopted. It permits to estimate more accurately the actual contribution of each variable to this component of the decomposition.[6]

Consequently, the decomposition takes the following form:

$$\Delta_{Q_\theta} = (\overline{X}^n - \overline{X}^i)\hat{\gamma}^*_{Q_\theta} + \left\{\overline{X}^n(\hat{\gamma}^i_{Q_\theta} - \hat{\gamma}^*_{Q_\theta}) + \overline{X}^i(\hat{\gamma}^*_{Q_\theta} - \hat{\gamma}^n_{Q_\theta})\right\} \quad (7)$$

Wherein Δ_{Q_θ} is the difference in the quantile Q_θ (or, as has been indicated, in any other statistic) of the wage distributions of natives and immigrants males, respectively; $\overline{X}^r$ and $\overline{X}^h$ are the average observed characteristics for natives and immigrants and $\hat{\gamma}^n_{Q_\theta}$, $\hat{\gamma}^i_{Q_\theta}$ *and* $\hat{\gamma}^*_{Q_\theta}$ are the estimated coefficients following regression of the RIF variable of the quantile Q_θ on the group of explanatory variables for natives, immigrants and the pool of both groups respectively. The first component of the right-hand side of the equation represents the effect on the differential between distributions caused by differences in characteristics (or 'explained' component) whereas the second corresponds to the effect of the coefficients (or 'unexplained' component). As previously refereed, the contribution of each explanatory factor can be observed in the decomposition results.

5. Results

5.1. Descriptive evidence

Table 1 and Figure 1 contain information on the wage gap between native and immigrant men in Spain, measured in logarithms of the gross hourly wage (Figure A.1 in the Appendix

[5] Although the formal presentation appearing in the text is based on the quantiles of the unconditional distribution of wages, the empirical analysis also includes the Gini index (the exact expression of the RIF function of this statistic may be found in Firpo, Fortin and Lemieux, 2007).

[6] This strategy is equivalent to calculating the average of the contributions to each component of the decomposition of different estimates in which each of the categories of each subset of dummies is used interchangeably as reference.

provides the corresponding density functions of the wage distributions for each group). A significant disadvantage in average wages of immigrants against natives can be observed throughout the whole period (i.e. 0.204 log points in 2002, 0.244 in 2006 and 0.259 in 2010). Moreover, the wage differential has an increasing profile along the whole wage distribution, with the exception of the right tail, where it tends to decrease. As regards to changes over time, the magnitude of the gap tends to increase along the entire period, but during the economic expansion the increase is more significant (with a change of 0.04 log points between 2002 and 2006) and occurs mainly in the upper part of the wage distribution. By contrast, during the economic downturn the growth has a lower magnitude (0.015 log points) and takes place almost exclusively in the lower part of the distribution, decreasing in the right tail of the distribution.

[Table 1 about here]

[Figure 1 about here]

Table A.1 in the Appendix shows, in turn, how native and immigrant men in Spain differ significantly in their relative observed characteristics, as well as in its evolution over time. So, without being exhaustive, the comparison between the endowments of characteristics of native and immigrant men reveals that the latter are on average younger (and have hence lower levels of potential work experience), and have also lower endowments of education and seniority; higher incidence of temporary contracts; greater presence in occupations associated with lower levels of qualification and without supervisory responsibilities and, finally, greater representation in smaller firms and firms covered by sectoral agreements.[7] On the other hand, it must be noted that the aforementioned immigrants´ disadvantages increased during the economic expansion in some of these dimensions (including, for instance, their presence in semi- and unskilled occupations and in jobs without supervisory tasks), whereas most of them tended to decrease during the economic downturn (i.e. education and occupation). Finally, it is worth to mention that the composition of immigrants in Spain according to their geographical origin is rather stable over time, although the share of immigrants from Europe and Latin America tends to increase slightly (in the latter case, with the exception of the period 2006-2010) and, consequently, the share of immigrants from the rest of the world tends to decrease.

5.2. Econometric decompositions

Table 2 contains the results of the application of the extension of the Juhn, Murphy and Pierce (1991, 1993) proposal to decompose average wages differentials. The first row provides the value of the wage gap between native and immigrant men and the rest of the rows the figures corresponding to the different terms of the decomposition (note that a positive value for a specific

factor indicates an unfavorable effect for immigrant men). Two specifications of the wage equation have been considered: the first one includes as explanatory variables sociodemographic characteristics of individuals as well as job and firm attributes (model 1) while the second specification considers firm fixed effects instead of firm attributes (model 2). Note that the results of model 1 are equivalent to those of a standard Oaxaca-Blinder decomposition into two components (characteristics and returns), whereas model 2 incorporates to the results of the decomposition the third component of the right side of equation (3).[8]

According to the results of model 1, differences in the endowments of observed characteristics explain the bulk of the wage gap between native and immigrant men in the Spanish labour market (the characteristics component accounts for more than 90% of the raw wage gap) whereas the unexplained part of the gap has only a marginal effect. The detailed results of the decomposition show, in turn, that the lower tenure of immigrants as well as their presence in low-wage occupations are particularly important elements in explaining the wage gap (the sum of both factors justify between 60% and 70% of their wage disadvantage, depending on the year). The results also show that in general immigrants tend to exhibit unfavourable relative endowments of all the characteristics considered (being the only exceptions the region of residence and, during the economic expansionary period, the activity sector of the firm, which suggests that immigrants tend to be located in high-wage regions and sectors).

When firm fixed effects are included as explanatory variables (Model 2), differences in the endowments of productive characteristics, captured by the first term of the decomposition, continue to justify the bulk of the average wage differential between native and immigrant workers (between two thirds and 90% of the gap, according to the year). Unobservable factors justify, in turn, an almost negligible part of the wage gap (the second component of the decomposition takes values lower than 0.01 log points). Note that, by the nature of the decomposition applied, the value of this component provides the average wage differential between native and equally productive immigrant men working in the same establishment. This finding, therefore, suggests that in general firms tend to pay similar wages to natives and immigrants with similar observed characteristics, which apparently precludes the existence of wide-ranging direct discrimination against immigrants in the Spanish labour market. Finally, the third component of the decomposition reveals that the unequal distribution by firms of native and immigrant workers is a factor with a notable influence on the wage differential, explaining a significant proportion of the gap (between 0.040 and 0.095 log points or between 20% and 47% of the average wage

[7] Almost without exceptions, all these characteristics are generally associated to lower wages (see, for instance, Davia and Hernanz, 2002 and Card and De la Rica, 2006 for the influence of the type of contract and the type of collective agreement on wages in the Spanish labour market).

differential, depending on the year) and, accordingly, that the relative segregation of immigrant men in low-wage firms is a relevant argument in explaining their lower relative wages. Moreover, the influence of this factor increases significantly in 2010, almost doubling its effect in previous years, suggesting that the economic crisis has exacerbated the segregation of immigrants into low-wage establishments.

[Table 2 about here]

From a time perspective, Table 3 shows the results of the decomposition of the change of the native-immigrant wage gap between the periods 2002-2006 and 2006-2010 following equation (4). The first row of the table contains the change over time of the wage differential, whereas the remaining rows show the contribution of the different terms of the decomposition (a positive value indicates that the factor contributes to increase the gap). The significant increase of the native-immigrant wage gap between 2002 and 2006 (0.040 log points) is due to the joint effect of several factors. On one hand, the worsening of the relative endowments of observed characteristics of immigrants, with a prominent role of changes in the distribution by occupation and, to a lesser extent, by jobs with supervisory tasks (both elements explain jointly more than the half of the wage gap). On the other hand, and focusing on the results derived from model 2, the intensification of the segregation of immigrants into low-wage firms (the fifth component of the decomposition takes a value of 0.014 log points) as well as the effect of unobserved factors (the third component of the decomposition takes a value of 0.011 log points, indicating that the average position of immigrants in the residual wage distribution worsened during the period). The effect of these factors was just partially offset by changes in the returns of the observed characteristics (the second component of the decomposition takes a value of -0.012 log points).

Regarding the period 2006-2010, the lower increase of the native-immigrant wage differential (0.015 log points) is due to the counteracting effect of some of the factors that shape the gap, many of which notably changed their impact direction with respect to the previous period. Hence, by contrast to the expansionary phase, the relative endowments of immigrants´ productive characteristics markedly improved (focusing on the results derived from model 2, with an impact in the gap of -0.017 log points), especially as regards the type of jobs they hold (changes in occupation and jobs with supervisory tasks explain jointly -0.015 log points)[9] and, in accordance, their educational level. In addition, changes in the effect of unobserved factors were favourable for immigrant relative wages (-0.016). Yet, the effect of both factors was offset by those derived from

[8] The detailed results of the wage equations used in the calculation of the decompositions are available from the authors at their request.

[9] This is consistent with the fact that the deep destruction of employment in Spain after the onset of the Great Recession has affected especially low-quality jobs (OECD, 2010, 2013 b) and immigrants (2013 a).

changes in the returns of the observed characteristics (0.006 log points)[10] and, especially, from the sharp intensification of the segregation of immigrants in low-wage firms (0.041 points). Results from model 1 show, in turn, that the latter was partially due to the reallocation of immigrants to low-wage sectors and to firms without collective agreements (both factors explain jointly 0.018 log points).

[Table 3 about here]

Figures 2 and 3 attend to the differences between natives and immigrants in the quantiles of the log hourly wages distribution and show the results of the decomposition obtained via the methodology proposed by Fortin, Lemieux and Firpo (2011). To ease presentation, Figure 2 distinguishes only between the aggregate contribution of characteristics and returns components, whereas Figure 3 contains the detailed results of the individual effects of explanatory variables through the former. This evidence has been obtained using as explanatory variables sociodemographic characteristics of individuals and jobs and firms attributes (thus, following Model 1). With the aim of facilitating the presentation, explanatory variables have been grouped into three categories, depending if the are individual characteristics of the workers, attributes of the jobs or characteristics of the firms. Additional information on the results of the decomposition can be found in Table 4.[11]

[Table 4 about here]

Aggregate results show that the native-immigrant wage gap tends to be explained basically by differences in the endowments of characteristics throughout the wage distribution (Figure 2). Consequently, the returns component has in general a negligible contribution to the gap, with the only exception of the right part of the distribution. According to the detailed results of the decomposition, the bulk of the gap is actually explained by differences in the characteristics of the jobs hold by natives and immigrants (Figure 3) and, particularly, by the lower tenure of immigrants, their presence in low-wage occupations and, to a lesser extent, in jobs without supervisory tasks (Table 4). It should be noted that this evidence is generally consistent with that obtained previously regarding the decomposition of the average wages of native and immigrant workers (Table 2).

With regards to changes over time, the increase of the gap between 2002 and 2006 which occurs mainly in the upper part of the wage distribution is mainly explained by the increase in the magnitude of the characteristics component in the right part of that distribution (Figure 2). This upsurge is explained, in turn, by an intensification of the differences in natives and immigrants´

[10] The influence of this component is consistent with global changes observed in the Spanish wage structure, given that, in contrast with most other advanced countries, wage inequality decreased during the economic expansion and increased significantly during the economic crisis (Carrasco et al., 2014; Casado and Simón, 2014).

endowments of jobs characteristics in favour of the former (Figure 3), especially as regards tenure, occupation and supervision (Table 4). On the other hand, changes of the gap in the period 2006-2010 (namely, a rise in the lower part of the distribution and a decrease in the right tail) is explained essentially by a change in the profile of the characteristics components, whereby differences in the endowments of characteristics in favour of native workers become more important in the left part of the distribution (the increase in the returns component also play a role in this case) and, by contrast, less intense in the upper tail (Figure 2). Again, these modifications are driven by changes in the endowments of job characteristics with a prominent role of occupation and supervision.

[Figures 2 and 3 about here]

6. Conclusions

The aim of this article is to examine the impact of the Great Recession on relative wages of immigrants in Spain. The empirical analysis is restricted to men and is based on matched employer-employee microdata from the *Encuesta de Estructura Salarial*, a survey conducted in Spain with a harmonized methodology common to other members of the European Union, using two different econometric decomposition techniques. The first one is an extension of the methodology of Juhn, Murphy and Pierce (1991, 1993) adapted for its use with matched employer-employee microdata which permits, inter alia, observe the impact of firms on the native-immigrant average wage gap and its evolution over time. The second technique is the methodology proposed by Fortin, Lemieux and Firpo (2011) which allows the development of a detailed decomposition of wage differences across the entire wage distribution.

The obtained results confirm that immigrant men suffer a significant wage disadvantage compared with equally productive native men in the Spanish labor market that increases along the wage distribution. Although the wage gap shows an upward trend over the examined period, this upsurge is much more significant during the economic expansion than after the onset of the Great Recession. Again, the temporal increase of the gap is not monotonic over the wage distribution, as during the period 2002-2006 occurs mainly in the upper part of the wage distribution and between 2006 and 2010 the growth takes place exclusively in the lower part of the distribution, actually decreasing in the right tail. Regarding to the above, descriptive evidence shows that Spaniards and immigrant men differ significantly in their relative productive characteristics as well as in its evolution over time. Thus, immigrants´ relative characteristics are generally associated to lower wages; nonetheless, whereas immigrants´ disadvantages in the endowments of characteristics

[11] Information on the coefficients estimated by the method of unconditional quantile regression on which the decomposition methodology is based is available from the authors at their request.

increased in general during the economic expansion, they tended to decrease during the economic downturn.

The results of the native-immigrant wage differentials decomposition show that differences in the endowments of observed characteristics explain the bulk of the wage gap each of the years considered, both in terms of average wages and in terms of differentials along the wage distribution. Among these productive characteristics, differences in allocation across type of jobs seem to be especially important. Thus, the predominant presence of immigrants in low-wage occupations as well as their relatively lower endowments of tenure particularly hit their relative wages, being also the segregation of immigrant into low-wage firms a factor with a significant influence on the wage differential. These findings confirm, as suggested by previous studies, that the segregation of immigrants into low-wage labour market segments is a key explanatory element of their lower relative wages. Finally, it is also noteworthy that intra-firm wage differentials are almost negligible, which confirms that, once differences in individual, jobs and firms characteristics are accounted for, immigrants receive in general a similar wage treatment than natives in the Spanish labour market.

Also in accordance with previous empirical evidence, our results suggest that changes in the economic cycle could become an important factor in explaining the nature of native-immigrant wage differentials and its evolution over time. Moreover, our findings indicate that the Great Recession has had a remarkable impact on the relative wages of immigrants in Spain through the effect derived from a deep employment destruction. Therefore, the significant increase of the native-immigrant wage gap observed during the expansionary period is due to the worsening of the relative endowments of productive characteristics of immigrants, with prominent roles of changes in the distribution by occupations and by firms. Conversely, the slight increase of the native-immigrant wage gap after the onset of the economic recession is due to the counteracting effect of the different factors that shape the gap. Thus, the positive impact of immigrants´ relative productive characteristics improvement (as well as of the favourable change in the effect of unobserved factors) was fully counteracted by the hard intensification of the segregation of immigrants into low-wage firms. These results also agree in general with previous findings in the literature that document that most of the changes over time in the relative wages of immigrants tend to be essentially explained by composition effects.

References

Aeberhardt, R. and Pouget, J. (2010): "National origin differences in wages and hierarchical positions", *Annals of Economics and Statistics*, Nº 99/100, pp. 117.139.

Abowd, J.M., Kramarz, F., Margolis, D.N. and Troske, K. (2001) 'The Relative Importance of Employer and Employee Effects on Compensation: A Comparison of France and the United States', *Journal of the Japanese and International Economics*, No 15, pp. 419-436.

Alcobendas, M.A. and Rodríguez-Planas, N. (2009): "Immigrant assimilation process in a segmented labor market", IZA Discussion Paper Nº 4394.

Alonso-Villar, O. and del Río, C. (2013): "Occupational segregation in a country of recent mass immigration: Evidence from Spain", *Annals of Regional Science*, Vol. 50 (1), pp. 109-134.

Amuedo-Dorantes and de la Rica, S. (2007): "Labor market assimilation of recent immigrants in Spain", *British Journal of Industrial Relations*, Vol. 45(2), pp. 257-284.

Amuedo-Dorantes, C. and de la Rica, S. (2011): "Complements or substitutes? Task specialization by gender and nativity in Spain", *Labour Economics*, Vol. 18, pp. 697-707.

Ashenfelter, O. (1970): "Changes in labor market discrimination over time", *Journal of Human Resources*, Vol. 5 (4), pp. 403-430.

Aslund, O. and Skans, O.N. (2010): "Will I see you at work? Ethnic workplace segregation in Sweeden, 1985-2002", *Industrial and Labor Relations Review*, Vol. 63 (3), pp. 471-493.

Aydemir, A. (2003): "Effects of the business cycle on the labour market assimilation of immigrants", in Beach, C., Green, A. and Reitz, J. (eds.): *Canadian Immigration Policy for the 21st Century,* Montreal and Kingston: McGill-Queen´s University Press, pp. 372-412.

Aydemir, A. and Skuterud, M. (2008): "The immigrant wage differential within and across establishments", *Industrial and Labor Relations Review*, Vol. 61 (3), pp. 334-352.

Baker, M. and Benjamin, D. (1994): "The performance of immigrants in the Canadian labor market", *Journal of Labor Economics*, Vol. 12(3), pp. 369-405.

Barrett, A., McGuinness, S. and O´Brien, M. (2012): "The immigrant earnings disadvantage across the earnings and skills distributions: The case of immigrants from the EU´s New Member States", *Industrial and Labor Relations Review*, Vol. 50 (3), pp. 475-481.

Barth, E., Bratsberg, B. and Raaum, O. (2004): "Identifying earnings assimilation of immigrants under changing macroeconomic conditions", *Scandinavian Journal of Economics*, Vol. 106(1), pp. 1-22.

Barth, E., Bratsberg, B. and Raaum, O. (2006): "Local unemployment and the relative wages of immigrants: evidence from current population surveys", *Review of Economics and Statistics*, Vol. 88(2), pp. 243-263.

Barth, E., Bratsberg, B. and Raaum, O. (2012): "Immigrant wage profiles within and between establishments", *Labour Economics*, Vol. 19 (4), pp. 541-556.

Bayard, K., Hellerstein, J., Neumark, D. and Troske, K. (1999): "Why Are Racial and Ethnic Wage Gaps Larger for Men than for Women? Exploring the Role of Segregation Using the New Worker-Establishment Characteristics Database", in Haltiwanger, J.C., Lane, J.I., Spletzer, J.R., Theeuwes, J.J. and Troske, K.eds., *The Creation and Analysis of Employer-Employee Matched Data* (Amsterdam: Elsevier Science B.V.), pp. 175-203.

Becker, G. (1957): *The economics of discrimination*, Chicago: University of Chicago Press.

Bentolila, S., Cahuc, P., Dolado, J.J. and Le Barbanchon, T. (2012): "Two-tier labour markets in the Great Recession: France *Versus* Spain", *The Economic Journal*, Vol. 122 (562), pp. F155-F187.

Bernardi, F., Garrido, L. and Miyar, M. (2011): "The recent fast upsurge of immigrants in Spain and their employment patterns and occupational attainment", *International Migration*, Vol. 49 (1), pp.148-187.

Biddle, J. and Hamermesh, D. (2013): "Wage discrimination over the business cycle", *IZA Journal of Labour Policy,* Vol. 2 (7).

Blau, F.D. and Kahn, L.M. (1992) 'The Gender Earnings Gap: Learning from International Comparisons', *American Economic Review*, vol. 82, pp. 533-38.

Borjas, G.J. (1985): "Assimilation, changes in cohort quality, and the earnings of immigrants", *Journal of Labor Economics*, Vol. Vol. 3(4), pp. 463-489.

Borjas, G.J. (1994): "The economics of immigration", *Journal of Economic Literature*, Vol. 32 (4), pp. 1667-1717(4).

Borjas, G.J. (1999): The economic analysis of immigration. In O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3 (A), Amsterdam: North-Holland, pp.1697-1760.

Card, D.; de la Rica, S. (2006): "Firm-level Contracting and the Structure of Wages", *Industrial and Labor Relations Review*, 59(4), pp. 573-593.

Carliner, G. (1980): "Wages, earnings and hours of first, second and third generation American males", *Economic Inquiry*, Vol. 18 (1), pp.87-102.
Carneiro, A., Fortuna, N. and Varejao, J. (2012): "Immigrants at new destinations: How they fare and why", *Journal of Population Economics*, Vol. 25 (3), pp. 1165-1185.
Carrasco, R., J. F. Jimeno, and A. Carolina Ortega (2014): "Returns to Skill and the Distribution of Wages: Spain 1995-2006", *Oxford Bulletin of Economics and Statistics*, doi: 10.1111/obes.12077.
Casado, J.M. and Simón, H. (2014): "La evolución de la desigualdad salarial en España (2002-2010)", *Revista de Economía Aplicada* (forthcoming).
Chiswick, B.R. (1978): "The effect of Americanization on the earnings of foreign-born men", *Journal of Political Economy*, Vol. 86 (5), pp. 897-922.
Chiswick, B., Cohen, Y. and Zach, T. (1997): "The labor market status of immigrants: Effects of the unemployment rate at the arrival and duration of residence", *Industrial and Labor Relations Review*, Vol. 50(2), pp. 289-303.
Chiswick, B., Lee, Y., and Miller, P. (2005): "A Longitudinal Analysis of Immigrant Occupational Mobility: A Test of the Immigrant Assimilation Hypothesis", *International Migration Review*, vol. 39, n.2, pp. 332-353.
Constant, A.F. and Massey, D.S. (2003): "Self-selection, earnings and out-migration: A longitudinal study of immigrants to Germany", *Journal of Population Economics*, Vol. 16 (4), pp. 631-653.
Constant, A.F and Zimmermann, K.F. (2013): "Migration and ethnicity: an introduction", in International Handbook on the Economics of Migration, Edwar Elgan, Cheltenham, UK.
Davia, M. A. y Hernanz, V. (2002): "Temporary Employment and Segmentation in the Spanish Labour Market: An Empirical Analysis through the Study of Wage Differentials", *Spanish Economic Review*, 6, pp. 291-318.
De la Rica, S. y Card, D. (2006): "Firm level contracting and the structure of sages in Spain", *Industrial and Labor Relations Review*, 59 (4), pp. 573-592.
De la Rica, S., Glitz, A. and Ortega, A. (2014): 'Immigration in Spain: What have we learned from recent evidence?', *Cuadernos económicos de ICE*, Nº 87
De la Rica, S. and Polonyankina, T. (2014): "The impact of immigration on occupational specialization among natives in Spain: Does the business cycle matter?", Revista de Economía Aplicada, XXI (63), pp. 51-75.
Dowhan, D.J. and Duleep, H.O. (2002): "Insights form longitudinal data on earnings of US foreign born men", *Demography*, Vol. 39 (3), pp. 485-506.
Dustmann, C., Glitz A. and Voguel, T. (2010): "Employment, wages, and the economic cycle: Differences between immigrants and natives", *European Economic Review*, Vol. 54(1), pp. 1-17.
European Commission (2013): Labour market developments in Europe, 2013. European economy 2/2011. European Commission, Luxembourg.
Fernández, C. and Ortega, C. (2008): "Labor market assimilation of immigrants in Spain: employment at the expense of bad job-matches?", *Spanish Economic Review*, Vol. 10 (2) , pp. 83-107.
Firpo, S.; Fortin, N.; Lemieux, T. (2007). Decomposing Distribution Using Recentered Influence Function Regressions, mimeo, University of British Columbia.
Firpo, S.; Fortin, N., & Lemieux, T. (2009). Unconditional Quantile Regressions. *Econometrica*, 77(3), 953-973.
Fortin, N.; Lemieux, T.; Firpo, S.; (2011): "Decomposition Methods in Economics", *Handbook of Labor Economics*, Vol. 4, Chapter 1, pp. 1-102. Elsevier.
Friedberg, R. M. (2000): "You can´t take it with you? Immigrant assimilation and the portability of human capital", *Journal of Labour Economics*, Vol. (18), pp. 221-251.
García-Pérez, J.I., Muñoz-Bullón, F. and Prieto-Rodríguez, M. (2012): "The wage gap between foreign and Spanish nationals in Spain: an analysis using matched employer-employee data", *International Migration*. doi: 10.1111/imig.12000
Gartner, H. and Stephan, G. (2004) 'How collective contracts and works councils reduce the gender wage gap', IAB Discussion paper 7/2004.
Heckman, J. (1979): "Sample Selection Bias as a Specification Error", *Econometrica*, 47(1), pp. 153-161.
Honeys, H., Miller, D.L. and Schaller, J. (2012): "Who suffers during recessions?", *Journal of Economic Perspectives*, Vol. 26 (3), pp. 27-48.
Izquierdo, M., Lacuesta, A. and Vegas, R. (2009): "Assimilation of immigrants in Spain: A longitudinal analysis", *Labour Economics*, Vol. 16, pp. 669-678.

Johnston, D. and Lordan, G. (2014): "When work disappears: Racial prejudice and recession labour market penalties", CEP Discussion Paper No 1257.
Juhn, C., Murphy, K. and Pierce, B. (1991): "Accounting for the slowdown in black-white convergence", in M. Osters (eds.) *Workers and Their Wages*, 107-143. Washington DC: American Enterprise Institute Press.
Juhn, C., Murphy, K. and Pierce, B. (1993): "Wage inequality and the rise in returns to skills", *Journal of Political Economy*, Vol. 101, pp. 410-442.
Kaufman, R.L. (2010): *Race, gender and the labor market: Inequalities at work*, Lynne Rienner Publishers.
LaLonde, R.J. and Topel, R.H. (1991): Labor market adjustments to increased immigration, in Abowd, J.M. and Friedman, R.B., eds., *Immigration, trade and the labor market*, University of Chicago Press.
Lane, J. (2009) 'Inequality and the Labour Market: Employers' in W. Salverda, B. Nolan and T. Smeeding (eds.) *The Oxford Handbook of Income Inequality*, ed. Oxford University Press.
Larramona, G. (2013): "Out-migration of Spanish immigrants", *Population*, Vol. 68 (2), pp. 213-236.
Neumark, D. (1988) 'Employer´s discriminatory behaviour and the estimation of wage discrimination', *Journal of Human Resources*, 23, pp. 279-295.
Nicodemo, C. and Ramos, R. (2012): "Wage differentials between native and immigrant women in Spain. Accounting for differences in support", *International Journal of Manpower*, Vol. 33(1), pp. 118-136.
Orrenius, P.M. and Zavodny, M. (2010): "Mexican immigrant employment outcomes over the business cycle", *American Economic Review,* Vol. 100(2), pp. 316-20.
Oaxaca, R. and Ransom, M. (1994) 'On discrimination and the decomposition of wage differentials', *Journal of Econometrics*, 61, pp. 5-22.
Oaxaca, R.; Ramson, M. (1999): 'Identification in detailed wage decompositions', *The Review of Economics and Statistics*, 81(1), pp. 154-157.
OECD (2010): Employment Outlook, Moving beyond the jobs crisis. OECD Paris.
OECD (2013a): International Migration Outlook, DOI: 10.1787/migr_outlook-2013-en.
OECD (2013b): Employment Outlook, All in all together? The experience of different labour market groups following the crisis, http://dx.doi.org/10.1787/empl_outlook-2013-en.
Phelps, E.S. (1972): "A statistical theory of racism and sexism", *American Economic Review*, Vol. 62, pp. 659-661.
Simón, H., Ramos, R. and Sanromá, E. (2014): "Immigrant Occupational Mobility: Evidence from Spain", *European Journal of Population* (forthcoming).
Simón, H., Sanromá, E. and Ramos, R. (2008): "Labour segregation and immigrant and native-born wage distributions in Spain: an analysis using matched employer-employee data", *Spanish Economic Review*, Vol. 10 (2), pp. 135-168.
United Nations, Department of Economics and Social Affairs, Population Division (2009): "International Migration Report 2006: a global assessment", United Nations, New York: http://www.un.org/esa/population/unpop.htm
Yoshida, Y. and Smith, M.R. (2005): "Training and the earnings of immigrant males: Evidence from the Canadian Workplace and Employee Survey", *Social Science Quarterly*, Vol. 86, pp. 1218-1241.
Yun, M. (2005): "A Simple Solution to the Identification Problem in Detailed Wage Decompositions", *Economic Inquiry*, Vol. 43, pp. 766-772.

Table 1.
Wage differentials between native and immigrant men in Spain.

	2002	2006	2010	Change 2002-2006	Change 2006-2010
Average	0.204	0.244	0.259	0.040	0.015
Percentiles					
10	0.078	0.078	0.145	-0.001	0.067
20	0.097	0.100	0.168	0.022	0.068
30	0.120	0.128	0.211	0.031	0.083
40	0.157	0.168	0.253	0.048	0.085
50	0.208	0.222	0.303	0.065	0.081
60	0.270	0.296	0.345	0.088	0.049
70	0.321	0.365	0.369	0.095	0.004
80	0.368	0.422	0.368	0.101	-0.054
90	0.344	0.440	0.320	0.072	-0.120

Notes: The wage gap corresponds to the differential of the logarithm of the hourly wage.

Table 2.

Decomposition of the differential in average wages between native and immigrant men. Juhn-Murphy-Pierce decomposition.

	2002		2006		2010	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Wage differential	0.204	0.204	0.244	0.244	0.259	0.259
Characteristics (1)	0.200(98.0)	0.167(81.9)	0.226(92.6)	0.182(74.6)	0.241(93.1)	0.171(66.0)
Educational attainment	0.013	0.010	0.022	0.013	0.019	0.013
Age	0.015	0.014	0.010	0.011	0.016	0.015
Tenure	0.076	0.066	0.090	0.066	0.095	0.072
Type of contract	0.014	0.014	0.004	0.009	-0.001	0.001
Full- or part-time	0.000	0.000	0.000	0.000	0.002	-0.001
Occupation	0.064	0.044	0.074	0.053	0.068	0.048
Supervisory tasks	0.015	0.019	0.021	0.030	0.015	0.023
Region	-0.014	-	-0.009	-	-0.012	-
Activity sector	-0.005	-	-0.010	-	0.007	-
Firm size	0.013	-	0.018	-	0.019	-
Collective agreement	0.009	-	0.006	-	0.013	-
Wage residuals (2)	0.004(2.0)	-0.003(-0.1)	0.018(7.4)	0.009(3.7)	0.018(6.9)	-0.007(-2.7)
Firm fixed effects (3)	-	0.040(19.6)	-	0.053(21.7)	-	0.095(36.7)

Notes: The table shows the results obtained after applying equation (3) to the different waves of the *Encuesta de Estructura Salarial*. Model 2 corresponds to a specification of the wage equation that includes both individual characteristics and attributes of the job and the firm (age, education, tenure, type of contract, full- or part-time, supervisory tasks, occupation, region, sector, size and type of collective agreement), whereas Model 3 includes individual and job attributes and firm fixed effects instead of firm attributes. The percentage of the wage differential explained by each term appears in brackets.

Table 3.

Decomposition of the change in the differential in average wages between native and immigrant men. Juhn-Murphy-Pierce decomposition.

	Model 1		Model 2	
	2002-2006	2006-2010	2002-2006	2006-2010
Wage differential$_B$-Wage differential$_A$	0.040	0.015	0.040	0.015
Characteristics (1)	0.035(87.5)	0.000(0.0)	0.027(67.5)	-0.017(-113.3)
Educational attainment	0.005	-0.009	0.003	-0.006
Age	0.000	0.002	0.000	0.002
Tenure	0.003	0.006	0.002	0.004
Type of contract	0.000	0.001	0.000	-0.001
Full- or part-time	-0.001	0.002	0.000	-0.001
Occupation	0.022	-0.010	0.016	-0.008
Supervisory tasks	0.004	-0.005	0.006	-0.007
Region	0.006	-0.004	-	-
Activity sector	-0.008	0.011	-	-
Firm size	0.005	0.001	-	-
Collective agreement	0.000	0.007	-	-
Returns (2)	-0.009(-22.5)	0.014(93.3)	-0.012(-30.0)	0.006(40.0)
Educational attainment	0.004	0.006	0.000	0.005
Age	-0.004	0.004	-0.003	0.003
Tenure	0.011	-0.001	-0.002	0.001
Type of contract	-0.010	-0.006	-0.005	-0.007
Full- or part-time	0.001	0.000	0.000	0.000
Occupation	-0.011	0.005	-0.007	0.003
Supervisory tasks	0.002	-0.001	0.005	0.001
Region	-0.001	0.000	-	-
Activity sector	0.002	0.007	-	-
Firm size	0.001	0.000	-	-
Collective agreement	-0.003	0.000	-	-
Relative wage residuals (3)	0.014(35.0)	0.001(6.7)	0.011(27.5)	-0.016(-106.7)
Residual wage dispersion (4)	0.000(0.0)	0.000(0.0)	0.000(0.0)	0.000(0.0)
Relative firm fixed effects (5)	-	-	0.014(35.0)	0.041(273.3)
Firm fixed effects dispersion (6)	-	-	0.000(0.0)	0.000(0.0)

Notes: The table shows the results obtained after applying equation (4) to the microdata from the *Encuesta de Estructura Salarial*. Model 1 corresponds to a specification of the wage equation that includes both individual characteristics and attributes of the job and the firm (age, education, tenure, type of contract, full- or part-time, supervisory tasks, occupation, region, sector, size and type of collective agreement) and model 2 includes individual and job attributes and firm fixed effects instead of firm attributes. The percentage of the wage differential explained by each term appears in brackets.

Table 4.
Decomposition of wage differentials between native and immigrant men. Fortin-Lemieux-Firpo decomposition. Model 1.

		2002			2006			2010		
		10th perc.	Median	90th perc.	10th perc.	Median	90th perc.	10th perc.	Median	90th perc.
Total	Native men	1.545	1.977	2.749	1.713	2.145	2.900	1.545	1.977	2.749
		(0.002)***	(0.002)***	(0.004)***	(0.002)***	(0.002)***	(0.004)***	(0.002)***	(0.002)***	(0.004)***
	Immigrant men	1.468	1.769	2.405	1.635	1.923	2.460	1.468	1.769	2.405
		(0.007)***	(0.007)***	(0.025)***	(0.005)***	(0.004)***	(0.014)***	(0.007)***	(0.007)***	(0.025)***
	Difference	0.077	0.208	0.344	0.078	0.222	0.440	0.077	0.208	0.344
		(0.007)***	(0.007)***	(0.026)***	(0.005)***	(0.004)***	(0.014)***	(0.007)***	(0.007)***	(0.026)***
	Characteristics	0.076	0.223	0.272	0.081	0.255	0.340	0.076	0.223	0.272
		(0.003)***	(0.006)***	(0.010)***	(0.003)***	(0.004)***	(0.007)***	(0.003)***	(0.006)***	(0.010)***
	Coefficients	0.001	-0.015	0.072	-0.003	-0.034	0.100	0.001	-0.015	0.072
		(0.008)	(0.007)**	(0.022)***	(0.006)	(0.005)***	(0.013)***	(0.008)	(0.007)**	(0.022)***
Characteristics	Age	0.005	0.013	0.034	0.002	0.009	0.026	0.005	0.013	0.034
		(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***
	Education	0.004	0.012	0.021	0.007	0.019	0.033	0.004	0.012	0.021
		(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***
	Tenure	0.037	0.089	0.072	0.044	0.090	0.099	0.037	0.089	0.072
		(0.002)***	(0.002)***	(0.004)***	(0.002)***	(0.002)***	(0.004)***	(0.002)***	(0.002)***	(0.004)***
	Contract	0.009	0.021	0.011	0.012	0.019	-0.005	0.009	0.021	0.011
		(0.002)***	(0.002)***	(0.003)***	(0.002)***	(0.002)***	(0.003)*	(0.002)***	(0.002)***	(0.003)***
	Full-/part-time	0.002	-0.000	-0.002	0.001	0.000	-0.001	0.002	-0.000	-0.002
		(0.001)***	(0.000)	(0.001)***	(0.000)*	(0.000)	(0.000)*	(0.001)***	(0.000)	(0.001)***
	Supervisory tasks	0.005	0.015	0.021	0.006	0.024	0.033	0.005	0.015	0.021
		(0.000)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***	(0.000)***	(0.001)***	(0.002)***
	Occupation	0.031	0.066	0.089	0.028	0.070	0.123	0.031	0.066	0.089
		(0.002)***	(0.003)***	(0.007)***	(0.002)***	(0.002)***	(0.004)***	(0.002)***	(0.003)***	(0.007)***
	Region	-0.014	-0.024	-0.017	-0.009	-0.013	-0.009	-0.014	-0.024	-0.017
		(0.001)***	(0.002)***	(0.002)***	(0.001)***	(0.002)***	(0.002)***	(0.001)***	(0.002)***	(0.002)***
	Sector	-0.012	-0.000	0.017	-0.022	-0.001	0.012	-0.012	-0.000	0.017
		(0.001)***	(0.002)	(0.003)***	(0.001)***	(0.001)	(0.003)***	(0.001)***	(0.002)	(0.003)***
	Size	0.007	0.019	0.016	0.011	0.031	0.022	0.007	0.019	0.016
		(0.001)***	(0.002)***	(0.002)***	(0.001)***	(0.002)***	(0.002)***	(0.001)***	(0.002)***	(0.002)***
	Collective agreement	0.001	0.012	0.011	-0.000	0.007	0.007	0.001	0.012	0.011
		(0.000)***	(0.001)***	(0.001)***	(0.000)	(0.001)***	(0.001)***	(0.000)***	(0.001)***	(0.001)***
N		78,424	78,424	78,424	82,195	82,195	82,195	78,424	78,424	78,424

* $p<0.1$; ** $p<0.05$; *** $p<0.01$.

Figure 1.
Wage differentials across the wage distribution. Native and immigrant men.

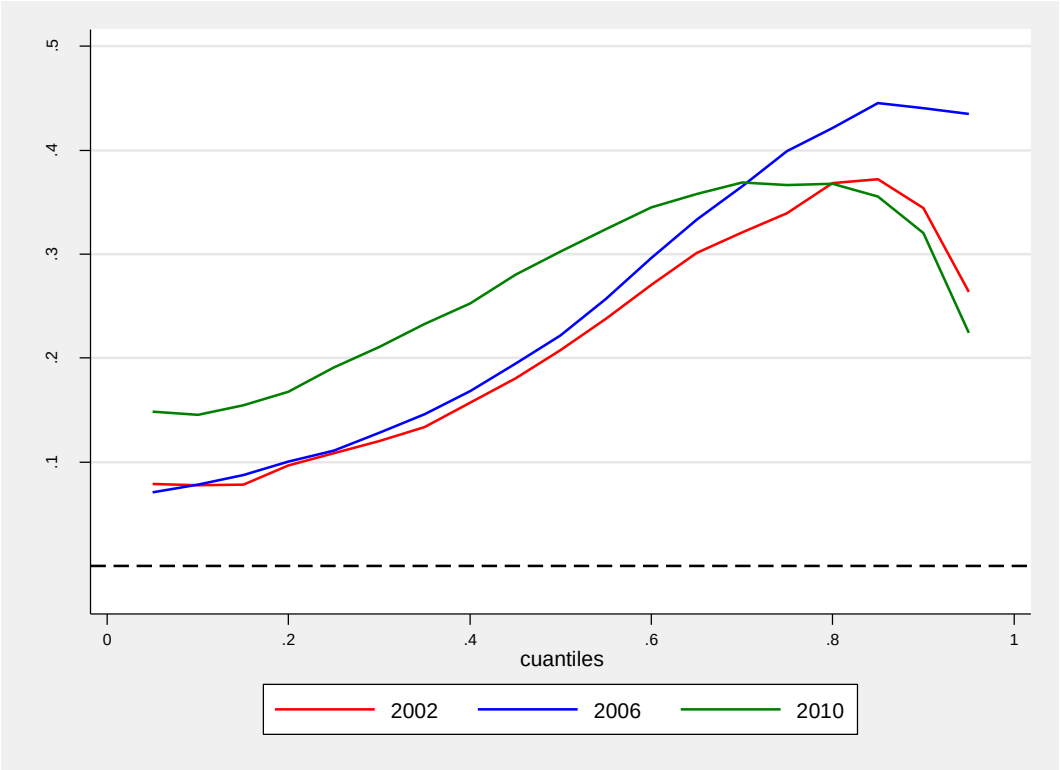
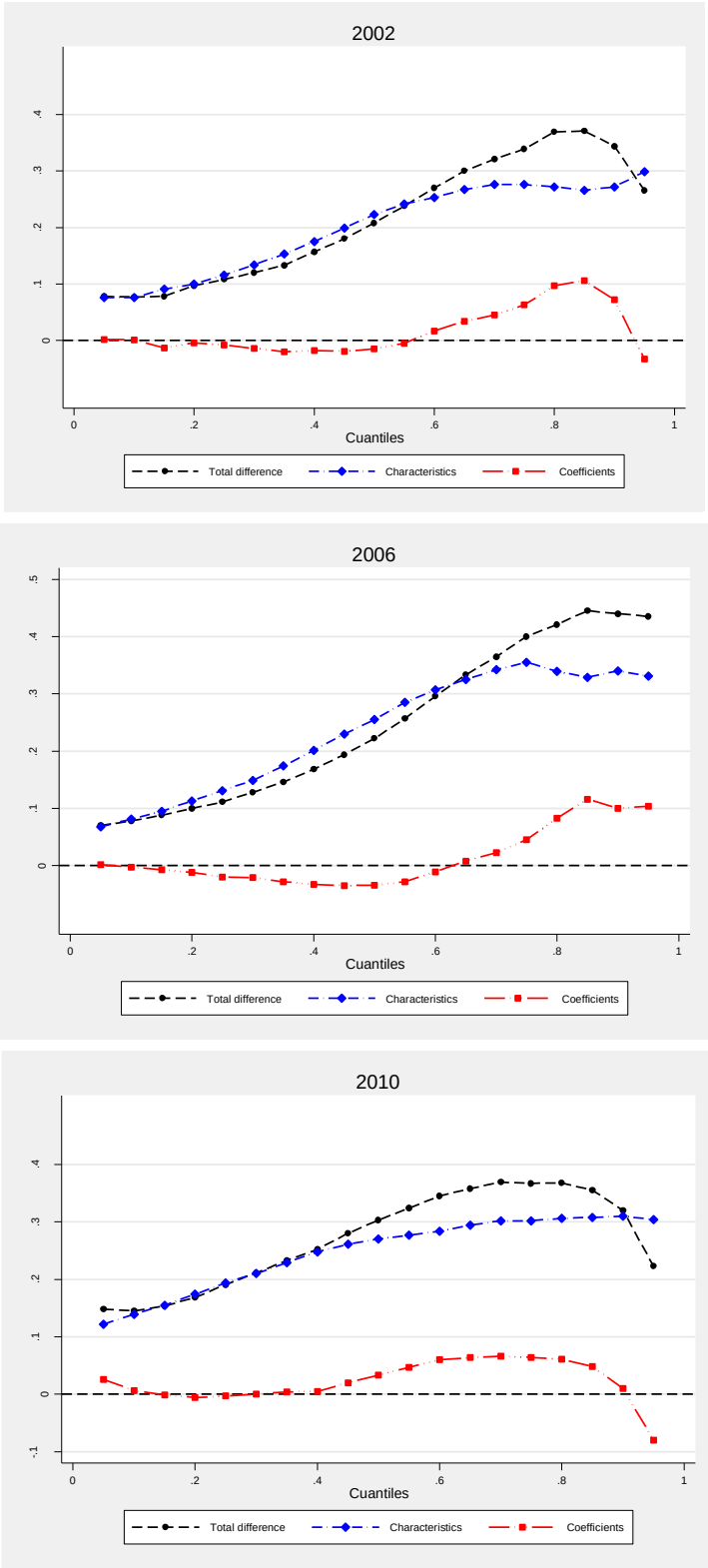
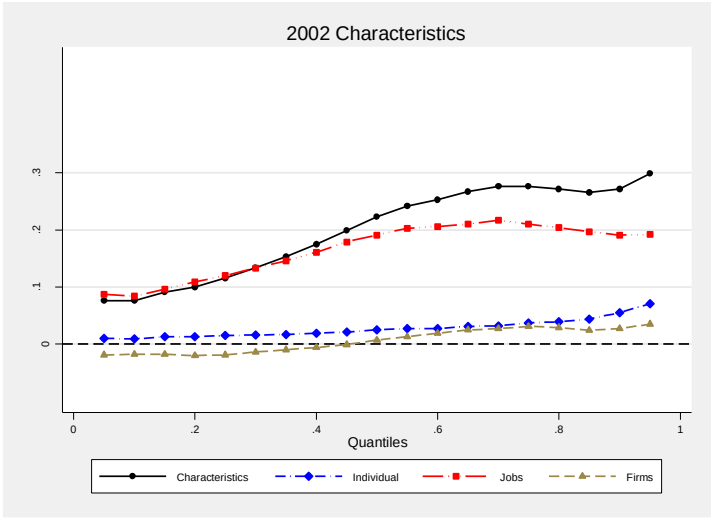


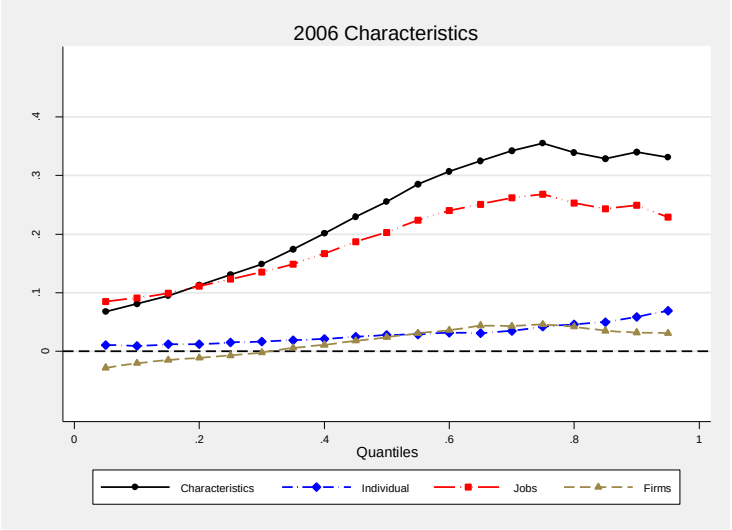
Figure 2.
Aggregate decomposition of wage differentials. Native and immigrant men. Fortin-Lemieux-Firpo decomposition. Model 1.

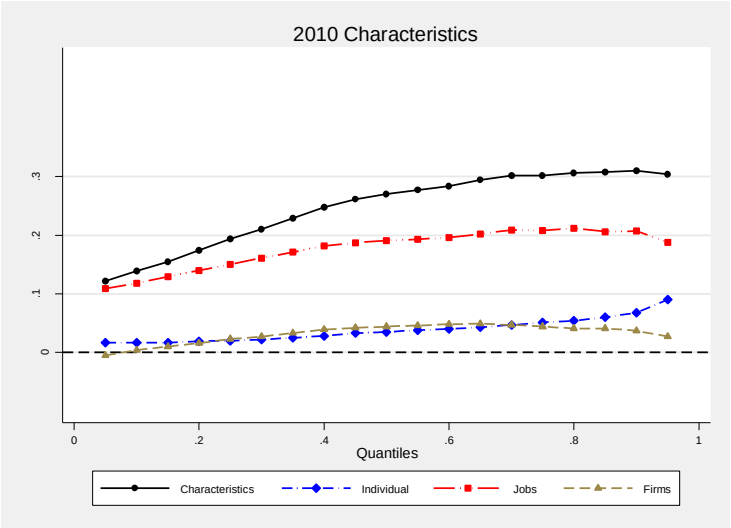


Notes: Model 1 includes as explanatory variables individual characteristics and job and firm attributes.

Figure 3.
Detailed decomposition of wage differentials. Effect of the characteristics. Native and immigrant men. Fortin-Lemieux-Firpo decomposition. Model 1.



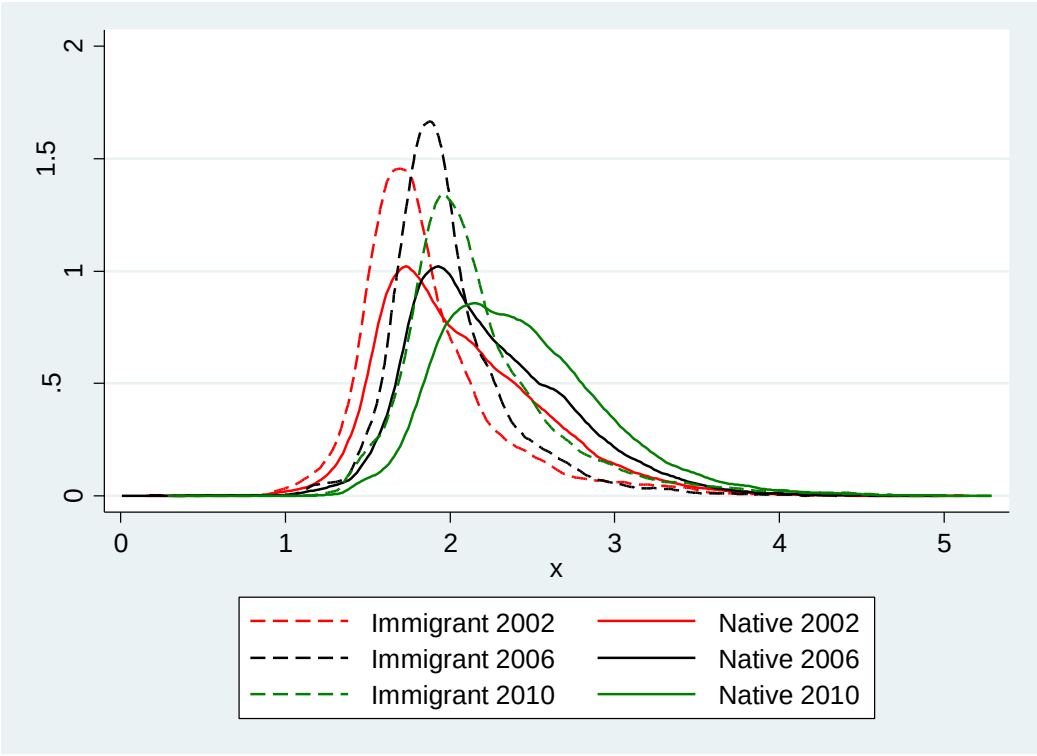




Notes: Model 1 includes as explanatory variables individual characteristics and job and firm attributes.

Appendix

Figure A.1.
Kernel density functions of the logarithm of hourly wages of native and immigrant men.



Notes: The figure includes the density function of the logarithm of the hourly wage.

Table A.1.
Descriptive statistics. Native and immigrant men.

	2002		2006		2010	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
Hourly wage	9.170	7.435	10.701	8.023	13.334	10.381
	(6.30)	(6.57)	(6.97)	(5.07)	(9.75)	(9.10)
Logarithm of hourly wage	2.073	1.869	2.235	1.991	2.441	2.182
	(0.49)	(0.44)	(0.49)	(0.38)	(0.51)	(0.48)
Immigrant: Europe	-	0.345	-	0.358	-	0.437
Immigrant: Latin America	-	0.294	-	0.346	-	0.322
Immigrant: Rest of the world	-	0.360	-	0.296	-	0.241
Age: less than 30	0.256	0.331	0.222	0.287	0.148	0.223
Age: between 30 and 45	0.466	0.555	0.468	0.576	0.500	0.617
Age: more than 45	0.278	0.114	0.310	0.137	0.352	0.159
Primary education	0.294	0.553	0.273	0.542	0.172	0.357
Secondary education	0.555	0.352	0.541	0.372	0.599	0.484
Tertiary education	0.151	0.095	0.185	0.085	0.229	0.159
Tenure	7.937	1.330	8.126	1.243	9.960	2.375
	(9.70)	(3.23)	(9.85)	(2.78)	(10.23)	(3.04)
Fixed-term contract	0.256	0.582	0.261	0.580	0.202	0.395
Part-time job	0.041	0.056	0.066	0.072	0.086	0.127
Supervisory tasks	0.294	0.176	0.227	0.081	0.226	0.116
Directors and managers	0.032	0.015	0.036	0.009	0.042	0.023
Technical and scientific professionals	0.084	0.056	0.090	0.029	0.131	0.085
Technicians and associate professionals	0.136	0.054	0.133	0.041	0.199	0.091
Office and administrative staff	0.079	0.022	0.086	0.028	0.083	0.052
Caterers and vendors	0.075	0.097	0.062	0.075	0.081	0.110
Workers skilled in agriculture	0.002	0.003	0.003	0.003	0.004	0.007
Skilled workers in manufacturing and construction	0.254	0.311	0.266	0.343	0.219	0.274
Operators of plant and machinery	0.240	0.173	0.210	0.167	0.156	0.128
Elementary occupations	0.099	0.270	0.114	0.305	0.085	0.230
Mining and quarrying	0.017	0.019	0.013	0.010	0.006	0.007
Manufacturing	0.438	0.348	0.398	0.288	0.384	0.269
Production of electricity, gas and water	0.013	0.002	0.008	0.001	0.033	0.020
Construction	0.146	0.286	0.153	0.349	0.104	0.207
Trade	0.077	0.048	0.080	0.051	0.131	0.123
Hospitality	0.047	0.111	0.043	0.103	0.020	0.065
Transport and communications	0.055	0.048	0.063	0.068	0.060	0.035
Financial intermediation	0.058	0.007	0.055	0.005	0.038	0.007
Real estate and rental	0.068	0.071	0.088	0.089	0.135	0.188
Education	0.030	0.029	0.039	0.016	0.014	0.009
Health	0.033	0.008	0.040	0.007	0.038	0.020
Other social and services activities	0.018	0.023	0.021	0.015	0.037	0.050
Firm size less than 20	0.216	0.269	0.227	0.296	0.222	0.297
Firm size 20-49	0.271	0.291	0.263	0.299	0.132	0.170
Firm size 50-99	0.150	0.163	0.134	0.150	0.110	0.127
Firm size 100-199	0.111	0.121	0.105	0.107	0.143	0.123
Firm size 200-499	0.145	0.095	0.140	0.075	0.219	0.165
Firm size 500 or more	0.107	0.061	0.130	0.072	0.174	0.118
National sectoral collective agreement	0.356	0.344	0.378	0.345	0.384	0.368
Sub-national sectoral collective agreement	0.542	0.631	0.534	0.639	0.502	0.559
Firm collective agreement	0.102	0.025	0.089	0.016	0.114	0.072
Number of observations	75,549	2,875	75,319	6,876	87,875	6,584

Notes: Standard deviation for continuous variables in brackets.