THE WAGE GAP OF IMMIGRANTS IN THE PORTUGUESE LABOUR MARKET*

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ABSTRACT

Using matched employer-employee data, we examine the wage gap upon arrival between immigrant and native workers in the Portuguese labour market in the 2002-2008 period. We use the relation between Gelbach's and Oaxaca-Blinder's decompositions to split the unconditional average wage gap as the sum of a composition effect and a wage structure effect. Our results show that most of the wage gap is not due to worst endowments of the immigrants compared to natives but to differences in the returns to those characteristics and to the immigrant status effect. In particular, education and foreign experience of the average immigrant are significantly less valued in the Portuguese labour market than natives' education and experience. Total immigrants are a heterogeneous group of different nationalities, with immigrants from the EU15 and China starring as the two extreme cases.

1. Introduction

Portugal has traditionally been a country of emigration and significant immigration flows began more recently. Until the mid-nineties, immigration in Portugal was relatively modest in international terms, comprising mainly nationals from Portuguese speaking countries. In the late nineties, immigration accelerated and there was an important change in the main countries of origin. A substantial part of these more recent arrivals originated from Central and Eastern European countries, with no particular historical or cultural link with Portugal, and, more recently, from Brazil.

The rapid increase of immigration in Portugal, together with the change in its nationality composition, raises new questions regarding the economic performance of immigrants. Do they earn the same wages as natives upon arrival? If not, what accounts for the difference? Are these results homogeneous across main immigrant nationalities? This article aims at answering these questions using a matched employer--employee longitudinal database (*Quadros de Pessoal*) from 2002 to 2008. A related question is how the immigrant-native wage differential evolves as experience in Portuguese labour market increases (wage assimilation). This issue will not be examined in detail in this article, remaining a question for future research.

Starting with Chiswick (1978), it is commonly observed that immigrants earn less upon arrival than comparable native workers. The imperfect portability of human capital, in particular education and work experience, acquired in the country of origin, as well as the lack of fluency in the destination language were found to be important determinants of this wage gap (Friedberg (2000)). Over time, immigrants' wages tend to catch up to natives' wages as they engage in a process of acquiring skills relevant for the destination country.

In this article, we examine the wages of immigrants in the Portuguese labour market identifying the major differences with native employees upon arrival. In the line of Friedberg (2000), we investigate if education and labour market experience obtained in different countries are rewarded differently in the Portuguese labour market. Given the nature of recent immigration flows in Portugal, we also examine immigrants by main regions of origin, to see if the returns to these characteristics are homogeneous across different immigrant groups.

The article is organized as follows. Section 2 presents the longitudinal database used (*Quadros de Pessoal*) and section 3 describes the main characteristics of immigrants relative to those of native workers. The estimation methodology is outlined in section 4. Section 5 presents our main empirical results, accounting for the potential heterogeneity of the immigrants by country of origin. Finally, section 6 presents some concluding remarks.

2. Database and identification strategy

The database used in this article is *Quadros de Pessoal* (QP), a longitudinal dataset matching workers and firms based in Portugal. The data are made available by the Ministry of Labour and Social Solidarity, drawing on an annual mandatory employment survey that covers virtually all establishments with wage earners in Portugal in a reference month (October), outside of Public Administration and domestic work. Given that it is compulsory, it does not suffer from the non-response problems that often plague standard household and firm surveys. Apart from the advantage of its comprehensive coverage, it is also generally recognized that this dataset is reliable by virtue of its public availability.

Reported data cover the establishment itself (establishment identifier, location, economic activity, employment, etc), the firm (firm identifier, location, economic activity, employment, sales, ownership, etc) and each of its workers (social security identifier, gender, age, education, skills, occupation, tenure, employment status, hours worked, earnings, etc). The information on earnings is very complete, including the base wage, regular and irregular wage benefits and overtime pay.

The worker-level data cover all years since 1986, except for 1990 and 2001, but information on the nationality of the worker only starts in 2000, so our sample period starts in 2002 and ends in 2008. The exact nationality at the country level of the worker is the only information available that helps to identify migrant workers in QP, since neither the place of birth nor the year of arrival to Portugal are recorded. Nevertheless, given the nature of recent immigration in Portugal and the low naturalisation rate, the sample of immigrants covered in QP database seems to be a reasonable approximation of the target population. Since some workers do not report their nationality in every year considered, we further assumed that individuals that declare at least once to be foreign nationals are immigrants and maintain that nationality throughout the whole period (see D'Amuri *et al*. (2010) for a similar assumption).

Regarding data on formal education, the QP dataset has information on the highest level of education completed by each worker but not on the country where that level of education was attained. So, we cannot differentiate between foreign and domestic schooling. However, recent immigrant flows in Portugal were linked with employment opportunities and, hence, it is reasonable to assume that most of these immigrants completed their education in the country of origin. We defined 6 education categories based on the International Standard Classification of Education (ISCED): illiterate (no formal education or below ISCED 1), 4 years completed (primary education) and 6 years completed (first stage of basic education) are both included in ISCED 1, 9 years completed refers to ISCED 2 (lower secondary education), 12 years completed refers to ISCED 3-4 (upper-secondary) and tertiary refers to ISCED 5-6.

The QP database has no information on the date of arrival in Portugal, hence we can not directly obtain the variable of the time spent in the destination country, commonly referred to as years since migration. However, we can obtain information on the date that each individual (native and immigrant) first entered private employment (legally) in Portugal. When this occurs, each worker is given an identification number

that is unique and remains constant over time. We used this property of the data to trace back each worker present in the 2002-2008 database to its first record. The database also has information on the date of admission of each worker in each firm. Since the QP database only starts in 1986, we used the minimum of the two records (year the worker first appears in the database and first year of admission in a firm) as the date of entry in the Portuguese labour market. For immigrants, this information is used to compute a proxy of time spent in Portugal, *i.e.*, years since migration. A caveat of this measure is that the date of entry in private employment does not necessarily coincides with the actual date of entry in Portugal, since a significant part of the recent immigration flows in Portugal were of irregular nature, as evinced by the series of regularisations that occurred since 2000 (see Marques and Góis (2007) for a description of recent Portuguese immigration policies).

Nevertheless, the detailed characteristics of the QP database still make it suitable to study the wage performance of immigrants in Portugal. At present, empirical evidence on the behaviour of immigrants in the Portuguese labour market is relatively scarce, probably reflecting the novelty of the phenomenon. Some exceptions are Carneiro et al. (2012) who study the wage assimilation of immigrants in the Portuguese labour market in 2003-2008 and Cabral and Duarte (2010) that provide a comprehensive description of the main features of recent immigration flows in Portugal from 2002 to 2008, both using the QP database.

Some additional filters were imposed on the database to eliminate erroneous, inconsistent or missing reports. First, the analysis was restricted to individuals for whom there was information available for a set of key variables, such as gender, age, nationality, industry and tenure. Second, we further restricted our sample to workers aged between 15 and 80 years and with a job tenure below 65 years. Third, we focused our analysis on the full-time employees segment and we only considered those employees that reported a base wage of at least 80 per cent of the minimum legal wage.[1] Whenever a worker was present more than once in a given year we kept the register corresponding to maximum earnings or maximum hours worked. Fourth, we use a regular wage measure that includes the base wage (monthly gross pay for normal hours of work) and the regular subsidies and premiums paid on a monthly basis like seniority payments.

3. Exploratory analysis

Historically, Portugal has been a country of emigration, but in the late nineties immigration flows grew strongly driven by high labour demand. A significant share of this new immigration flows came from Central and Eastern European countries (CEEC), *i.e.*, from countries with no evident cultural link with Portugal.[2] More recently, there was a very significant increase in immigrants from Brazil. Immigration from China, although growing strongly in the last decade, still represents a small share of total immigrant workers. At present, three major groups make up the bulk of immigration in Portugal, representing around 75 per cent of total: Brazil, Portuguese speaking countries in Africa (PALOP) and CEEC.[3]

Full-time employed immigrants in Portugal increased by 47 per cent in cumulative terms from 2002 to 2008, representing 6.4 per cent of the total in 2008. Table 1 reports the sample means of some relevant variables for natives and immigrants, as well as for the main nationalities of immigrant employees in Portugal.

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[1] By law, the minimum wage of apprentices and trainees can be reduced at most by 20 per cent.

[2] CEEC (Central and Eastern European countries) in the QP database includes Slovakia, Poland, Czech Republic, Hungary, Estonia, Slovenia, Latvia, Lithuania, Romania, Russian Federation, Moldova, Ukraine and Serbia.

[3] PALOP (*Países Africanos de Língua Oficial Portuguesa*) refers to the former Portuguese colonies in Africa (Angola, Cape Verde, Guinea Bissau, Mozambique, and São Tomé and Príncipe).

Table 1

MAIN CHARACTERISTICS OF NATIVE AND IMMIGRANT FULL-TIME EMPLOYEES IN PORTUGAL, AVERAGE 2002-2008							
	Natives	**Immigrants**	**EU15**	**PALOP**	**CEEC**	**Brazil**	**China**
Levels in 2008	2 324 699	159 539	13 294	39 305	37 638	42 266	2 670
Share in total, 2008	93.6	6.4	8.3	24.6	23.6	26.5	1.7
Employment status (%)							
Permanent contract	77.6	45.2	66.3	49.6	35.4	35.9	44.0
Fixed-term contract	22.4	54.8	33.7	50.4	64.6	64.1	56.0
Age							
Average years	37.9	35.7	36.5	36.5	36.3	33.0	34.3
% workers aged less than 35 years	43.4	50.5	51.1	45.7	47.5	62.4	53.9
Gender (%)							
Male	57.0	65.0	56.6	58.9	75.4	61.1	64.0
Female	43.0	35.0	43.4	41.1	24.6	38.9	36.0
Work experience in Portugal							
Average years	13.0	5.1	7.4	6.7	2.9	2.9	3.1
Educational attainment (%)							
Illiterate	1.2	4.1	0.5	4.8	6.3	1.7	15.4
4 years completed	24.0	23.2	7.9	34.1	20.6	16.7	38.8
6 years completed	22.1	17.0	11.7	16.9	16.9	18.5	15.0
9 years completed	21.6	24.3	19.9	21.8	26.7	27.9	20.0
12 years completed	20.0	23.0	29.7	16.7	23.7	29.3	7.6
Tertiary	11.0	8.5	30.2	5.8	5.9	5.8	3.2
Main sectors of activity (%)							
Manufacturing industry	28.4	15.7	20.6	8.8	22.0	10.7	1.4
Construction	11.4	23.7	8.2	28.5	31.9	19.2	0.6
Services, of which:	57.6	57.6	68.9	61.9	40.0	68.3	98.0
Wholesale and retail trade	20.0	13.5	19.9	11.1	9.1	15.8	49.9
Hotels and restaurants	6.2	15.3	11.5	14.6	10.6	23.5	45.1
Business services	9.6	15.5	12.8	23.6	10.7	15.2	1.1
Other sectors	2.6	3.0	2.3	0.8	6.1	1.9	0.1
Average real monthly wage							
In Euros	853.7	745.7	1463.4	681.2	609.3	723.7	456.1
Wage gap to natives							
In Euros		-108.0	609.8	-172.4	-244.3	-129.9	-397.6
In log points		-15.0	33.2	-16.9	-24.3	-19.3	-49.5
% Minimum wage earners	8.0	12.6	6.8	8.4	13.3	16.7	57.3

Sources: *Quadros de Pessoal* and authors' calculations.
Notes: The shares of main immigrant groups are computed as a percentage of total immigrants. EU15 includes the initial 15 Member-States of European Union except Portugal. CEEC (Central and Eastern European countries) includes Slovakia, Poland, Czech Republic, Hungary, Estonia, Slovenia, Latvia, Lithuania, Romania, Russian Federation, Moldova, Ukraine and Serbia. PALOP (*Países Africanos de Língua Oficial Portuguesa*) refers to the former Portuguese colonies in Africa (Angola, Cape Verde, Guinea Bissau, Mozambique, and São Tomé and Príncipe). Illiterate refers to no formal education or below ISCED 1, 4 years completed (primary education) and 6 years completed (second stage of basic education) are both included in ISCED 1, 9 years completed refers to ISCED 2 (lower secondary education), 12 years completed refers to ISCED 3-4 (upper-secondary) and tertiary refers to ISCED 5-6. ISCED stands for International Standard Classification of Education. The wage gap in log points corresponds to the difference in log real hourly wages between natives and immigrants. The percentage of minimum wage earners was computed considering workers with wage in the interval of +/- 1 euro centered on the minimum wage.

One of the most notable differences between immigrants and natives in the Portuguese labour market relates to the nature of the contract, *i.e.*, permanent versus fixed-term. In the 2002-2008 period, more than half of immigrant workers had a fixed-term contract, compared to around 22 per cent for native employees. By main nationality groups, the proportion of workers with fixed-term contracts is the highest for workers from Brazil and CEEC.

Immigrant workers in Portugal are younger than natives. Workers with less than 35 years account for around 43 per cent of total natives but represent about 50 per cent of immigrants. This difference is higher in the case of workers from China and, especially, from Brazil.

The percentage of females in immigrant employment is lower than in native employment, but the exclusion of domestic work from the analysis tends to underestimate female employment in Portugal. The share of female workers is higher in the case of the EU15 and PALOP (more than 40 per cent in both cases) and lower in the case of CEEC.[4]

As expected, given the recent nature of most immigrant flows in Portugal, the effective work experience of immigrant workers in Portugal is much lower than that of natives. Within immigrants, experience in Portugal is higher for workers from the EU15 and, to a lesser extent, from PALOP, which are the immigrant groups that have been longer in the country.

The differences in educational attainment between natives and immigrants as a whole are not substantial, even if the share of illiterates is higher for immigrants. However, there are important differences among the main immigrant groups. Immigrants from China stand out by their extremely low educational level, with around 15 per cent of illiterates and only around 3 per cent of workers with tertiary education. The proportion of workers with a tertiary education is very similar in immigrants from the PALOP, CEEC and Brazil, but the Brazilians have a smaller share of individuals with very low education levels. In contrast, the educational attainment of immigrants from the EU15 is significantly higher than that of all other nationality groups, including the natives, with more than 30 per cent of them having tertiary education.

Immigrant employment in Portugal is concentrated in a few sectors, namely construction and some services activities. Construction is the main sector of immigrant employment in Portugal, accounting for almost 24 per cent of the total. The employment share of the services sector as a whole is similar for natives and immigrants but the breakdown within services is very different. Immigrants are especially concentrated in three sub-sectors: hotels and restaurants, real estate and business services, and wholesale and retail trade.

Regarding wages and not controlling for any differentiating factors, immigrants in Portugal are, on average, paid below the wages of native workers in the 2002-2008 period.[5] The average real hourly wages of immigrant workers are 15.0 log points or 13.9 per cent ($= \exp(-0.150) - 1$) below the average wages of natives, but there are substantial differences among immigrants. The average wage of workers from the EU15 is about twice as high as the average immigrant wage and substantially higher than the average native wage. In contrast, Chinese immigrants earn wages significantly lower than other migrant groups.

The proportion of workers that are paid the minimum wage is higher for immigrants than for natives.[6] Immigrants from the EU15 have the lowest share of minimum wage earners, even lower than that of natives, while more than 57 per cent of Chinese workers are reported as earning the minimum wage in this period.

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4 EU15 includes the initial 15 Member-States of European Union except Portugal.

5 In the regression analysis of the next section, real hourly wages are the dependent variable. We also included the real monthly wage in this descriptive analysis as it results in more intuitive values and the conclusions remain unaltered.

6 The percentage of minimum wage earners was computed considering workers with a monthly wage in the interval of +/- 1 euro centered on the minimum wage.

4. Estimation strategy

Most of the studies on wage assimilation of immigrants treat education and labour market experience obtained in different countries as perfect substitutes. However, Friedberg (2000) highlights the importance of taking into account differences between immigrants and natives in their returns to human capital. The imperfect portability of education and experience acquired in the country of origin results in lower returns to foreign human capital of immigrants in comparison to natives' domestic human capital. In addition, returns to experience and education obtained in the destination country were also found to differ between natives and immigrants. Given the characteristics of our sample, we cannot completely differentiate returns to education of natives and immigrants because we have no information on the place where the formal education was obtained. Nevertheless, we can allow for different returns to education for natives and immigrants irrespective of the place where the formal grade was obtained. As regards labour market experience, we can allow the returns to foreign and domestically acquired experience of immigrants to differ, as well as the returns of domestic work experience of natives and immigrants.

For this purpose and following Friedberg (2000), let us start with:

$$\log W_{it} = \alpha + \beta_0 imi + \beta_1 ysm + \beta_2 pexp + \gamma_2 imi * pexp + \sum_{j=1}^{5} \beta_{3j} edu_j$$
$$+ \sum_{j=1}^{5} \gamma_{3j} imi * edu_j + \psi X_{it} + \varepsilon_{it}$$

(1)

where $\log W_{it}$ is the natural logarithm of the real hourly wage of individual i at time t, imi is a dummy variable for immigrant status, ysm is a proxy for years since migration, edu_j are the formal education categories described in section 2 (illiterate workers are the omitted category), $pexp$ is the traditional potential work experience, or education-corrected age, computed as age minus 6 minus years of education, and ε_{it} is a conventional stochastic error term. Other characteristics that potentially affect wages are included in the vector X_{it}. As we analyse both males and females, X_{it} has a variable on the worker's gender (the reference group being male). A dummy variable identifying fixed-term contracts is also included. The equation also controls for sector, geographical and year-specific effects. The reference categories are 2002 for the time dummies, Lisboa for the geographical location and manufacturing industry for the sectoral classification. Appendix A describes all variables used in the analysis.

In equation 1, the coefficient β_0 measures the wage gap upon arrival between an immigrant and a comparable native, both illiterate and without any work experience. As denoted by this interpretation, the wage gap is computed throughout the text as the wage of immigrants minus the wage of natives. The γ_{3j} coefficients measure the difference in the returns to education between immigrants and natives for the other 5 educational levels considered, with β_{3j} denoting the returns to the different education categories for natives. Ignoring higher order polynomials, the γ_2 coefficient captures the difference between the returns of one year of work experience of an immigrant in his home country and one year of experience of a native worker in Portugal, and the β_1 coefficient captures the difference between the returns to domestic and foreign experience of immigrant workers. The sum of β_1 and γ_2 captures the difference in the returns to experience of immigrants and natives in the Portuguese labour market.

In this article, we estimated a more flexible version of equation 1, allowing for the impact of all variables to vary between natives and immigrants (coefficients γ in equation 2), as follows

$$\log W_{it} = \alpha + \beta_0 imi + \sum_{j=1}^{m} \beta_j x_j + \sum_{j=1}^{m} \gamma_j imi * x_j + \varepsilon_{it}$$

(2)

where m denotes the total number of covariates included in the model. When including interactions between all variables considered and the immigrant dummy this is equivalent to estimating separate regressions for native and immigrant workers.

While the above specification permits the distinction between natives and immigrants, in the case of immigrants it assumes that the effects are homogeneous across different nationality groups. As described in section 3, immigrant workers in Portugal are not a homogeneous group and considering immigrants as a whole conceals important differences among nationalities. In an alternative specification, we augmented equation 2 by replacing the immigrant dummy variable with a set of indicators for the major immigrant communities in Portugal (Brazil, PALOP and CEEC) and also for EU15 and China. Immigrants from the EU15 are quite different from the average immigrant worker, as these workers are much more qualified and earn much higher wages, on average. At the other extreme are the immigrants from China, which grew strongly in recent years: they are the least qualified and earn the lowest wages, on average.

4.1. Decomposition analysis

Let us focus on the following questions: whether immigrants earn the same wages as natives upon arrival and, if not, how this wage gap is influenced by differences in endowments and returns to worker and firm characteristics. Instead of resorting to the sequential comparison across specifications of the coefficient of interest (in this case, the β_0 coefficient, denoting the wage gap upon arrival), which is a quite common procedure but can lead to misleading conclusions, we use the decomposition technique proposed by Gelbach (2010). While the results obtained from the simple comparison of the estimates for different specifications are influenced by the sequence of specifications, Gelbach's procedure is path--independent and consistently delivers the individual contribution of each additional variable, conditional on all other regressors.

Consider as base model the regression of $\log W_{it}$ in a constant and a dummy variable for immigrant status (imi) and as full model the one specified in equation 2. The aim of this analysis is to have a better grasp on how β_0 is influenced by introducing additional regressors in the base model. Gelbach shows that the difference between the coefficient of interest in both models ($\beta_0^{base} - \beta_0^{full}$) can be additively decomposed into δ_i contributions, where i represents the regressors added to the full model and not included in the base model.[7] The contributions can be calculated as

$$\delta = (X'_{base} X_{base})^{-1} X'_{base} X_{full} \beta^{full}$$

(3)

where X_{base} denotes the regressors included in the base model - dummy variable for immigrant status -, X_{full} are the regressors included only in the full model and β^{full} are the coefficients in the full model associated with X_{full} variables. The δ_i contributions are the mean gap between immigrants and natives over the i regressors scaled by the coefficient of these regressors in the full model.

Another way of seeing this is by saying that β_0^{base}, i.e., the unconditional average wage gap, is the sum of two terms - the composition effect and the wage structure effect. The composition effect represents the part of the unconditional wage gap that can be attributed to differences (relative to natives) in the average levels of the variables included in the model, except ysm.[8] The wage structure effect is the sum of the contributions associated with ysm and with all the interaction variables (differences in returns) and the unexplained part of the gap due to "group membership" (the immigrant dummy, β_0^{full}, that also captures all potential effects of differences in unobserved variables). Analytically,

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7 Since this decomposition is additive, one can obtain δ_i contributions for groups of regressors, e.g. J sector dummies, as the sum of group-wise components, $\delta_{sector} = \sum_{j=1}^{J} \delta_j$. Furthermore, robust standard errors clustered at the individual level are considered. For more details, see Gelbach (2010).

8 The differences in the covariates are weighted by the coefficients of natives. This procedure resumes to building a counterfactual scenario where the returns to the covariates for immigrants are assumed to be the same as for natives, being exclusively assessed the impact of differences in the levels of the covariates.

$$\beta_0^{base} = \underbrace{(\overline{X}_{full}^{imi} - \overline{X}_{full}^{natives})\beta_{natives}^{full}}_{\text{Composition effect}} + \underbrace{\overline{X}_{full}^{imi}(\beta_{imi}^{full} - \beta_{natives}^{full}) + \beta_0^{full}}_{\text{Wage structure effect}} \qquad (4)$$

where $\overline{X}$ are the sample averages. This reasoning owes to the well-known strand of the literature on decompositions of mean wage differentials, namely the Oaxaca-Blinder decomposition (Oaxaca (1973) and Blinder (1973)).

As discussed in Fortin *et al.* (2011), to include categorical variables with more than two categories - in our case, educational attainment, sectors, regions and time effects - raises some difficulties in the interpretation of the results of the wage structure effect. In particular, the possibility of separating the differences in the returns of the omitted category from the "true" unexplained component is hindered. Although the overall wage structure effect is independent of the omitted categories chosen, the differences in the returns to individual variables, as well as β_0^{full}, vary with this choice. One should bear in mind the fact that these individual effects are always conditional on the choice of the omitted categories and, thus, should be interpreted carefully.

5. Empirical results

In this section, we begin by examining the wage differences between immigrants and natives, using the database for the 2002-2008 period presented in section 2 and the estimation strategy outlined in section 4. Then, we analyse the heterogeneity of the results by main regions of origin of immigrants in section 5.2.

5.1 Base results

As shown in the second column of Table 1, the simple difference in means between log wages of immigrant and native workers amounts to -15.0 log points. How does controlling for other variables affect this unconditional wage gap? The first column of Table 2 includes the estimation results of equation 2 that allows the impact of all characteristics to vary between natives and immigrants. Using these estimates, the coefficient of the immigrant dummy is 20.5 log points, meaning that the wage upon arrival of an immigrant whose characteristics match the omitted categories is 20.5 log points, or 22.8 per cent, higher than the wage of a comparable native, both without any work experience. Recall that the omitted categories are: illiterate, male, manufacturing sector, Lisbon, permanent contract and 2002. So, what are the main drivers behind the unconditional average wage gap of -15 log points between immigrants and natives? The first column of Table 3 shows the results of applying Gelbach's decomposition. The total composition effect amounts to -2.1 log points and the total wage structure effect is -12.9 log points. Starting from the -15.0 log points of unconditional wage gap of the average immigrant, -2.1 log points reflect differences in the average values of the variables between immigrant and native workers and -12.9 log points result from differences in the returns of these variables compared to natives and from the immigrant status effect. So, the majority of the wage gap is explained by differences in the returns of the covariates and by the "group membership" effect, and not by differences in endowments.

Let us look into more detail to each individual contribution to the composition effect, starting with the characteristics whose differences in means favour the immigrants. Controlling for gender increases the wage gap, as in our database the share of female workers is smaller among immigrants and there is a wage penalty associated with female workers. If the share of female workers was the same for natives and immigrants, then the average wage gap would be 1.9 log points higher. Similarly, since immigrant workers are more concentrated in regions with higher wages, on average, and higher employment growth (see Cabral and Duarte (2010)), if the geographical concentration of immigrants and natives was the same, then the wage gap would be 3.9 log points higher.

Table 2

POOLED OLS REGRESSION ESTIMATES, 2002-2008, DEPENDENT VARIABLE: LOG OF REAL HOURLY WAGE						
	Immigrants	**EU15**	**PALOP**	**CEEC**	**Brazil**	**China**
imi	0.205	0.073	0.221	0.254	0.274	0.255
	[0.000]	[0.121]	[0.000]	[0.000]	[0.000]	[0.000]
pexp	0.034	0.034	0.034	0.034	0.034	0.034
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
pexp²	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
imi*pexp	-0.023	0.012	-0.022	-0.030	-0.027	-0.033
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
imi*pexp²	0.0002	-0.0002	0.0002	0.0003	0.0003	0.0004
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ysm	0.025	-0.009	0.020	0.025	0.038	0.012
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
ysm²	-0.0004	0.0004	-0.0002	-0.0002	-0.0007	0.000
	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.985]
gender	-0.237	-0.237	-0.237	-0.237	-0.237	-0.237
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
imi*gender	0.049	-0.055	0.059	0.068	0.062	0.219
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
edu₁	0.070	0.070	0.070	0.070	0.070	0.070
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
edu₂	0.192	0.192	0.192	0.192	0.192	0.192
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
edu₃	0.379	0.379	0.379	0.379	0.379	0.379
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
edu₄	0.623	0.623	0.623	0.623	0.623	0.623
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
edu₅	1.281	1.281	1.281	1.281	1.281	1.281
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
imi*edu₁	-0.065	-0.031	-0.053	-0.054	-0.054	-0.068
	[0.000]	[0.492]	[0.000]	[0.000]	[0.000]	[0.000]
imi*edu₂	-0.141	-0.024	-0.140	-0.170	-0.151	-0.188
	[0.000]	[0.583]	[0.000]	[0.000]	[0.000]	[0.000]
imi*edu₃	-0.260	0.028	-0.256	-0.339	-0.294	-0.356
	[0.000]	[0.537]	[0.000]	[0.000]	[0.000]	[0.000]
imi*edu₄	-0.395	0.051	-0.375	-0.571	-0.456	-0.572
	[0.000]	[0.253]	[0.000]	[0.000]	[0.000]	[0.000]
imi*edu₅	-0.435	0.112	-0.391	-1.059	-0.582	-0.941
	[0.000]	[0.014]	[0.000]	[0.000]	[0.000]	[0.000]
contract	-0.078	-0.078	-0.078	-0.078	-0.078	-0.078
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
imi*contract	0.031	-0.034	0.040	0.087	0.058	0.043
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Other controls	-Yes-	-Yes-	-Yes-	-Yes-	-Yes-	-Yes-
No. of observations	15 932 970	15 060 001	15 215 980	15 247 469	15 174 975	14 990 179
R²	0.4515	0.4588	0.4576	0.4571	0.4567	0.4585

Source: Authors' calculations.
Notes: p-values in brackets (implicit standard errors are worker-cluster robust). See the main text and Appendix A for a full description of all variables included.

Table 3

DECOMPOSING THE IMMIGRANT-NATIVE WAGE GAP (OAXACA-BLINDER DECOMPOSITION): CONTRIBUTION OF REGRESSORS INCLUDED IN FULL MODEL WITH INTERACTIONS		
Reference group:	Illiterate	12 years of education
Unconditional wage gap	-0.150	-0.150
Composition effect: *of which:*	-0.021	-0.021
Potential work experience	-0.015	-0.015
Gender	0.019	0.019
Contract	-0.025	-0.025
Sector	-0.024	-0.024
Region	0.039	0.039
Time effects	0.000	0.000
Education	-0.014	-0.014
Wage structure effect: *of which:*	-0.129	-0.129
Years since migration	0.101	0.101
Potential work experience	-0.371	-0.371
Gender	0.017	0.017
Contract	0.017	0.017
Sector	0.052	0.052
Region	0.072	0.072
Time effects	0.008	0.008
Education	-0.230	0.165
Immigrant dummy	0.205	-0.189

Source: Authors' calculations.
Notes: The immigrant dummy represents the unexplained part of the gap due to "group membership". The decomposition of the unconditional wage gap follows the strategy described in equation 4. Please refer to the text for more details. All coefficients reported are statistically significant at a level of significance of 1 per cent.

In turn, immigrants tend to be employed in sectors with below average wages, namely construction, hotels and restaurants and wholesale and retail trade, as shown in Table 1. Hence, part of the unconditional average wage disadvantage of immigrants is due to their sectoral concentration. Regarding the type of contract, there is a much higher proportion of immigrants with fixed-term contracts and there is an average wage penalty associated with these contracts, so controlling for this composition effect leads to a decline in the wage gap. A similar reasoning applies to the educational attainment. Finally, wages increase with potential experience and immigrants have, on average, lower values for this variable. If mean potential experience of immigrants was the same of natives, the wage gap would be 1.5 log points lower.

Regarding the breakdown of the wage structure effect, let us start with the difference in the returns to potential work experience. This difference has a strong negative contribution to the wage gap. If the returns to potential work experience were the same between natives and immigrants, the wage gap would be 37.1 log points lower. However, based on the standard errors of the Gelbach's decomposition procedure, the hypothesis of different returns is not rejected. Recall from the discussion in section 4 that the coefficients associated with potential work experience have different interpretations for natives and immigrants in the full model regression. For natives, it captures the impact on wages of an additional year of experience in the Portuguese labour market. For immigrants, the coefficient associated with the interaction of the immigrant dummy with the variable potential work experience measures the difference between the returns of one year of work experience of an immigrant in his home country and one year of experience of a native in Portugal. This estimated difference is negative, meaning that pre-immigration work experience of immigrants is less valued than domestic experience of natives, which is consistent with the idea of imperfect portability of human capital across countries. Using the estimates of the first column of Table 2, one additional year of experience in the Portuguese labour market increases the average real hourly wages of native workers by 3.4 log points, while one additional year of foreign experience

increases the real hourly wages of immigrant workers by 1.0 log points (3.4 – 2.3).[9] So, foreign potential experience of immigrants is rewarded by less than one third than domestic potential experience of natives. Thus, for comparable workers with the same amount of potential experience, one additional year of potential experience deepens the wage gap upon arrival between immigrants and natives.

Controlling for the variable years since migration (ysm) leads to an increase of 10.1 log points in the conditional wage gap. The coefficient β_0 in the full model measures the wage gap upon arrival of immigrants to the host country, while in the base model we have the average wage gap across all immigrants. The coefficient associated with ysm (β_1) captures the difference between the returns to domestic and foreign experience of immigrant workers. The estimated β_1 coefficient is positive, meaning that foreign experience of immigrant workers is less valued than their domestic experience. This difference in returns results in a large positive contribution to the wage structure effect. Moreover, the difference between the returns to an additional year of domestic experience between immigrants and natives shows how the relative initial situation of immigrants changes with years in Portugal (Borjas (1999)). Ignoring the squared terms for the sake of simplicity, this difference in returns is only 0.2 log points (2.5 – 2.3). Although the study of the wage assimilation of immigrants in the Portuguese labour market is beyond the scope of this article, this result points to no substantial evolution of the relative wage of the average immigrant compared to the average native over time.

The returns to gender and type of contract have similar positive (though small) contributions to the wage gap upon arrival. If returns to gender were the same between native and immigrant workers then the wage gap would increase by 1.7 log points. This evidence implies that the wage penalty associated with being a female worker is smaller in the case of immigrants. The same reasoning applies to the type of contract. If the penalty associated with having a fixed-term contract relative to a permanent contract was the same for natives and immigrants, the wage gap would also be 1.7 log points higher.

Recall that in the presence of categorical variables, the contributions of these variables to the wage structure effect are always conditional on the choice of the omitted categories. In addition, the immigrant status coefficient includes the average wage gap for the omitted categories, as well as the potential effect of unobserved variables. The comparison of the two columns of Table 3 illustrates this point, focusing on the educational attainment variable. The only difference between the two columns is the reference group, or omitted category, of the education variable, which is 12 years of schooling (upper-secondary education) in the second column.

Starting with the first column, conditional on the choice of illiterate, manufacturing, Lisboa and 2002 as omitted categories, the returns to education of immigrants are lower than those of natives for the other schooling levels. If the returns to an additional level of education relative to being illiterate were the same between immigrant and native workers, the wage gap would be 23.0 log points lower. However, this does not mean that the contribution of different returns to education is -23.0 log points because this value can not be dissociated from the estimate obtained for the immigrant dummy (20.5 log points), which also includes the impact of the difference in returns for the omitted category of education. Given that we have more than one categorical variable, this value also includes the implicit contribution of the difference in returns of the omitted categories of the sector, region and time effects.

Turning to the second column of Table 3, omitting the category of 12 years of education and keeping the rest constant, from the Gelbach's procedure we obtain a positive contribution of different returns to education to the respective wage gap (16.5 log points). If the returns to the other levels of education relative to having 12 years of schooling were the same for natives and immigrants, the wage gap would

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9 For the sake of simplicity, this discussion ignores the squared terms. This simplification does not affect the signal of the impacts, only their magnitude over time. For instance, when evaluated at 5 years of experience, an additional year of foreign experience of the immigrants increases the average wage by 0.8 log points, while the return of an additional year of domestic experience is 2.9 log points for a native.

be 16.5 log points higher. Again this effect can not be detached from the value estimated for the immigrant dummy: conditional on all other variables, an immigrant with 12 years of education would earn upon arrival less 18.9 log points than a comparable native. Note that the sum of the contribution of the difference in returns to education and the immigrant dummy is the same in both columns: -2.4 log points.

Given the relevance of differences in returns to formal education in the literature on immigration and the magnitude of the estimated parameters in our regression, let us summarize the conditional wage gap upon arrival by educational attainment level. As these wage gaps are obtained by summing the coefficients associated with the immigrant status variable and the interaction of the different education levels with the estimated immigrant dummy, they are independent of the reference group chosen for the education variable, but still conditional on the omitted categories of the other variables.

As can be seen in the first column of Table 2, the estimated coefficients of the interaction of education and the immigrant status are all negative and the returns on completing one more educational level (compared to being illiterate) of immigrants relative to a comparable native worker are progressively lower as we move up the educational ladder. The wage difference between an illiterate male immigrant worker in the manufacturing sector, in Lisboa, with a permanent contract, without work experience (foreign or in host country), in 2002 and a comparable native is positive and amounts to 20.5 log points, while the wage difference for similar individuals but with 4 years of schooling is 14.1 log points (20.5 – 6.5) and 6.4 log points (20.5 – 14.1) for comparable individuals with 6 years of education completed. This conditional wage gap of immigrants upon arrival becomes increasingly negative for the three higher educational grades: -5.4 log points (20.5 – 26.0) for workers with 9 years of schooling, -18.9 log points for those with 12 years of schooling (20.5 – 39.5) and, finally, -22.9 log points (20.5 – 43.5) for individuals with tertiary education. So, the wages of immigrants with more formal education are relatively more penalised in Portuguese labour market, a result that supports the idea of imperfect transferability of human capital and that the international transferability of education also depends on its grade.

5.2 Accounting for heterogeneity by immigrant origin

In this section, we examine the heterogeneity of the wage gap upon arrival of immigrants in the Portuguese labour market by main nationality groups. We individualise immigrants from the EU15, PALOP, CEEC, Brazil and China. We allow all the coefficients to vary between immigrants and natives and among immigrant groups, which is equivalent to estimating separate regressions for each nationality group.[10] In this section, we focus on the main results by nationality, highlighting the key contrast points among immigrant groups. The columns (2) to (6) of Table 2 include a selection of the main results of replacing the immigrant dummy variable by a set of indicators for each of the main nationalities considered.

As described in section 3, we find a negative unconditional wage differential between the main groups of immigrants and natives, except in the case of immigrants from the EU15. How are these wage differences affected when we control for the characteristics of individuals and firms? As before, we use Gelbach's technique for implementing the Oaxaca-Blinder decomposition. All the gains and caveats of using this decomposition technique discussed above remain valid. Figure 1 shows the general results of this decomposition for each immigrant group, dividing the differential in average wages relative to natives into two terms, a composition effect and a wage structure effect.

Let us start with immigrants from EU15, which have very distinct results from the other immigrant groups examined. Immigrants from EU15 earn, on average, more 33.2 log points than natives, reflecting a positive wage structure effects and, especially, a substantial positive composition effect. The relative difference in the magnitudes of the wage determinants included in the regression largely favours immigrants from the EU15, a result that is in sharp contrast with the other immigrant groups considered. If the average

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10 The full set of results of all individual regressions is available from the authors upon request.

Chart 1

DECOMPOSING THE IMMIGRANT-NATIVE WAGE GAP (OAXACA-BLINDER DECOMPOSITION) FOR THE
MAIN IMMIGRANT GROUPS
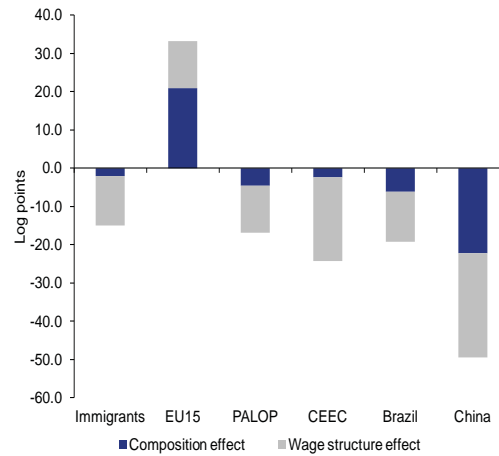
Source: Authors' calculations.
Note: This decomposition follows the technique proposed by Gelbach (2010) and described in section 4.1.

level of the variables included was the same for immigrants from the EU15 and natives, then the wage
difference would be 20.9 log points lower. Moreover, if there were no differences in the gains/penalties
associated with each variable and no unexplained component, then the wage difference would be 12.3
log points lower. Hence, this result suggests that the EU15 immigrants not only have better endowments
but also tend to earn better returns on those variables.

The results of the composition and wage structure effects of Chinese immigrants are quite the opposite.
Both effects are negative and substantial, contributing almost evenly to the relative wage disadvantage
of these immigrants. From the -49.5 log points of unconditional wage gap to natives, -22.3 log points
result from level differences in wage determinants and -27.2 log points reflect differences in the returns
of the variables compared to natives and the immigrant status effect.

With the exception of these two extreme cases, the results of the other immigrants groups are broadly in
line with those obtained for the average immigrant: both effects contribute to the unconditional wage
gap but the wage structure effect clearly dominates. That is, most of the wage gap is not due to worst
endowments of the immigrants compared to natives but to differences in the returns of the covariates
and to the "group membership" effect.

This decomposition technique also provides a detailed breakdown of the contribution of each covariate
for both the composition and wage structure effects. Table 4 depicts the detailed breakdown for the
different immigrant groups. Starting again with immigrants from EU15, the main contribution to the
positive composition effect is associated with the education variable. This highly positive contribution
results from the fact that the educational attainment of immigrants from EU15 is significantly higher
than that of natives (see Table 1). In contrast, potential work experience gives a negative contribution,
as average potential work experience among immigrants from the EU15 is lower than for natives. As the
share of male and female workers is very similar between these immigrants and natives, the composition
effect associated with gender is not statistically significant.

Turning to the positive wage structure effect, the contribution of allowing for different returns on potential
work experience between natives and immigrants from the EU15 is positive, which contrast sharply with
the results for the other immigrant groups. The foreign work experience of immigrants from the EU15
is better rewarded than the domestic experience of natives, as can be seen from the positive coefficient

associated with the interaction of the EU15 immigrant dummy and the potential work experience variable in Table 2. Ignoring the squared terms for the sake of simplicity, one additional year of foreign work experience of these immigrants results in a wage increase of 4.6 log points (3.4 + 1.2), while in the case of natives the increase amounts to 3.4 log points.

In contrast to the average immigrant, for which the wage penalty associated with female and fixed term workers is smaller than for natives, female and fixed term workers from EU15 have a higher wage penalty than similar natives. In addition, their positive wage differential compared to natives declines (although at a decreasing rate) with years since migration. So, controlling for this effect increases the positive wage difference between immigrants from the EU15 and natives.

The breakdown of the composition and wage structure effects for Chinese immigrants is, to some extent, symmetric to the one just described for EU15 immigrants, as least regarding the major contributions to each effect. Firstly, the extremely low educational attainment of Chinese workers contributes strongly to the negative composition effect. Secondly, the negative difference in returns to pre-immigration work experience of Chinese immigrants and domestic experience of natives is the main element behind the negative wage structure effect. Using the regression estimates of Table 2 and ignoring quadratic terms, an additional year of labour market experience abroad increases mean wages of Chinese workers by only 0.1 log points (3.4 – 3.3), which suggests that work experience acquired in China has no substantial wage value in the Portuguese labour market.

Regarding the other wage determinants, the individual contributions for decomposing the wage gap upon arrival obtained for the main groups of immigrants, excluding the EU15, are qualitatively similar to the ones obtained for total immigrants, though with differences in magnitudes. Gender has a positive contribution both in the composition and wage structure effect. This result indicates that for these groups of immigrants the share of females is smaller than for natives and the wage penalty associated with female workers is smaller in the case of immigrants. However, female immigrants from China earn wages that are only 1.8 log points (-23.7 + 21.9) below their male counterparts, the smallest penalty estimated for all nationalities, which compares to a penalty of 23.7 log points for native workers and 18.8 log points (-23.7 + 4.9) for the average immigrant.

The contribution of the type of contract associated with the composition effect is negative, while the contribution associated with the wage structure effect is positive. Hence, immigrant workers from these origins tend to have proportionally more fixed-term links to the labour market but their wage penalty associated with that link is smaller than for natives. However, in contrast with a penalty of 7.8 log points for natives and 4.7 log points (-7.8 + 3.1) for the average immigrant, immigrants from the CEEC working under a fixed-term contract have wages that are slightly above the ones of their compatriots with a permanent contract (0.9 log points).

As it was done for the average immigrant in the previous section, let us finalize by examining the wage gap upon arrival for the different immigrant groups by educational attainment level. The regression estimates included in Table 2 show that, with the exception of immigrants from the EU15, the returns to education (in comparison to an illiterate worker) of the various immigrant groups are always lower than those of native workers across all educational levels. This result confirms the idea of imperfect transferability of education across borders, but there are important differences among immigrant groups. The highest difference in the returns to education compared to natives is obtained for workers from the CEEC and China, especially in the highest educational level. An average immigrant from the CEEC with tertiary education earns only more 22.2 log points (128.1 – 105.9) than a comparable illiterate worker of the same nationality, compared to 128.1 log points for a native worker and 84.6 log points for the average immigrant. The returns to tertiary education for an average Chinese worker (34.0 log points) are also significantly lower than the average immigrant. In addition, for Chinese workers, there are basically no wage returns of having 4 and 6 years of schooling compared to being illiterate.

Table 4

| DECOMPOSING THE IMMIGRANT-NATIVE WAGE GAP (OAXACA-BLINDER DECOMPOSITION) FOR THE MAIN IMMIGRANT GROUPS: CONTRIBUTION OF REGRESSORS INCLUDED IN FULL MODEL WITH INTERACTIONS						
	Immigrants	**EU15**	**PALOP**	**CEEC**	**Brazil**	**China**
Unconditional wage gap	-0.150	0.332	-0.169	-0.243	-0.193	-0.495
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Composition effect:	-0.021	0.209	-0.046	-0.025	-0.062	-0.223
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
of which:						
Potential work experience	-0.015	-0.058	0.011	0.002	-0.063	0.009
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Gender	0.019	-0.001	0.005	0.043	0.010	0.017
	[0.000]	[0.281]	[0.000]	[0.000]	[0.000]	[0.000]
Contract	-0.025	-0.009	-0.022	-0.033	-0.032	-0.026
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sector	-0.024	-0.010	-0.026	-0.022	-0.031	-0.059
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Region	0.039	0.019	0.078	0.020	0.053	0.026
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Time effects	0.000	0.000	-0.001	0.001	-0.002	-0.001
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Education	-0.014	0.268	-0.090	-0.036	0.003	-0.187
	[0.000]	[0.000]	[0.000]	[0.000]	[0.029]	[0.000]
Wage structure effect:	-0.129	0.123	-0.124	-0.218	-0.131	-0.272
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
of which:						
Years since migration	0.101	-0.028	0.115	0.070	0.095	0.036
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Potential work experience	-0.371	0.110	-0.385	-0.480	-0.373	-0.513
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Gender	0.017	-0.024	0.024	0.017	0.024	0.079
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Contract	0.017	-0.011	0.020	0.056	0.037	0.024
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sector	0.052	-0.003	0.017	0.060	0.043	-0.078
	[0.000]	[0.728]	[0.001]	[0.000]	[0.000]	[0.213]
Region	0.072	-0.031	0.052	0.094	0.071	0.106
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Time effects	0.008	-0.012	-0.005	0.038	-0.015	0.017
	[0.000]	[0.018]	[0.008]	[0.000]	[0.000]	[0.007]
Education	-0.230	0.049	-0.183	-0.328	-0.287	-0.199
	[0.000]	[0.262]	[0.000]	[0.000]	[0.000]	[0.000]
Immigrant dummy	0.205	0.073	0.221	0.254	0.274	0.255
	[0.000]	[0.121]	[0.000]	[0.000]	[0.000]	[0.000]

Source: Authors' calculations.
Notes: p-values in brackets (implicit standard errors are worker-cluster robust). See the main text and Appendix A for a full description of all variables included.

Since immigrants' schooling is progressively less valued than natives, the wage gaps upon arrival of the various immigrant groups (excluding EU15) become negative for the top-three educational levels (Figure 2). Taking the case of Brazil as an example, an illiterate male Brazilian worker in the manufacturing sector in 2002, in Lisboa, with a permanent contract and without any work experience has an average wage that is 27.4 log points higher than a comparable native. This positive wage difference vanishes as the educational attainment increases and becomes negative for the top three educational levels: -2.1 log points (27.4 – 29.4) for 9 years of education completed, -18.2 log points (27.4 – 45.6) for 12 years and -30.8 log points (27.4 – 58.2) for tertiary education. For workers with tertiary education, the wage gap upon arrival compared to natives is especially high for immigrants from the CEEC (-80.5 log points) and China (-68.6 log points).

The estimates of returns to education for immigrants from the EU15 are very different from the other immigrant groups. Although results in Figure 2 show a positive wage gap upon arrival for all educational levels, the positive gap for illiterate workers is not statistically significant and the same occurs in most differences in returns to education compared to natives. The differences in the returns to tertiary education of EU15 immigrants, which are higher and statistically significant at a 5 per cent level, are the exception. The idea that the returns to education are similar between natives and immigrants from the EU15 was already evinced in the fact that the contribution of the educational variables to the wage structure effect was not statistically significant for these immigrants.[11] The fact that formal education acquired in EU15 countries is more easily transferable to Portugal is not surprising and is in line with results found for other countries of higher international portability of education between developed countries (see, for instance, Basilio and Bauer (2010)).

Chart 2

WAGE GAP UPON ARRIVAL BETWEEN IMMIGRANTS AND NATIVES BY EDUCATIONAL LEVEL | WAGE DIFFERENCE RELATIVE TO A COMPARABLE NATIVE WORKER IN LOG POINTS
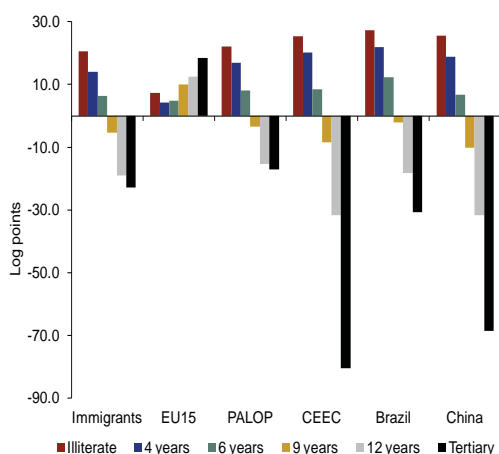
Source: Authors' calculations.
Note: See the main text and Appendix A for a detailed description of the different educational levels.

11 Recall, however, that this contribution to the wage structure effect is conditional on the reference group chosen for the categorical variable. We replicated the calculations using 12 years of education as the reference category and the contribution of the education variables to the wage structure effect continued to lack statistical significance for EU15 immigrants.

6. Conclusions

The increase in immigration flows in the late nineties and the substantial change in its nationality mix makes it relevant to analyse the relative wage performance of immigrant workers in Portugal. A large strand of the empirical research on immigration in the last decades focused on several aspects of labour market adjustment of immigrants. Most of this research is based on the "positive assimilation" model of Chiswick (1978) and assumes the pre-migration skills are not perfectly transferable when immigrants move from a lower to a higher income area. As a result the immigrants face a wage penalty upon arrival in the destination country. In Portugal, over the period 2002-2008, the simple difference in means between wages of immigrant and native workers amounts to -15.0 log points, or -13.9 per cent.

In this article, we use a longitudinal matched employer-employee database (*Quadros de Pessoal*) in the 2002-2008 period to analyse the wages of immigrants in the Portuguese labour market, identifying the major differences against native workers upon arrival. To disentangle the main drivers of this wage gap we apply the decomposition procedure proposed by Gelbach (2010). We exploit the relation between Gelbach's decomposition and the Oaxaca-Blinder decomposition (Oaxaca (1973) and Blinder (1973)), describing the unconditional average wage gap as the sum of a composition effect - associated with differences in the average magnitude of variables included in the model - and a wage structure effect - differences in the returns to the variables considered in the model and the unexplained part of the gap due to the immigrant status.

The wage gap upon arrival between comparable immigrant and native workers is mainly associated with the wage structure effect and not with differences in endowments. In particular, foreign work experience of immigrants is rewarded by less than one third of natives' domestic experience. Moreover, the estimated returns to education (compared to being illiterate) of immigrants relative to natives are lower for all educational levels and become progressively lower as we move up the educational ladder. So, on average, the wages of immigrants with more formal education are relatively more penalised in the Portuguese labour market. Both these results support the idea of imperfect portability of human capital across countries (Friedberg (2000)).

We also assess the wage gap upon arrival by main nationality groups of immigrants - EU15, PALOP, CEEC, Brazil and China. There are significant differences among these nationalities and we find that treating immigrants as a homogeneous group conceals distinct results across nationalities. The average wage of workers from the EU15 is substantially higher than the average native wage, while Chinese immigrants earn wages significantly lower than other migrant groups. Our decomposition results show that the EU15 immigrants not only have better endowments but also tend to earn better returns to those characteristics. In particular, their educational attainment is significantly higher than that of natives and their foreign work experience is better rewarded than the domestic experience of natives. The results for Chinese workers are strikingly different: both the composition and wage structure effects are negative and substantial, contributing almost evenly to the relative wage disadvantage of these immigrants. In particular, they have an extremely low educational attainment and their pre-immigration work experience is not significantly valued in the Portuguese labour market. With the exception of these two extreme cases, the results of the other groups are broadly in line with those obtained for the average immigrant: most of the wage gap is not due to worst endowments of the immigrants compared to natives but to differences in the returns of the covariates and to the immigrant status effect.

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Appendix A

DEFINITIONS OF VARIABLES	
Dependent variable	**Description**
log W$_{it}$	Natural logarithm of the real hourly wage of individual i at time t.
Explanatory variables	**Description**
imi	Dummy variable for immigrant status. Equals 1 if worker is immigrant.
pexp	Age - 6 - years of education.
ysm	Proxy of years since migration. Only for immigrant workers (equals zero for native workers). Based on the date that each worker first entered private employment (legally) in Portugal. Using QP records, it is possible to trace back each worker to its first record and also to obtain the first year of admission in a firm. This proxy corresponds to the difference between the reference year t and the minimum of these two dates.
Educational attainment	These variables record total years of education reported by the worker. The categories used are based on the International Standard Classification of Education (ISCED).
edu$_0$	Illiterate, meaning no formal education or below ISCED 1.
edu$_1$	4 years completed (primary education). Included in ISCED 1.
edu$_2$	6 years completed (second stage of basic education). Included in ISCED 1.
edu$_3$	9 years completed (lower secondary education). Refers to ISCED 2.
edu$_4$	12 years completed (upper-secondary education), Refers to ISCED 3-4.
edu$_5$	Tertiary education. Refers to ISCED 5-6.
Variables included in X$_{it}$	
Gender	Dummy variable for gender. Equals 1 if worker is female.
Contract	Dummy variable for distinguishing permanent from fixed-term contracts. Equals 1 in case of fixed-term contracts.
Sector	Dummy variables for different industries, namely agriculture, mining and quarrying, manufacturing, construction, wholesale and retail trade, hotels and restaurants, transportation, financial services,real estate and business services, public administration, education and health, and other services. The reference group is manufacturing industry.
Region	Dummy variables for different geographical locations, namely Aveiro, Braga, Faro, Leiria, Lisboa, Porto, Santarém, Setúbal and other regions. The reference group is Lisboa.
Time effects	Year-specific fixed effects. The reference year is 2002.