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Working Papers

31 | 2010

EMPLOYMENT AND WAGES OF IMMIGRANTS IN PORTUGAL

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December 2010

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BANCO DE PORTUGAL

Edition

Economics and Research Department

Av. Almirante Reis, 71-6th

1150-012 Lisboa

www.bportugal.pt

Pre-press and Distribution

Administrative Services Department

Documentation, Editing and Museum Division

Editing and Publishing Unit

Av. Almirante Reis, 71-2nd

1150-012 Lisboa

Printing

Administrative Services Department

Logistics Division

Lisbon, December 2010

Number of copies

170

ISBN 978-989-678-058-6

ISSN 0870-0117

Legal Deposit no. 3664/83

Employment and wages of immigrants in Portugal*

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Abstract

Using matched employer-employee data, we examine the main characteristics of immigrants in the Portuguese labour market in the 2002-2008 period. We find substantial differences in labour market outcomes between native and immigrant workers and among different nationality groups, in terms of age, gender, tenure, worker flows, geographical and sectoral concentration, and education levels. As in other countries, the wages of immigrants in Portugal are lower than the wages of natives, though growing at a higher pace in the period analysed. Moreover, downward wage rigidity appears to be slightly higher for immigrants than for natives.

Keywords: Immigration, Employment, Wages, Matched employer-employee data, Portuguese economy

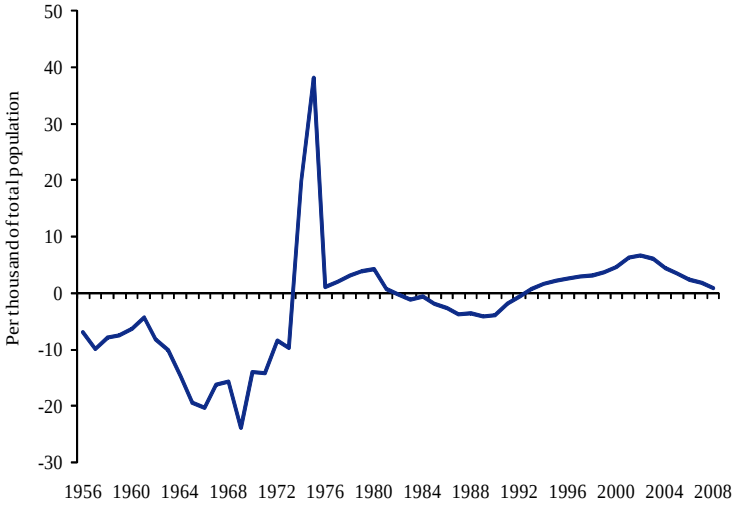
JEL Codes: F22, J31, J61

*The authors thank João Amador, Mário Centeno, Paulo Esteves and Pedro Portugal for their comments and suggestions. We also thank Lucena Vieira for excellent computational assistance. The opinions expressed in the paper are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors. Address: Banco de Portugal, Economics and Research Department, R. Francisco Ribeiro 2, 1150-165 Lisboa - Portugal. E-mails: scabral@bportugal.pt and cfduarte@bportugal.pt

1 Introduction

Portugal has traditionally been a country of emigration and significant immigration flows began much more recently (Figure 1). The first important wave of large-scale migration in Portugal was of a political nature, as it occurred after the Revolution of 1974 with the mass return of Portuguese citizens from former colonies in Africa. In the following years and until the mid-nineties, immigration in Portugal was relatively modest in international terms, comprising mainly nationals from Portuguese speaking countries. Immigration flows accelerated in the end-nineties, partly reflecting the high demand in the construction sector, and a substantial part of these arrivals originated from Central and Eastern European countries, with no particular historical or cultural link with Portugal, and also from Brazil. These recent immigration flows in Portugal were of irregular and economic nature, linked with employment opportunities, and hence tend to have a high rate of activity.

Figure 1: Net migration rate in Portugal



Source: OECD.
Note: Net migration is defined as the total number of immigrant nationals and foreigners minus the total number of emigrant foreigners and nationals. Arrivals and departures for purposes such as tourism and business travel are not included. The net migration rate is expressed per thousand of total population.

The impact of immigration on the labour market of the receiving country is an issue that has been much debated for several years and there is an extensive strand of the literature devoted to it, firstly focusing on the US but also, more recently, on several European countries. The strong increase of immigration flows of low-skilled individuals into developed countries has revived the study of immigration issues in last years. In brief, the literature has focused in two different but interrelated broad questions (see Borjas (1994), Borjas (1999), Card (2005) and Jean et al. (2010) for comprehensive surveys on the economics of immigration). First, how do immigrants perform in the host country? It is commonly observed that immigrants earn less upon arrival than comparable native workers. The imperfect portability of human capital and experience acquired in the origin country, as well as the lack of fluency in the

destination language were found to be important determinants of this wage gap (see, for instance, Friedberg (2000) and Adsera and Chiswick (2007)). Over time, the wage disadvantage tends to diminish as experience in the host economy increases but earnings assimilation differs across nationalities and, in some countries, the catching up is never complete (see Izquierdo et al. (2009) for a recent analysis of the case of Spain). Second, what is the impact of immigrants on native wages and employment? In a competitive labour market, an increase in the supply of immigrant workers should result in a lower wage or higher unemployment of natives whose skills are substitute and impact positively the natives with complementary skills. However, empirically there is no consensus and, depending on the data and methodology, some studies have found a negative and significant effect in native wages (like the seminal work of Borjas (2003)) but the majority of studies does not obtain a sizeable effect on employment and wages of natives (see Longhi et al. (2005) for a survey and, more recently, Ottaviano and Peri (2008) for a discussion).

At present, empirical evidence on the behaviour of immigrants in the Portuguese labour market is relatively scarce, probably also reflecting the novelty of the phenomenon. Some exceptions are Carneiro et al. (2010) who study the determinants of earnings of immigrants in 2003-2004 using a longitudinal database and OECD (2008*a*) that provides a comprehensive analysis of the main features of recent immigration in Portugal. This paper aims at contributing to this literature, by providing a detailed portrait of recent immigration in the Portuguese labour market. It adopts a fully empirical approach, describing and examining the main characteristics of immigrant workers in Portugal, with an emphasis on wages. We use matched employer-employee data from a longitudinal dataset (*Quadros de Pessoal*) from 2002 to 2008, focusing the analysis in the full-time employees segment and differentiating the results by main nationality groups within immigrant workers. All workers in illegal and irregular situations are, by definition, excluded from the analysis, leading to an underestimation of immigrants in the Portuguese labour market. A comparative analysis of wage developments (levels and growth) for natives and major immigrant groups over the period is included, with a breakdown by main sectors of activity of immigrant employment. In this context, differences between natives and immigrants in terms of wage rigidity are assessed by using the International Wage Flexibility Project (IWFP) methodology.

The article is organized as follows. Section 2 describes briefly the evolution of recent immigration in Portugal, comparing some of the characteristics of immigrants in Portugal with those observed for other OECD countries. Section 3 describes the database and the main features of immigrants relative to those of native workers. Section 4 focuses on comparing the wages of immigrants and natives. After a short presentation of the methodology for the calculation of the wage rigidity measures, the results for both immigrants and natives are reported in section 5. Finally, section 6 presents some concluding remarks.

2 Immigration in Portugal in the international context

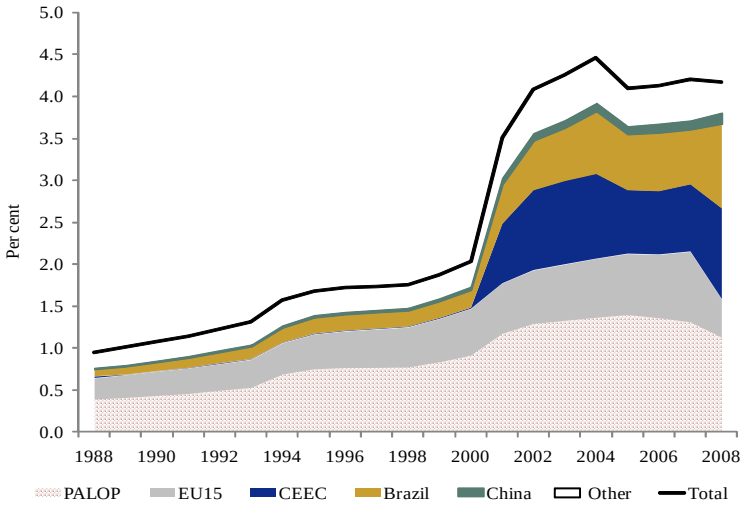
Portugal has traditionally been a country of emigration, with sustained and large-scale outflows until 1974 (Figure 1). The end of the dictatorship in 1974 and the following independence of Portugal's colonies in Africa led to a mass return of migrants from these countries, most of them with Portuguese nationality, the so-called *retornados*. The migration of the *retornados* resulted in the return of more than half a million persons, increasing the Portuguese labour force by around 10 per cent in three years (see Carrington and de Lima (1996) for an analysis of the impact of these migration flows from Africa on the Portuguese labour market). In the following years and until the mid-nineties, immigration flows in Portugal were modest on an international scale and included mainly persons from Portuguese speaking countries in Africa (PALOP) and Brazil.[1] Nationals from Cape Verde constituted the largest immigrant community in Portugal over the nineties, representing more than 20 per cent of the total foreign population. In the late nineties, immigration accelerated, driven by high and unmet labour demand resulting from the strong dynamics in the construction sector, linked with major infrastructure projects, and in some services sectors. There was also a change in the composition of the flow of immigrants, with a substantial share of this recent immigration originating from Central and Eastern European countries, with no apparent link with Portugal, and also from Brazil (Figure 2). Immigrants from Central and Eastern Europe mainly came from Ukraine but also from Romania and Moldova (see Baganha et al. (2004) for a portrait of these recent migration flows from Eastern Europe to Portugal). In 2008, Brazilian nationals were the major immigrant community in Portugal accounting for more than 24 per cent of total immigrants, followed by nationals from Cape Verde and Ukraine, both with individual shares of almost 12 per cent.

Most of these recent immigration flows in Portugal were of irregular nature, as evinced by the series of regularisations that occurred since 2000. In fact, following the large inflows of irregular migrants since the late nineties, a regularisation process occurred in 2001 (see Marques and Góis (2007) for a description of recent Portuguese immigration policies). With this new legislative framework, Portugal started to adopt an universal approach to the different immigrant groups, moving away from the preferential treatment traditionally given to immigrants from Portuguese-speaking countries. The 2001 legalization was directed towards immigrants working in Portugal, although without the necessary documents, in contrast with previous regularisation processes, which were directed to all immigrants irrespective of their status in the labour market. In addition, this legalization process remained open from January 2001 until November 2001, thus covering both immigrants already working in Portugal and those immigrants who where able to come to Portugal and find work until the end of this period. This regularisation was of an extraordinary scale, contributing to an increase in the

[1] 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).

stock of the legal foreign population in Portugal of around 70 per cent in 2001, as can be seen in Figure 2. Most of the immigrant workers that benefited from the 2001 regularisation came from Central and Eastern European countries, in particular from Ukraine. As a result of this regularisation process, the share of immigrants from Central and Eastern Europe in the total foreign population legally residing in Portugal increased from 0.6 per cent in 2000 to 20.2 per cent in 2001.

Figure 2: Stock of foreign population in Portugal
as a percentage of total population

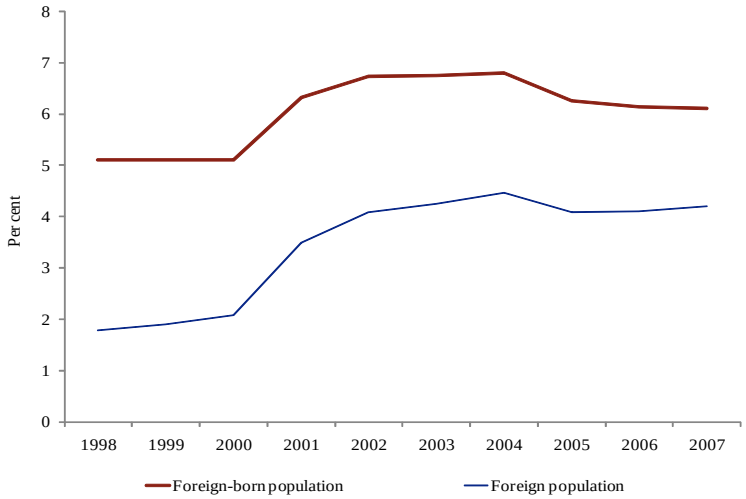


Source: OECD.
Note: PALOP refers to the former Portuguese colonies in Africa (Angola, Cape Verde, Guinea-Bissau, Mozambique, and São Tomé and Príncipe). CEEC includes Belarus, Bulgaria, Moldova, Romania, Russian Federation and Ukraine.

There are major differences in how immigrants are defined across countries (see, for instance, Parsons et al. (2007) for a discussion on the quality and comparability of international data on migration). Nationality and place of birth are the two criteria most commonly used to define the immigrant population. The foreign-born population covers all persons who have ever migrated from their country of birth to their current country of residence. The foreign population consists of persons who still have the nationality of their home country, but it may include persons born in the host country. Dealing with former colonies poses an additional difficulty in the international comparison of data on migration, since there can be a substantial difference between the stocks of foreign and foreign-born populations. In countries like Portugal and France, the foreign-born population includes a significant proportion of persons born abroad as national citizens and repatriated from former colonies. Historically, the number of naturalisations in Portugal has been very low, so the difference in levels between the two stocks mostly reflects the arrival of repatriates after the 1974 revolution and the evolution of both series is very similar in the most recent period (Figure 3). These foreign-born with Portuguese nationality should not be considered as migrants to evaluate the impact of immigration on the domestic labour market outcomes, since they now share most of the rel-

evant characteristics with the native population. So, our definition of immigrants throughout this paper focus on the nationality criterion, with the exception of some international data on immigrants' characteristics from census data that is only available for foreign-born populations. For instance, OECD (2008*b*) include a comprehensive and detailed comparison of the profile of foreign-born populations in OECD countries using Census 2001 data.

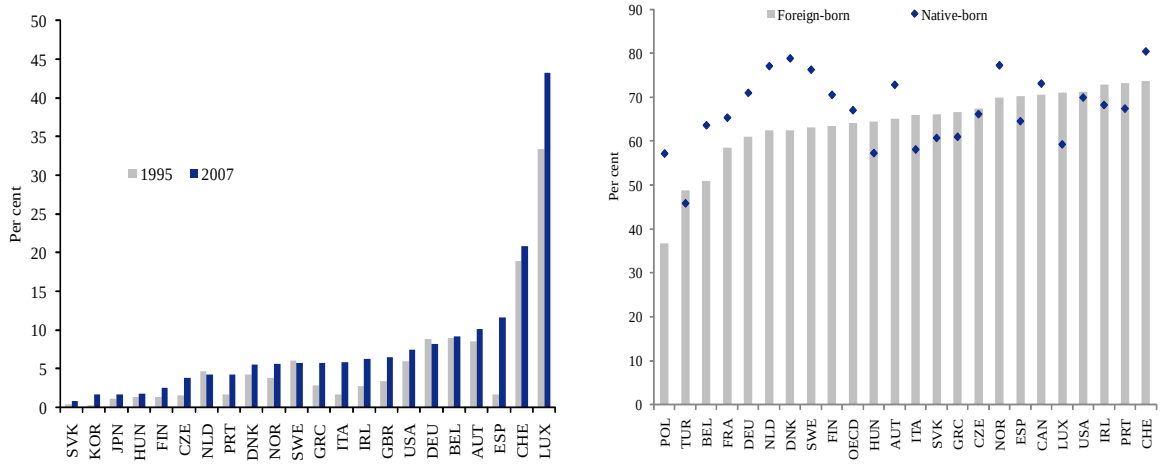
Figure 3: Foreign-born population and foreign population in Portugal as a percentage of total population



Source: OECD.

In international terms, the share of immigrants in total population in Portugal is relatively low, representing around 4 per cent in 2007, with traditional destination countries like Luxembourg and Switzerland showing the highest shares (Figure 4). As in other Southern European countries, like Spain and Italy, and in other new immigration countries in Europe, such as Ireland and Greece, immigration in Portugal is a recent but growing phenomenon. As already mentioned, recent immigrant flows in Portugal were linked with employment opportunities and hence, tend to have a high labour market attachment. In a cross-country comparison, the strong labour-market orientation of recent immigrants in Portugal clearly stands out. Portugal has one of the highest employment rates of immigrants among OECD countries, higher than that of natives for both men and women. However, immigrants in Portugal seem to be more affected than natives by downturns in economic activity. Dustmann et al. (2010) show that there is a larger cyclical response of unemployment for immigrants than for natives in Germany and the UK, even within narrowly defined skill groups. As discussed in OECD (2008*a*), a good picture on the evolution of immigrants unemployment over time in Portugal is hampered by the limited number of immigrants in the labour force survey. Nevertheless, as can be seen in Figure 5, the unemployment rate of immigrants is always higher than that of natives since 1998 and increases faster in periods of economic recession.

Figure 4: Immigrant population and its labour market orientation

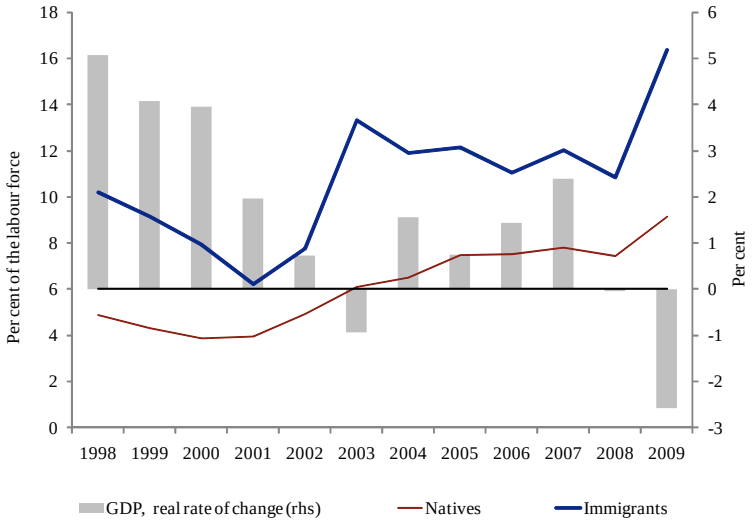


(a) Foreign population, as a percentage of the total population

(b) Employment rates of immigrant and native populations, 2007

Source: OECD.
Note: The employment rate is calculated as the share of employed persons aged 15-64 in the total population (active and inactive persons) of the same age.

Figure 5: Unemployment rates of native and immigrant populations in Portugal



Source: *INE* (National Statistical Institute).
Note: The unemployment rate is computed with data from the Portuguese Labour Force Survey.

3 Main characteristics of employed immigrants in Portugal

The main database used in this paper 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). Reported data cover the establishment itself (location, economic activity, employment, etc), the firm (location, economic activity, employment, sales, etc) and each of its workers (gender, age, education, skill, occupation, tenure, worker status, hours worked, earnings, etc). The information on earnings is very complete, including the base wage (gross pay for normal hours of work), regular and irregular wage benefits and overtime pay.

The worker-level data covers all years since 1982, 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 in Portugal are recorded. Nevertheless, given the nature of recent immigration in Portugal and the low naturalisation rate, this seems 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).

OECD data based on residence permits estimates that the foreign population in Portugal amounts to around 440 thousand individuals in 2008, while immigrant workers in the QP database used here are about 170 thousands (Table 1). The QP dataset does not cover domestic work. This fact can have some impact on the results since many foreign women in Portugal are linked to this sector. However, the longitudinal database made available by Instituto de Informática (Portuguese social security data-processing office) includes domestic work but its share in total employment is around 0.01 per cent on average for both natives and immigrants in the 2002-2007 period, which suggests that most people in this sector work in the informal economy. In addition, all workers in illegal and irregular situations are excluded from the analysis given the lack of information on these individuals in the QP database, leading to an underestimation of immigrants in the Portuguese labour market. Nevertheless, the detailed characteristics of the QP database make it especially suitable to study the evolution of immigration in the Portuguese labour market. Peixoto (2008) and Carneiro et al. (2010) also use the QP to examine different aspects of recent immigration flows in Portugal. Peixoto (2008) provides a descriptive analysis of employed immigrants in 2004 and Carneiro et al. (2010) study the assimilation of immigrants in the Portuguese labour market in 2003-2004. In addition, OECD (2008*a*) provides a very comprehensive study of the main features of

immigration in the Portuguese labour market using different databases including the QP.

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, sector of activity and tenure. Second, we further restricted our sample to non-apatrid workers, aged between 15 and 80 years and with a job tenure below 65 years. In the case of full-time employees, we only considered those that reported a base wage above 80 per cent of the minimum legal wage. Whenever a worker was present more than once in a given year we kept the register corresponding to maximum earnings or maximum hours worked.

Table 1: Employment status of natives and immigrants in Portugal, levels and shares in percentage, 2008

	Immigrants	**Total**		**Natives**		**Immigrants**	
	Share in total	Level	Share	Level	Share	Level	Share
Employer	4.1	200,226	7.3	191,965	7.4	8,261	4.8
Unpaid family worker	5.1	1,039	0.0	986	0.0	53	0.0
Employee	6.4	2,540,078	92.2	2,376,675	92.0	163,403	94.7
Full-time	6.3	2,409,333	87.5	2,258,521	87.5	150,812	87.4
Part-time	9.6	130,745	4.7	118,154	4.6	12,591	7.3
Other	6.6	13,597	0.5	12,705	0.5	892	0.5
Total	6.3	2,754,940	100	2,582,331	100	172,609	100

Sources: *Quadros de Pessoal* and authors' calculations.
Note: In the case of full-time employees, we only considered those that reported a base wage above 80 per cent of the minimum legal wage.

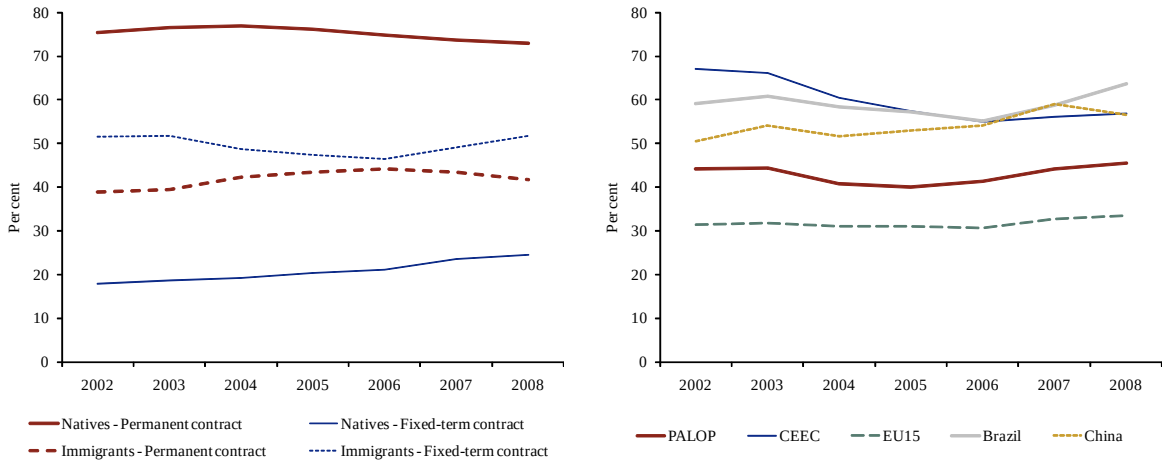
Dependent employment constitutes the main contractual form in the Portuguese labour market, representing 92 per cent of total employment for natives and 94.7 per cent for immigrants in 2008 (Table 1).[2] Full-time contracts have a similar incidence between natives and immigrants but immigrants have a higher proportion of part-time jobs. In 2008, a higher percentage of natives appears as employers, 7.4 per cent compared to 4.8 per cent for immigrants. The lower share of immigrants in self-employment in Portugal contrasts with evidence found in other countries where immigrants tend to be over-represented among the self-employed (see Borjas (1986) for the US, Clark and Drinkwater (2000) for England and Wales and Andersson and Wadensjo (2004) for Denmark and Sweden).[3] In the Portuguese labour market, the most notable difference between immigrants and natives relates to the nature of the contract, i.e., permanent versus fixed-term (Figure 6). Considering only full-time employees, 51.7 per cent of immigrant workers had fixed-term contracts, which are typically associated with jobs with lower wages, compared to 24.6 per cent for native employees in

[2]Table 1 includes only information for 2008, but the employment structure is similar over the 2002-2008 period. All yearly data is available from the authors upon request.

[3]Evidence on higher rates of self-employment among natives than immigrants is also obtained using data from the Portuguese Labour Force Survey (comprising the self-employed with and without employees), although with substantial differences in levels reflecting the different coverage of the two databases. According to this database, 24.1 per cent of employed natives are self-employed, on average, compared to 11.9 per cent for immigrants in the period 2002-2008.

2008. However, fixed-term contracts have been steadily gaining importance in the employment structure of native workers over this period, which can be seen as a consequence of the relative rigidity of permanent contracts in Portugal (see, for instance, Portugal (1999)). By main nationality groups, the proportion of workers with fixed-term contracts in 2008 is the highest for Brazilians (63.6 per cent) and it increased since 2006. An increasing incidence of temporary contracts is also evident in workers from China though less markedly. Immigrants from Central and Eastern European countries (CEEC) have also a significant share of fixed-term contracts but it declined over this period from 67.1 per cent in 2002 to 56.9 per cent in 2008.[4] Immigrants from the PALOP have a below average percentage of fixed-term contracts but it rose since 2005, from 40 per cent to 45.4 per cent in 2008. Finally, immigrants from the other 14 initial Member-States of European Union (EU15) have a much lower proportion of temporary contracts over the whole period (around 30 per cent).

Figure 6: Permanent and fixed-term contracts of natives and immigrants in Portugal
shares in total full-time employment



(a) Permanent and fixed-term contracts, shares in total

(b) Fixed-term contracts, shares in total

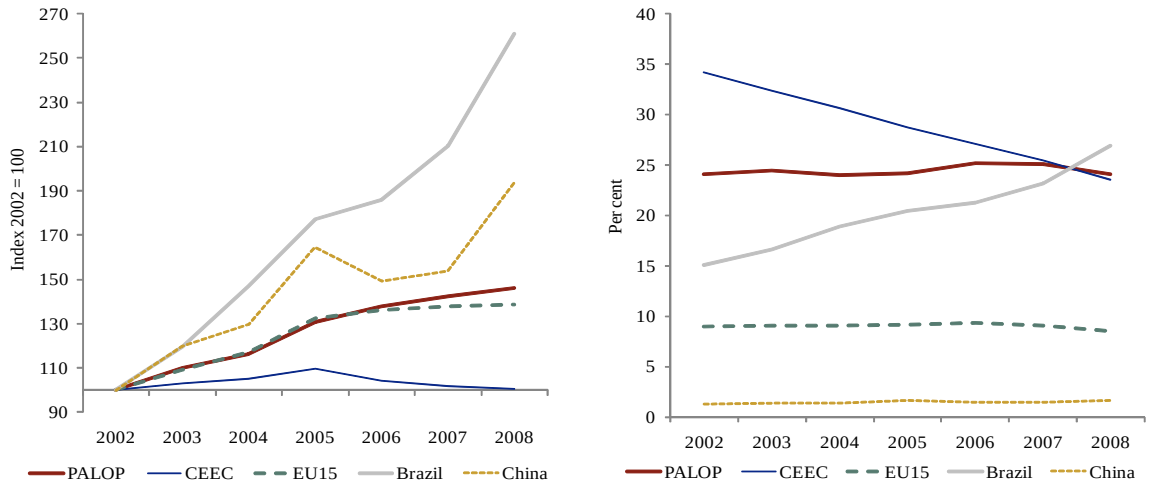
Sources: *Quadros de Pessoal* and authors' calculations.

The remainder of the analysis of this paper will focus on the full-time employees segment. Full-time employed immigrants in Portugal increased by 46.2 per cent in cumulative terms from 2002 to 2008, an average annual growth rate of 6.5 per cent. Hence, the share of immigrants in full-time employees in Portugal increased from 5.2 per cent in 2002 to 6.3 per cent in 2008. Immigrants from Brazil had an impressive growth of 161 per cent in cumulative terms over this period (average annual rate of 17.3 per cent), which translated into an increase of their share in total immigrant employees from 15.1 per cent in 2002 to 26.9 per cent in 2008 and made them the major single nationality group in Portuguese dependent employment (Figure 7). Immigrants from China also grew steadily over this period, but still represent a small proportion of total immigrants in Portugal (less than 2 per cent in

[4]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.

2008). On the contrary, the number of immigrants from CEEC remained almost stable over this period, showing even negative rates of change since 2006, in line with the slowdown of economic activity in some sectors. The strong inflows from CEEC at the end of the nineties were largely driven by labour market opportunities, specially in the construction sector. Immigrants from Ukraine, the major nationality within the CEEC, declined by 18.1 per cent in cumulative terms over the 2002-2008 period, accounting for 13.1 per cent of total immigrants in 2008 (23.3 per cent in 2002). In contrast, inflows from Romania, the second major CEEC origin, continued to grow over this period, with its share in total full-time immigrant worker increasing from 3.9 per cent in 2002 to 4.5 per cent in 2008. Immigrants from the PALOP maintained their share in total around 24 per cent over this period, but there was a decline in the share of employees from Angola (to 7.6 per cent in 2008) and an increase in the percentage of immigrants from Cape Verde (to 8.1 per cent in 2008). Finally, immigration from the EU15 grew slightly below average, in particular since 2007, resulting in a small decline of its share in total from 9 per cent in 2002 to 8.5 per cent in 2008. Within the EU15, the main countries of origin of immigrants are France, Spain, Germany and the United Kingdom. Summing up, immigration in Portugal is currently rather concentrated in three main geographical origins, Brazil, PALOP and CEEC, each with a share above 20 per cent of total and representing together 74.5 per cent of total full-time immigrant employees in 2008 (73.3 per cent in 2002).

Figure 7: Main nationalities of immigrant employment in Portugal



(a) Cumulative growth

(b) Shares in total

Sources: *Quadros de Pessoal* and authors' calculations.

As mentioned in other studies, immigrant workers in Portugal are slightly younger than natives (Table 2). Full-time employees with less than 35 years account for 44 per cent of total natives but represent 50.5 per cent of immigrants in the period 2002-2008. This difference is higher in the case of workers from China and especially from Brazil. In the case of Brazilian workers, 62.5 per cent of them have less than 35 years and almost 50 per cent is aged between

25 and 34 years. The percentage of females in immigrant employment is lower than in native employment, representing 34.8 and 43.1 per cent of total in this period, respectively. However, the exclusion of domestic work from the analysis tends to underestimate female employment in Portugal. For instance, OECD data based on residence permits of the foreign population in Portugal shows a percentage of females of 40.6 per cent on average in the period 2002-2008 (47.3 per cent in 2008). Looking at the main origins of immigrants, the share of female workers is higher in the case of the EU15 and Cape Verde (43.3 per cent in both cases) and lower in the case of CEEC and, particularly, Ukraine (23.6 per cent). However, from 2002 to 2008 there was an increase in the proportion of females in dependent employment in Portugal, common to all main nationalities but especially sharp in the case of immigrants from CEEC (Figure 8). The share of female workers from the CEEC increased from 20.3 per cent in 2002 to 29.5 per cent in 2008.

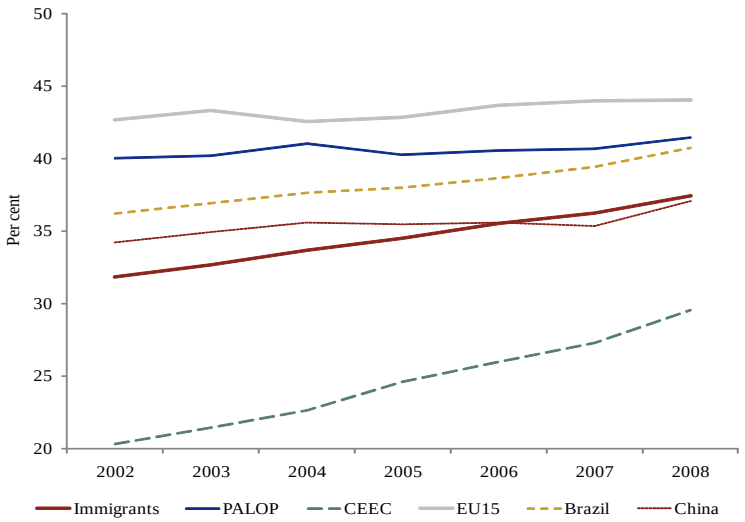
Table 2: Age and gender of native and immigrant employees in Portugal, average 2002-2008 shares as a percentage

	Natives	Immigrants							
			EU15	PALOP	CEEC			Brazil	China
					Cape Verde		Ukraine		
AGE									
Average	37.8	35.7	36.4	36.5	37.5	36.3	37.2	33.0	34.3
15-24	10.7	10.2	8.3	9.6	12.6	7.6	5.6	15.2	12.3
25-34	33.3	40.3	43.0	36.0	29.1	39.7	37.8	47.3	41.5
35-44	28.2	30.7	27.9	34.0	31.1	31.6	33.2	26.6	34.0
45-54	19.3	15.4	13.8	16.7	21.8	18.7	20.7	9.4	10.8
55+	8.6	3.4	7.1	3.7	5.5	2.3	2.7	1.5	1.5
	100	100	100	100	100	100	100	100	100
GENDER									
Men	56.9	65.2	56.7	59.4	56.7	75.5	76.4	61.4	64.4
Women	43.1	34.8	43.3	40.6	43.3	24.5	23.6	38.6	35.6
	100	100	100	100	100	100	100	100	100

Sources: *Quadros de Pessoal* and authors' calculations.

As could be expected given the recent nature of most immigrant flows in Portugal, the tenure of immigrant workers is much lower than that of natives, average of 2.4 and 7.4 years in the same job over the period 2002-2008, respectively (Table 3). Within immigrants, tenure is higher for workers from the EU15 and, to a lesser extent, from Cape Verde, which are the immigrant groups that have been longer in the country. The average tenure for other nationality groups is less than 2 years in this period. The proportion of immigrants with tenure less than 1 year is 37.7 per cent, which is more than double the share of natives in the same situation (15.9 per cent on average in this period). In the period 2002-2008, 44 per cent of native workers have tenure up to 3 years, but that proportion increases to 78.7 per cent in the case of immigrants. This result is in line with the higher incidence of temporary contracts, mostly with a length of 3 years, in immigrant employment. The share of immigrants with tenure up to 3 years is especially high in workers from China and

Figure 8: Proportion of females in immigrant employment by main nationalities shares as a percentage



Sources: *Quadros de Pessoal* and authors' calculations.

Brazil, 89.7 and 88.2 per cent on average in the period 2002-2008, respectively. A high percentage of workers from the CEEC also shows a tenure less than or equal to 3 years on average, but that proportion declined steadily over the period, from 98.7 per cent in 2002 to 76 per cent in 2008 (Figure 9). For workers from Brazil and China, the percentage of individuals with tenure up to 3 years declined until 2006, but remained stable afterwards at above 84 per cent. In 2008, 52.1 per cent of Brazilian workers had tenure inferior to 1 year and that share increased strongly in the last two years, while in the case of Ukraine that share decreased over the period to 35.5 per cent in 2008. Although this evolution can suggest that migrants from the CEEC have a higher probability of maintaining a job once they get it, it also reflects the very strong growth of recent migration flows from Brazil in the last two years. A precise analysis of the differences in labour market outcomes of the various nationality groups requires controlling for a broad range of characteristics that differentiate them. As no such control for heterogeneity is made here, these descriptive statistics should be interpreted with caution.

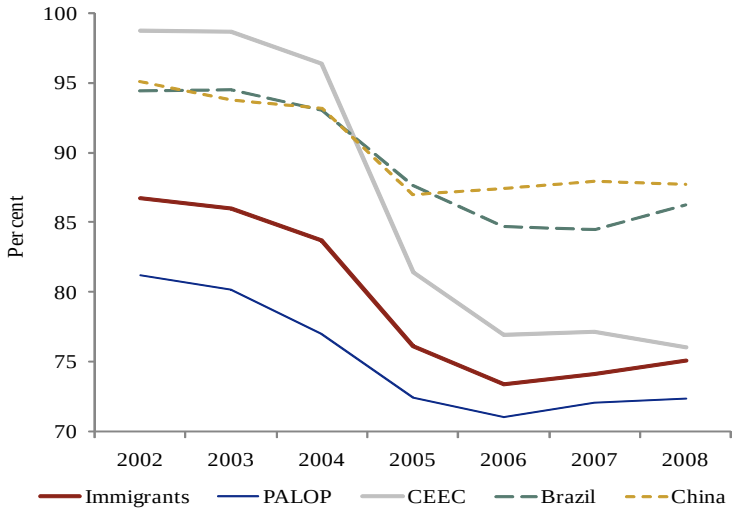
An analysis of worker flows offers a complementary perspective of immigrant employment, examining the allocation of workers through hires and separations. Even when aggregate employment does not change, workers move between jobs or enter/exit the labour force, so worker rotation rates exceed the rates of job creation and destruction (see Centeno et al. (2008) for a detailed analysis of worker and job flows in the Portuguese labour market). Following Burgess et al. (2000), total worker flows or turnover refer to all movements of workers into and out of jobs, i.e., the sum of hires and separations occurring between two years, and job flows are computed as net job changes, i.e., the difference between hires and separations. To obtain the corresponding rates, flows are divided by total average employment in the two

Table 3: Tenure of native and immigrant employees in Portugal, average 2002-2008
shares as a percentage

	Natives	Immigrants							
			EU15	PALOP		CEEC		Brazil	China
					Cape Verde		Ukraine		
[0, 3]	44.0	78.7	61.7	74.7	73.5	86.4	85.0	88.2	89.7
of which 0	15.9	37.7	24.1	37.6	34.9	38.7	36.0	47.1	44.1
[4, 6]	16.9	12.1	17.8	13.1	13.2	11.2	12.2	8.5	7.8
[7, 9]	10.8	3.9	8.8	5.2	5.2	1.4	1.5	1.7	1.5
[10, 19]	18.9	4.1	9.6	5.6	5.8	0.4	0.5	1.3	0.8
>=20	9.4	1.3	2.1	1.3	2.3	0.5	0.8	0.3	0.1
	100	100	100	100	100	100	100	100	100
Average years	7.4	2.4	4.1	2.8	3.1	1.6	1.8	1.4	1.3

Sources: *Quadros de Pessoal* and authors' calculations.

Figure 9: Immigrant employees with tenure up to 3 years by main nationalities
shares as a percentage

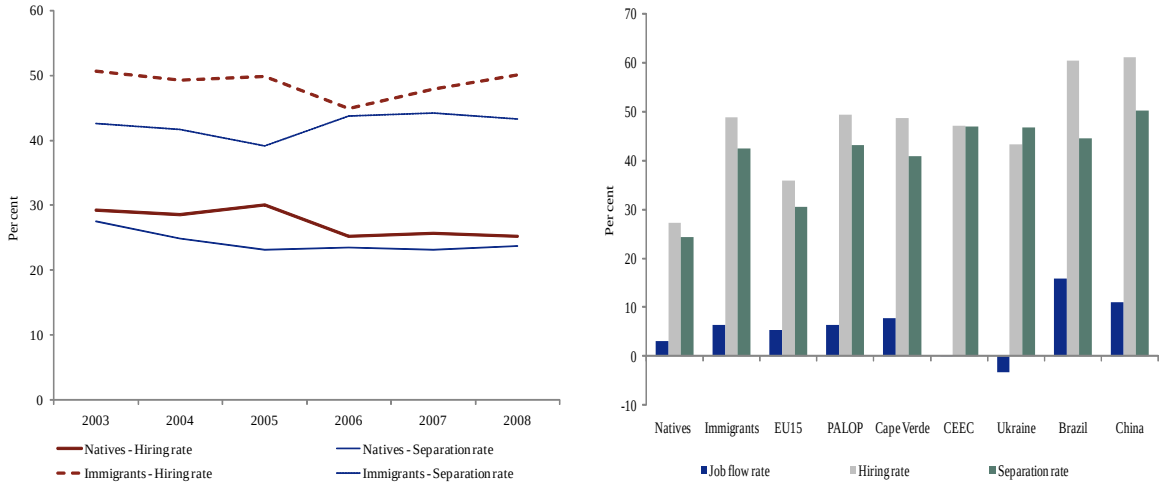


Sources: *Quadros de Pessoal* and authors' calculations.

years. In the 2003-2008 period, worker rotation rates in Portugal are higher for immigrants than for natives, with both hiring and separation rates showing higher values (Figure 10). This result is in line with the evidence in Centeno et al. (2008) that worker flows are higher among younger worker and workers with fixed-term contracts. By main nationality, Chinese immigrants have particularly high rotation rates, with the highest hiring and separation rates over the period. The hiring rate of immigrants from Brazil is also above 60 per cent, which partly translates into an important net job creation. In contrast, the hiring rates of workers from Ukraine are smaller that their separation rates, leading to a net job destruction over this period. Among immigrants, workers from the EU15 have the lowest rates of worker flows, but still above those of natives.

As discussed in Burgess et al. (2000), strong worker flows can coexist with a stable core of workers that remain in the same firm throughout the whole period. Figure 11 depicts the retention rates by main nationalities, defined as the percentage of workers who were

Figure 10: Hiring and separation rates of native and immigrant employees in Portugal

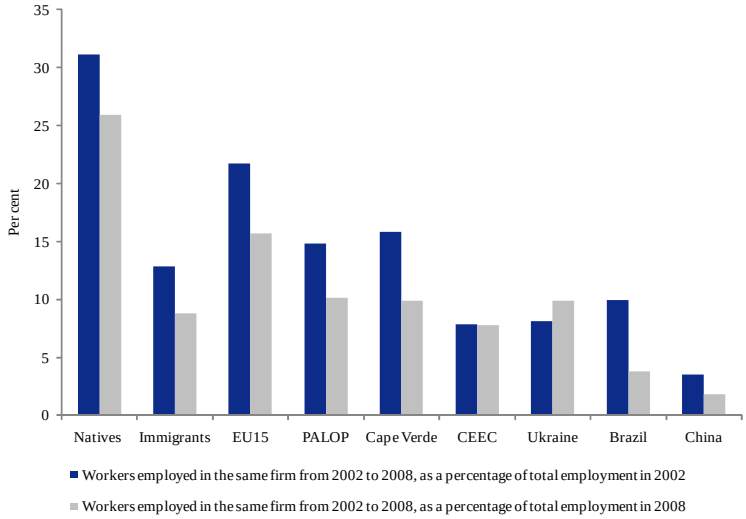


(a) Natives and immigrants

(b) By main nationalities, average 2003-2008

Sources: *Quadros de Pessoal* and authors' calculations.

Figure 11: Workers employed in the same firm from 2002 to 2008
shares as a percentage



Sources: *Quadros de Pessoal* and authors' calculations.

employed at the beginning of the period, and remain in the same firm at the end of the period. It shows that around 30 per cent of natives that were employed in 2002 remained in the same firm until 2008, but that share decreases sharply to 12.9 per cent for immigrants, not controlling for other factors that differentiate them. Within immigrants, the retention rate is the highest for workers from the EU15 and the lowest for workers from China, in line with the magnitude of worker flows for these immigrant groups. The percentage of immigrants from the CEEC and Brazil that were still employed by the same employer after 7 years amounts to 7.8 and 10 per cent, respectively. Given the higher worker flows of Brazilian employees it could be expected that the retention rate would be lower for them than for workers from the

CEEC. However, from 2002 to 2008, the number of Brazilian employees in Portugal grew strongly, while workers from the CEEC remained stable and these different trends affect the comparison of their retention rates. The extent of this influence becomes clearer if the group of workers that remained in the same firm over the whole period is divided by total employees in 2008, instead of in 2002. In this case, only 3.8 per cent of Brazilians that are employed in 2008 were already working in the same firm in 2002, compared to 7.8 per cent for workers from the CEEC.

Table 4: Geographical location of native and immigrant employees in Portugal, average 2002-2008 shares as a percentage

	Employment rate of change	Natives	Immigrants	EU15	PALOP		CEEC		Brazil	China
						Cape Verde		Ukraine		
Aveiro	1.8	7.4	4.2	4.2	1.8	0.6	5.4	6.7	3.1	3.0
Braga	2.6	**8.9**	3.3	4.5	1.5	0.5	3.6	4.6	2.1	2.7
Faro	6.0	3.2	**11.7**	**18.6**	6.0	**7.5**	**18.0**	**15.9**	**9.4**	**13.1**
Leiria	3.0	4.5	4.5	5.2	1.8	1.9	**7.9**	**10.2**	3.5	2.8
Lisboa	3.6	**31.7**	**45.3**	**34.2**	**67.5**	**69.9**	**32.4**	**28.6**	**53.0**	**37.3**
Porto	3.2	**18.8**	**9.5**	**12.2**	**6.2**	4.9	7.1	8.2	8.4	**16.9**
Santarém	2.5	3.5	3.3	2.8	1.5	0.9	5.8	6.8	2.9	4.9
Setúbal	2.2	4.6	7.3	3.9	**8.8**	**10.2**	6.7	4.9	**8.9**	7.0
Others	3.6	17.4	11.0	14.4	4.8	3.6	13.0	14.1	8.6	12.3
Total	3.3	100	100	100	100	100	100	100	100	100

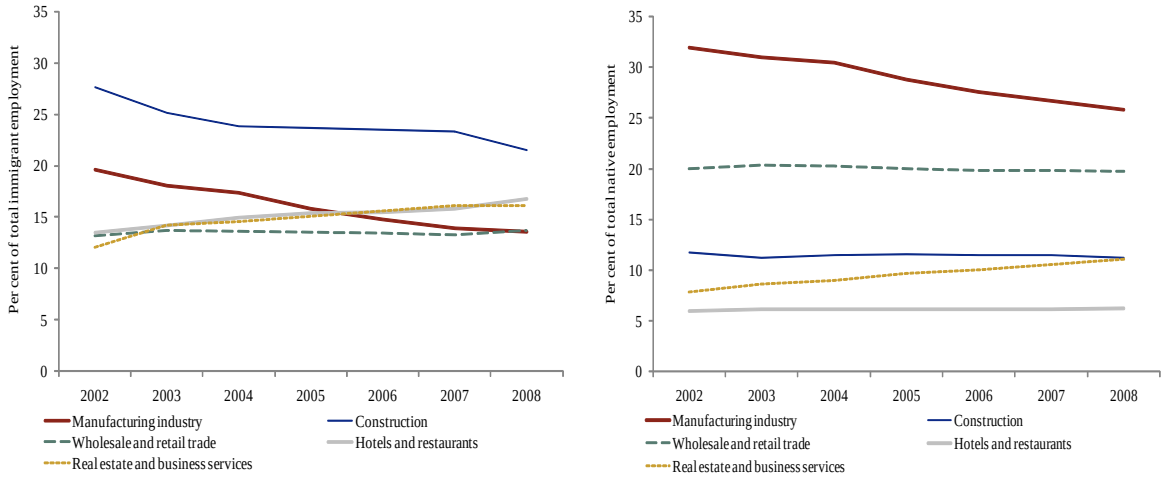
Sources: *Quadros de Pessoal* and authors' calculations.
Note: The rate of change of employment refers to the annual average rate of change of total employment (natives and immigrants) over the period 2002-2008, as a percentage.

Table 4 shows the regional distribution of immigrants within the country in comparison with native workers in the 2002-2008 period. The top 3 districts for each nationality group are highlighted in Table 4, with Lisboa being the main location for all nationality groups considered. In the case of immigrants, the main three locations in Portugal are Lisboa, Faro and Porto, but Setúbal is also an important location. This regional distribution is different from that of natives which are more widespread across the country and relatively more concentrated in the North of the country, with Porto and Braga being major locations for native employment. Immigrants are relatively more concentrated than natives in the Lisboa district, a district whose total employment grew above average in this period. The second major location of immigrant workers, Faro, had also a strong increase in total employment, the highest of the districts included in Table 4. Immigrants from the PALOP are heavily concentrated in the Lisboa and Setúbal districts, especially in the case of Cape Verde (80.1 per cent of immigrant workers from Cape Verde are located in these two districts). Workers from Brazil are also very concentrated in Lisbon (53 per cent of total), with Faro, Setúbal and Porto appearing also as important locations in this period. Porto is the second major location for Chinese immigrants, with an above-average share of 16.9 per cent, followed by

Faro with 13.1 per cent. Workers from the CEEC are relatively more concentrated in Faro, with Leiria appearing as the third major district for these workers. Faro is also an important location for immigrants from the EU15, accounting for 18.6 per cent of total workers from these countries in the period 2002-2008.

Immigrant employment in Portugal is concentrated in a few sectors, namely construction and some services activities. In contrast, the share of the manufacturing industry in total immigrant employment is much lower than that in native employment (15.9 and 28.8 per cent on average in the 2002-2008 period, respectively) and declined from 2002 to 2008 (Figure 12 and Table 5). The main sector of immigrant employment in Portugal is the construction sector, accounting for 23.9 per cent of the total employment of immigrants in this period (11.5 per cent for natives). The construction sector is especially relevant for male immigrants as 35.5 per cent of them are employed in this sector (18.4 per cent for native males) and for immigrants of the PALOP and, mostly, the CEEC. The high concentration of immigrants in the construction sector reflects the fact that recent immigration flows in Portugal were partly driven by strong demand in this sector. However, the proportion of immigrants employed in construction declined over the 2002-2008 period, in line with the deceleration of activity in this sector, but the share of native employment remained virtually stable. This fact points to a higher sensitivity of immigrants employment to the evolution of activity in this sector.

Figure 12: Main sectors of immigrant employment in Portugal



(a) Immigrants, shares in total

(b) Natives, shares in total

Sources: *Quadros de Pessoal* and authors' calculations.

In the period 2002-2008, the employment share of the services sector as a whole is very similar for natives and immigrants, representing almost 60 per cent of total in both cases, and has been increasing over time reflecting the shift to services observed in most advanced economies since the eighties. However, the breakdown within services is very different for natives and immigrants in Portugal. Immigrants are especially concentrated in three sub-sectors: hotels and restaurants, real estate and business services, and wholesale and retail

Table 5: Main sectors of activity of native and immigrant employees in Portugal, average 2002-2008 shares as a percentage

		Natives	Immigrants						Males		Females	
ISIC code				EU15	PALOP	CEEC	Brazil	China	Natives	Immigrants	Natives	Immigrants
1+2+5	Agriculture, forestry and fishing	1.6	2.6	1.9	0.6	5.2	1.7	0.3	1.8	2.7	1.3	2.3
10-14	Mining and quarrying	0.5	0.4	0.4	0.2	0.9	0.1	0.0	0.8	0.7	0.1	0.1
15-37	Manufacturing industry	28.8	15.9	20.8	8.9	22.0	10.8	1.0	28.5	17.0	29.1	13.8
15-16	Food products, beverages and tobacco	3.6	2.8	2.2	1.8	3.7	2.8	0.0	3.4	2.3	3.9	3.8
17-19	Textiles, clothing, footwear and leather	8.6	2.4	4.0	0.6	2.4	0.7	0.5	4.4	1.6	14.1	3.9
20-22	Wood, cork and paper	3.1	1.5	1.9	0.9	1.9	1.0	0.1	3.8	1.7	2.2	1.0
23-25	Chemicals, including energy	1.9	1.1	1.6	0.7	1.5	0.8	0.1	2.2	1.2	1.5	0.9
26-28	Minerals and metals	5.1	4.3	4.2	2.3	7.7	2.5	0.0	7.0	5.7	2.7	1.7
29-33	Machinery and equipments	3.0	1.7	3.0	1.2	1.9	1.5	0.1	3.5	2.1	2.2	1.1
34+35	Transport equipment	1.6	1.2	2.5	0.9	1.5	0.9	0.0	1.9	1.3	1.1	0.9
36+37	Other manufacturing	1.8	0.9	1.4	0.5	1.4	0.6	0.2	2.3	1.1	1.3	0.6
40+41	Electricity, gas and water supply	0.6	0.1	0.1	0.1	0.1	0.1	0.0	0.9	0.1	0.2	0.1
45	Construction	11.5	23.9	8.1	29.1	32.3	19.4	0.5	18.4	35.5	2.3	2.2
50-99	Services	57.1	57.1	68.7	61.1	39.5	68.0	98.2	49.6	44.1	67.0	81.5
50-52	Wholesale and retail trade	20.0	13.5	19.7	11.1	9.0	15.8	50.0	19.5	11.7	20.7	17.0
55	Hotels and restaurants	6.1	15.3	11.4	14.6	10.7	23.7	46.0	4.2	8.7	8.7	27.7
60 a 64	Transports and communications	5.9	4.3	5.5	2.5	5.3	4.6	0.2	8.1	5.6	3.0	1.7
65-67	Financial intermediation	3.2	0.8	2.2	1.4	0.1	0.5	0.0	3.2	0.6	3.2	1.1
70-74	Real estate and business services	9.6	15.0	12.9	22.9	10.3	14.7	0.9	9.4	13.7	10.0	17.4
75	Public administration	0.9	0.3	0.4	0.4	0.1	0.2	0.0	0.8	0.2	1.1	0.4
80	Education	1.9	1.1	4.9	0.8	0.3	0.5	0.2	0.8	0.5	3.4	2.2
85	Health and social work	5.8	3.6	7.1	4.6	1.4	3.3	0.1	1.2	0.9	11.9	8.7
90-99	Other services	3.6	3.3	4.6	2.9	2.4	4.6	0.8	2.4	2.2	5.1	5.2
		100	100	100	100	100	100	100	100	100	100	100

Sources: *Quadros de Pessoal* and authors' calculations.
Note: ISIC refers to the International Standard Industrial Classification of All Economic Activities.

trade. The first two sub-sectors represent individually around 15 per cent of total immigrant employment in this period, a share much higher than that of natives. Both sub-sectors recorded also an increase of immigrant employment from 2002 to 2008. These two sub-sectors are particularly significant for female immigrants, with shares in total female immigrant employment of 27.7 percent for hotels and restaurants and 17.4 per cent for real estate and business services in this period. Within the real estate and business services, the major sub-sectors of immigrant employment are industrial cleaning and labour recruitment and provision of personnel, which includes temporary work agencies. This sub-sector employs an especially high share of immigrants from the PALOP (22.9 per cent on average in the period), in particular in cleaning services. Around 15 per cent of immigrants from Brazil also work in real estate and business services, but particularly in temporary work agencies. Immigrants from China and, to a lesser extent, Brazil are relatively more concentrated in hotels and restaurants (average shares of 46 per cent and 23.7 per cent, respectively). A significant percentage of immigrants works in wholesale and retail trade (13.5 per cent compared to 20 per cent for natives in the period 2002-2008) and this share remained almost stable over this period. Female immigrants are relatively more concentrated in this sub-sector than male

immigrants (shares in total of 17 and 11.7 per cent, respectively), while for native workers the proportions between men and women are similar (around 20 per cent). Immigrants from China are predominantly employed in wholesale and retail trade, accounting for 50 per cent of total on average in this period. A higher than average share of employment in this sub-sector is also found for immigrants from the EU15 (19.7 per cent). Workers from the EU15 are also more concentrated in education and health than immigrants from other origins.

Table 6: Education attainment of native and immigrant employees in Portugal, average 2002-2008 shares as a percentage

	Natives	Immigrants							
			EU15	PALOP		CEEC		Brazil	China
					Cape Verde		Ukraine		
Very low	46.9	44.1	19.5	55.8	71.3	43.8	45.1	37.0	70.0
of which illiterate	1.2	4.1	0.5	4.9	8.7	6.3	6.7	1.7	15.3
Low	21.4	24.2	19.7	21.7	16.4	26.8	26.7	27.9	20.1
Medium	20.2	23.1	29.8	16.7	10.0	23.6	22.6	29.5	7.2
High	11.5	8.7	31.0	5.9	2.3	5.8	5.6	5.7	2.7
	100	100	100	100	100	100	100	100	100

Sources: *Quadros de Pessoal* and authors' calculations.
Note: Very low education level refers to ISCED 0-1 (primary, up to 6 years), low refers to ISCED 2 (lower secondary, up to 9 years), medium refers to ISCED 3-4 (upper-secondary, up to 12 years) and high refers to ISCED 5-6 (tertiary).

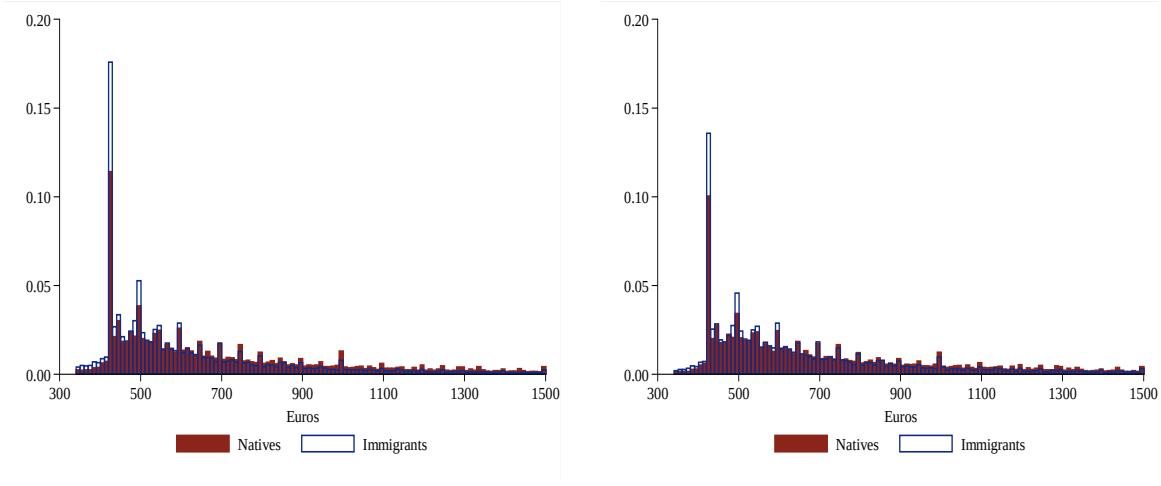
Table 6 compares the educational attainment of natives and immigrants in the Portuguese labour market using the International Standard Classification of Education (ISCED) categories. The differences between the levels of formal education of natives and immigrants as a whole are small. The percentage of immigrant workers with very low education levels is lower than the corresponding figure for native workers (44.1 and 46.9 per cent, respectively), but the share of illiterates is higher for immigrants. Immigrants with a high education level (tertiary education) represent also a smaller proportion of total than that of natives, while the percentage of immigrants with low and medium education levels is higher than that of native workers. However, these aggregate education levels conceal important differences between the main immigrant groups. Immigrants from Cape Verde and China stand out as having an extremely low educational attainment. 71.3 per cent of immigrants from Cape Verde have a very low education level (primary education or less), with 8.7 per cent of illiterates, and only 2.3 per cent of them have tertiary education in the 2002-2008 period. These education levels are much lower than in the case of immigrants from other PALOP and are comparable to those of workers from China, even though the Chinese have a higher percentage of illiterates (15.3 per cent). The proportion of highly-educated workers is very similar in immigrants from the PALOP, CEEC and Brazil (between 5.7 and 5.9 per cent of total), but the Brazilians have a smaller share of individuals with very low education levels and a higher percentage of workers with medium education. 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.

4 The wages of immigrants in Portugal

The wage-setting procedure in Portugal is mainly determined by three thresholds. First, the lower limit is defined, at the national level, through the legal mechanism of the minimum wage. Second, nominal wage cuts in the private sector are forbidden by law (Labour code, art. 129). Finally, in the context of wage bargaining, the vast majority of the lower limits of wages for each professional group are defined by sectoral agreements, as firm agreements are the exception. Hence, there is not an automatic wage indexation mechanism. This framework is common to both native and immigrant workers.

As expected, the distribution of wages for the total economy shows a mode in wages equal to, or very close to, the minimum wage. Furthermore, looking to this distribution one can see that the concentration of immigrants in lower wages was higher (Figure 13).[5] This was true for both total employees and employees who stayed at least for two consecutive years in the same firm. As workers who entered or exited a given firm in a given year, either natives or immigrants, earned lower wages, the concentration in the bottom-end of the wage distribution was higher for total employees than for stayers.

Figure 13: Distribution of wages in Portugal, 2008



(a) Total (b) Stayers

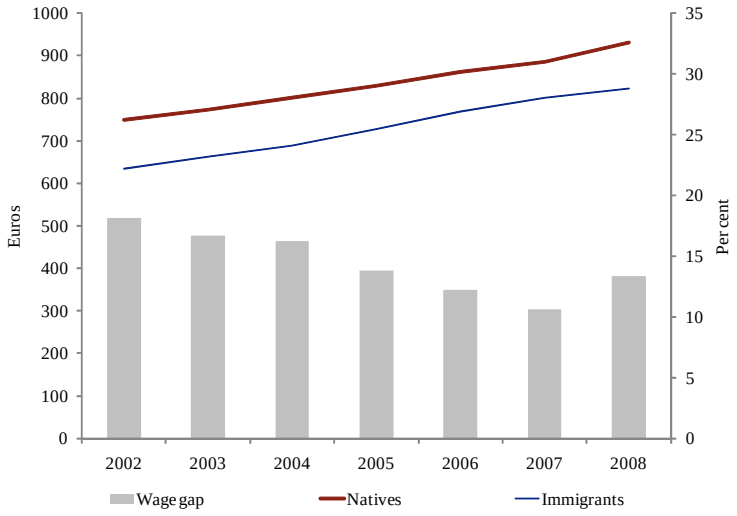
Sources: *Quadros de Pessoal* and authors' calculations.
Note: Stayers only include employees who stayed for at least two consecutive years in the same firm.

Not controlling for any differentiating factors, immigrants in Portugal are, on average, paid below the wages of native workers over the 2002-2008 period (Figure 14). In addition, the proportion of workers that are paid below the minimum wage is substantially higher for immigrants than for natives. In 2002, the average wages of native workers were 18.2 per cent above the average wages of immigrants, but this wage gap decreased to 13.3 per cent in 2008. Having started from lower wage levels, the average growth of wages in the period

[5] The distributions of wages are similar throughout the period analysed. These distributions are available from authors upon request.

2002-2008 was higher for immigrants than natives (annual average change of 4.4 and 3.7 per cent, respectively).

Figure 14: Wage levels of native and immigrant employees in Portugal



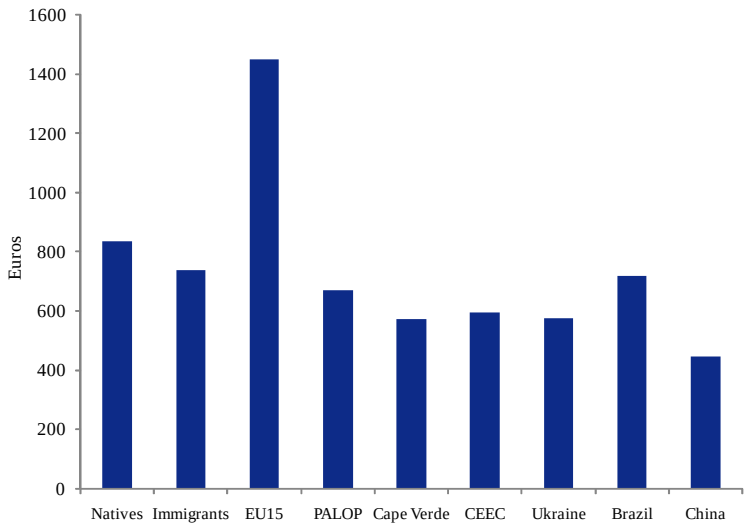
Sources: *Quadros de Pessoal* and authors' calculations.
Note: The percentual wage gap is defined as the difference between the average wages of native and immigrant workers expressed as a percentage of natives wages.

There are also important differences in average wages within immigrant workers in Portugal (Figure 15). Over the period analysed, the average wage of workers from the EU15 was almost twice as high as the average wage of natives and immigrants as a whole, growing at an annual rate of change of 4.6 per cent.[6] Immigrants from the PALOP earn less than the average immigrant but the difference is particularly stark in the case of workers from Cape Verde, which earn on average about 15 per cent less than the average PALOP worker. In 2002, the average wage of CEEC immigrants was lower than the one of workers from Cape Verde. However, the wages of CEEC workers grew significantly from 2002 to 2008 (41.4 per cent over the whole period, i.e., an annual change of 5.9 per cent) (Figure 16). The average wage of Brazilian workers in 2002 was similar to the average wage of immigrants as a whole. However, particularly in the last few years, the rate of change of wages of Brazilian workers was the lowest of all migrant groups considered, being slightly negative in 2008. Chinese immigrants earn wages significantly lower than other migrant groups, on average, reflecting their strong concentration in some low-skilled sectors, like wholesale and retail trade, and hotels and restaurants, and also the extremely high share of minimum wage earners, which we will examine in more detail below. Nevertheless, the high percentage of minimum wage earners may be one of the reasons why the wages of Chinese workers increased at a higher pace than total immigrants' wages in the last two years. Summing up, apart from EU15 workers, the other migrant groups earn lower wages than natives, and the higher average

[6] As wage distributions exhibit a higher concentration in the left tail, the average wage is higher than the median wage. However, the results remain qualitatively unchanged if the median was used instead.

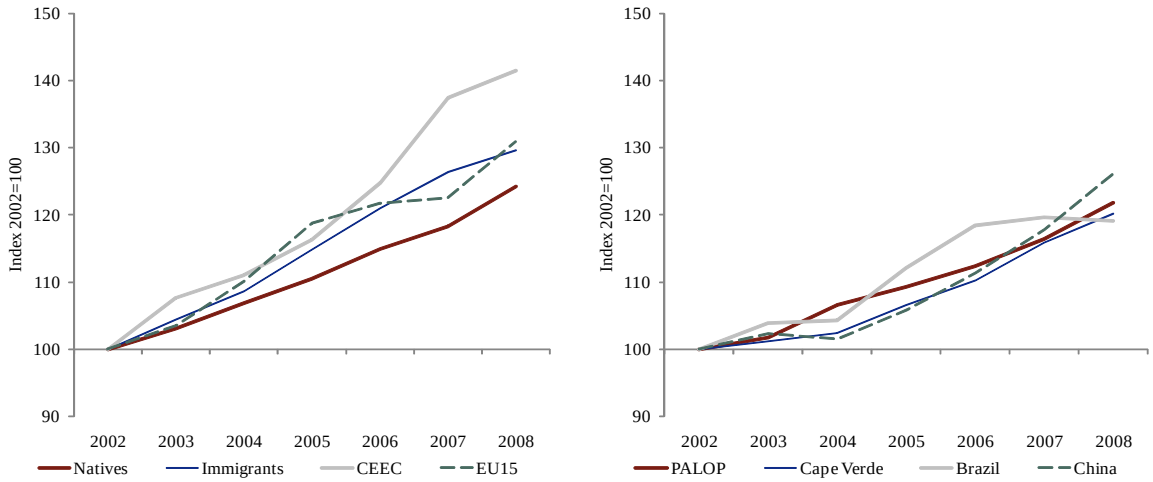
wage growth of immigrants compared to natives over the period analysed was mainly driven by developments in the wages of CEEC workers, whose tenure also rose steadily, and, to a lesser extent, of workers from the EU15.

Figure 15: Wage levels by main nationalities, average 2002-2008



Sources: *Quadros de Pessoal* and authors' calculations.

Figure 16: Evolution of average wages by main nationalities



(a) Cumulative growth

(b) Cumulative growth

Sources: *Quadros de Pessoal* and authors' calculations.

Several factors may contribute to the wage gap between natives and immigrants observed throughout the 2002-2008 period. This gap is linked with a broad range of variables that can have an impact on wages, such as age, gender, education, type of contract, tenure, sector and region, as we will discuss in further detail below. However, these variables do not seem to fully explain the observed wage gap between native and immigrant workers. For the whole sample period, we estimated a simple wage regression including variables controlling for the age, gender, education, type of contract, tenure, sector and region, and also nationality

and time dummies. The results in Table 7 show that the wage gap between natives and immigrants persists even after taking into account these regressors (OECD (2008*a*) found a similar result using data for 2005). From about 15 per cent, the average wage gap between natives and immigrants as a whole remains at 8.5 per cent even after controlling for worker, firm and match characteristics. Within immigrants, these characteristics account for around 40 and 30 per cent of the negative wage gap for PALOP and CEEC immigrants, respectively. This percentage is significantly higher in the case of Brazilians (almost 60 per cent) and Chinese workers (about 70 per cent). About half of the positive gap between the wages of EU15 and native workers is related with the selected regressors.

Table 7: Log wages of immigrants compared to natives, 2002-2008

	Immigrants	EU15	PALOP		CEEC		Brazil	China
				Cape Verde		Ukraine		
Coefficient of the nationality dummy								
Without controls	-0.149	0.329	-0.176	-0.265	-0.239	-0.251	-0.190	-0.484
With controls	-0.085	0.156	-0.106	-0.117	-0.164	-0.179	-0.077	-0.149
Explained gap (% of total gap)	42.9	52.6	39.5	56.0	31.7	28.6	59.3	69.2

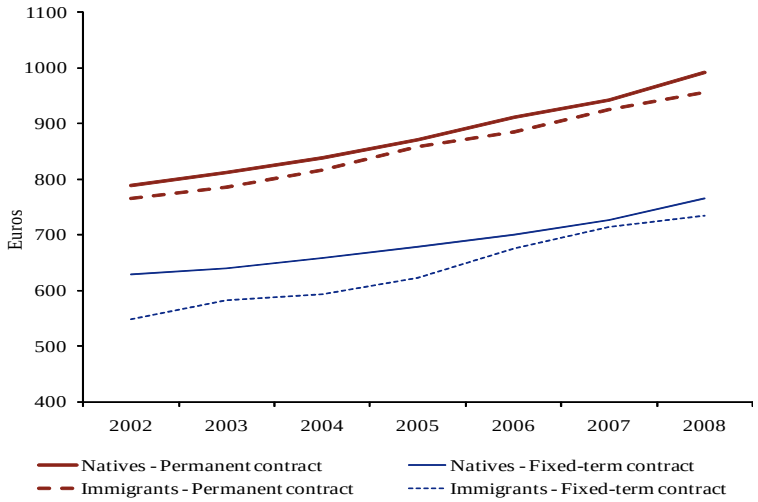
Sources: *Quadros de Pessoal* and authors' calculations.
Note: All regressions include time dummies. The control variables are age, gender, education, region, sector, tenure and type of contract.

Apart from information on tenure, our regression does not control for the duration of stay of immigrants in Portugal. Among other factors, longer periods of residence are associated with better language skills and more experience acquired in the destination country, which can contribute to partly offset the remaining wage gap between natives and immigrants (see, for instance, Carneiro et al. (2010)). A more in-depth analysis of the process of economic assimilation of immigrants in Portugal is an interesting topic for future research.

Worker, firm and match characteristics included in the wage regression presented above account for around 40 per cent of the overall wage gap between natives and immigrants. In the following analysis we will further examine some of these variables in more detail. Regarding the type of contract, results from the regression presented above point to the existence of a 3.7 per cent penalty on wages of similar workers but with fixed-term contracts. In the period 2002-2008, the positive wage gap between natives and immigrants is common to workers with permanent and fixed-term contracts (Figure 17). Considering workers with permanent contracts, the wage gap between natives and immigrants remained almost stable over this period, while the difference in wage levels of natives and immigrants with fixed-term contracts declined from 2002 to 2008. Moreover, workers with permanent contracts earn higher average wages than those with fixed-term contracts, both in native and in immigrant employment. In the period 2002-2008, natives with permanent contract earned approximately 27 per cent more than natives with fixed-term contract. In the case of immigrants this percentage gap

was even higher, reaching 34 per cent. Throughout the period, the difference in wage gaps between permanent and fixed-term contracts - of native and immigrant workers - dwindled away, being very similar in the most recent period (about 30 per cent). Hence, as the percentage of native workers with permanent contracts is higher than for immigrants and higher than the percentage of natives with fixed-term contracts, the wage gap between permanent and fixed-term contracts contributed positively to the higher average wages of natives when compared to immigrants.

Figure 17: Wage gap between natives and immigrants in Portugal by type of contract



Sources: *Quadros de Pessoal* and authors' calculations.

The pattern of differences in wage levels between natives and immigrants does not change substantially across the main sectors of activity of immigrant employment. Apart from EU15 workers, immigrants have lower average wages than natives in construction, hotels and restaurants, real estate and business services, and wholesale and retail trade. Nevertheless, there are some differences in the evolution of average wages of natives and immigrants over time in these sectors.

In wholesale and retail trade, the wages of immigrant workers increased at a lower rate than the wages of natives (annual rates of 2.6 and 3.6 per cent, respectively) (Table 8). On the one hand, the wages of Brazilian (the most significant group of immigrants in this sector), CEEC and Chinese workers increased at a higher pace than the wages of natives. On the other hand, changes in the wages of PALOP workers were below those of natives. Furthermore, the wages of workers from the EU15 decreased significantly in 2007 and 2008. Given the higher level of their wages, this evolution in wages of EU15 workers had a strong negative contribution to the developments in total immigrants' wages.

In contrast, in the construction sector, immigrants' wages grew more than those of native workers from 2002 to 2008 (annual average rates of 5.8 and 4.8 per cent, respectively).

Table 8: Evolution of average wages by main nationalities and sectors of activity of immigrant employment annual rate of change as a percentage, average 2002-2008

ISIC code		Natives	Immigrants	EU15	PALOP	Cape Verde	CEEC	Ukraine	Brazil	China
45	Construction	4.8	5.8	2.8	4.9	2.9	7.5	7.4	2.7	-6.1
50-52	Wholesale and retail trade	3.6	2.6	2.4	3.1	3.2	4.7	4.5	4.0	4.2
55	Hotels and restaurants	3.9	3.8	4.2	3.3	3.6	4.7	5.0	4.1	3.7
70-74	Real estate and business services	2.1	2.1	2.1	1.4	2.8	5.0	5.3	0.6	4.8
	Total	3.7	4.4	4.6	3.3	3.1	5.9	6.4	3.0	4.0

Sources: *Quadros de Pessoal* and authors' calculations.

Wages from PALOP workers increased almost the same as natives, but the average wages of CEEC workers - the other dominant group of immigrants in the construction sector - grew significantly (54.2 per cent in cumulative terms, i.e., an annual rate of change of 7.5 per cent). In spite of having started at a similar point in 2002, the wages of workers from Cape Verde in the construction sector increased by far less than overall PALOP workers, resulting in a gap in average wage of about 70 euros in 2008.

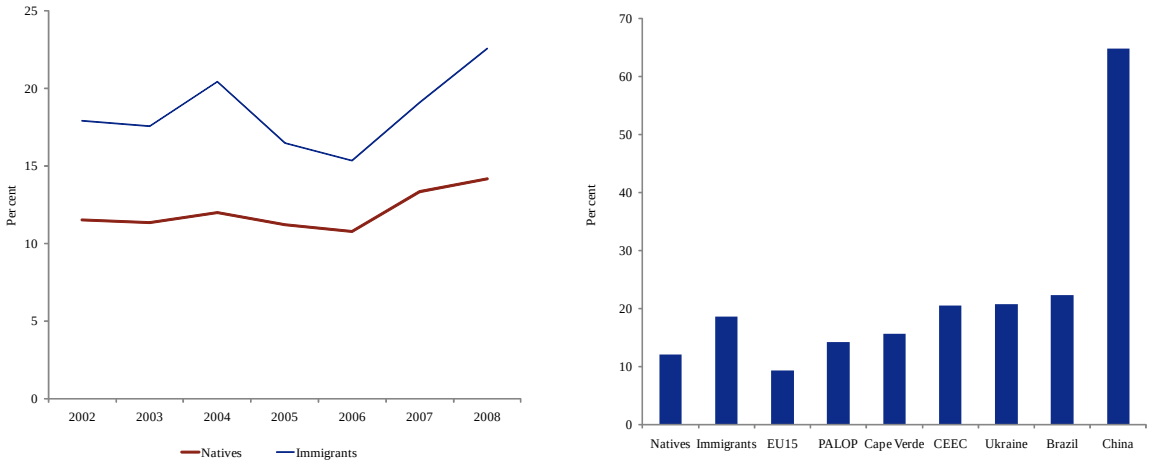
In the real estate and business services, workers from Cape Verde also earned lower wages, on average, over this period. Yet, the developments in their wages were significant, with an average wage growth higher than for total immigrants and natives working in this sector. Immigrants from other PALOP had feeble wage developments, as the cumulative average wage growth of total PALOP workers in this sector was about 4 percentage points below natives in the period 2002-2008. The average wage of Brazilians increased only by 3.7 per cent in 6 years, i.e., an annual change of 0.6 per cent, with negative rates of change in 2007 and 2008. So, in spite of the sharp increase in the average wages earned by CEEC workers, the wages of total immigrants grew virtually the same as those of natives in this sector.

In hotels and restaurants, the wages of immigrants and natives also increased roughly the same over this period, with an annual average rate of change of around 4 per cent. Wages of CEEC and Brazilian immigrants grew above average over this period, while the wages of PALOP workers increased by 3.3 per cent on average each year. Chinese workers in this sector have a cumulative wage growth close to the average over the period, but show a strong wage increase in the last two years, in line with the higher incidence of minimum wage earners in Chinese immigrants.

Indeed, the percentage of minimum wage earners is higher for immigrants than natives. In the period from 2002 to 2008, 12.5 per cent of workers reported wages close to the minimum wage (interval of +/- 10 euros centered on the minimum wage). Over this period, 12.1 per cent of native workers earned the minimum wage, while in the case of immigrants, the

proportion of minimum wage earners reached 18.6 per cent, on average. After a period where it remained fairly stable, the percentage of minimum wage earners grew for natives and, even more markedly, for immigrant workers in 2007 and 2008, amidst significant increases of the legal minimum wage of 4.4 and 5.7 per cent, respectively (Figure 18).[7]

Figure 18: Percentage of workers earning the minimum wage



(a) Annual shares

(b) By main nationalities, average 2002-2008

Sources: *Quadros de Pessoal* and authors' calculations.
Note: Consider as workers earning the minimum wage all those workers whose wage lies in an interval of +/- 10 euros centered on the minimum wage.

Immigrants from the EU15 have the lowest share of minimum wage earners, even lower than that of natives. In contrast, approximately every two out of three Chinese workers are reported as earning the minimum wage in this period. Minimum wage earners account for 14.3 per cent of total immigrants from PALOP but that proportion reaches 15.6 per cent if we consider workers from Cape Verde only. Immigrants from CEEC and from Brazil have an average percentage of minimum wage earners of 20.5 and 22.3 per cent, respectively, over the period 2002-2008. In the case of immigrants from Brazil that share increased strongly in the last two years to 28.8 per cent in 2008, while in the case of CEEC it remained mostly stable around 20 per cent.

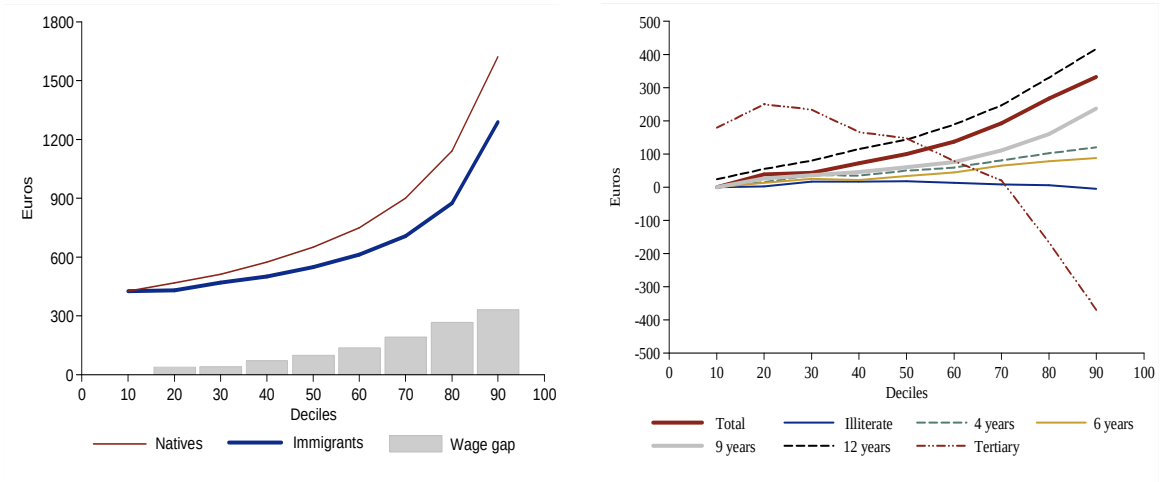
The shapes of the distributions of wages across different education levels were broadly similar to the distributions for total workers. Again, immigrants tended to be more concentrated on lower wages. Without controlling for factors other than education, the wage gap between natives and immigrants was positive, rising steadily from the bottom to the top of the wage distribution (Figure 19).[8] The gap is minimum at the very bottom of the wage distribution. As pointed out by Carneiro et al. (2010), the existence of a mandatory minimum wage level

[7] From 2002 to 2006 the minimum wage increased by 4.1, 2.5, 2.5, 2.5 and 3 per cent, respectively. Given that a goal of reaching a 500 euros minimum wage by 2011 was set in 2006, the increases of the minimum wage since 2007 have been higher (4.4 per cent in 2007, 5.7 per cent in 2008, and 5.6 per cent in 2009 and 2010).

[8] Information displayed on Figure 19 refers to 2008. The results are qualitatively similar throughout the period analysed and are available from the authors upon request.

may act as a forceful instrument to limit the wage gap between native and immigrant workers at the bottom-end of the wage distribution.

Figure 19: Wage gap between native and immigrant employees in Portugal, 2008



(a) Overall gap

(b) By education level (years completed)

Sources: *Quadros de Pessoal* and authors' calculations.

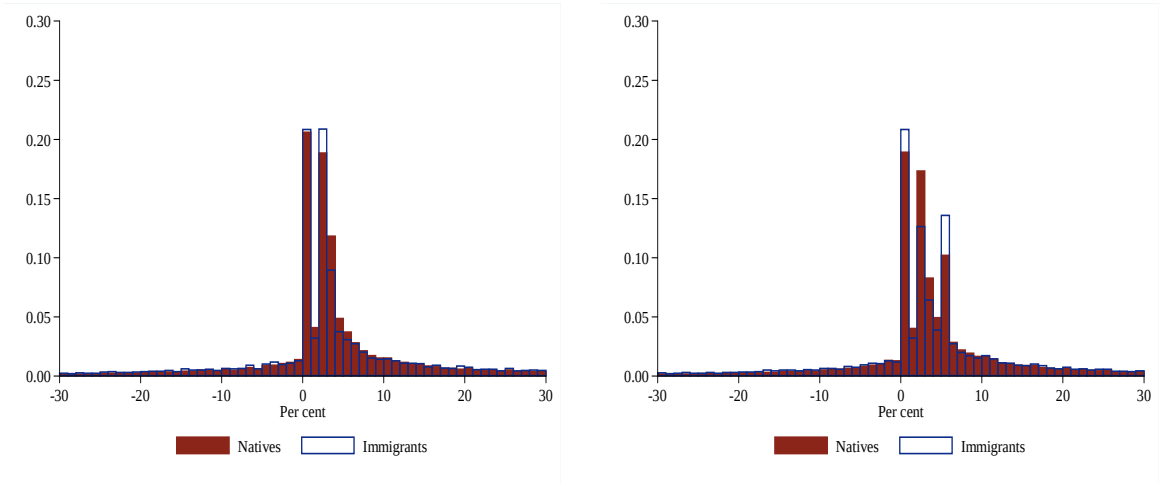
There are two interesting exceptions to this scenario. First, the wage gap between immigrants and natives was virtually nil in the case of illiterate workers. Within these workers, Ukraine and Cape Verde are the most important origin countries. The second refers to the group of workers in the top-end of the education distribution (tertiary education level), which in the case of immigrants are mostly from EU15, namely Spain and France. In this case, immigrants were more concentrated on both tails of the wage distribution, i.e., very low and very high wages. In the left tail of the wage distribution the wage gap was again positive, i.e., wages of immigrants were lower. Nevertheless, as one moves to the right, the positive wage gap progressively diminishes, reversing its sign as one approaches the top-end of the wage distribution. Thus, for example in 2008, immigrant workers with tertiary education and on the top 30 per cent of wage distribution were better paid than native workers with tertiary education on the top 30 per cent of wage distribution.

Regarding the distribution of wage changes, negative nominal changes almost do not exist (Figure 20).[9] Moreover, there is very high concentration on the zero change, in general slightly higher in the case of immigrant workers. Between 2003 and 2006 the distribution of wage changes had a second mode near the expected inflation rate (and bargaining and minimum wage reference values), common to both natives and immigrants. In 2007 and 2008, the distribution of wage changes has three spikes - at zero, at the expected inflation rate value (and bargaining reference value) and at the rate of change of the minimum wage. The concentration in the rate of change of the minimum wage is higher for immigrant workers,

[9] Since wage changes were calculated at the individual level, this distribution only includes employees who stayed for at least two consecutive years in the same firm.

reflecting the higher percentage of immigrants earning the minimum wage. Despite differences in the relative size of the spikes, the main features of the distribution of wage changes - near absence of negative changes and two- or three-spike distributions - were common to immigrants across nationalities, education levels and activity sectors.[10]

Figure 20: Distribution of wage changes in Portugal



(a) 2003 (b) 2008

Sources: *Quadros de Pessoal* and authors' calculations.

5 Wage rigidity

Wage rigidity (nominal and real) is associated with labour market frictions that prevent the normal adjustment of wages to labour demand, limiting firms' ability to accommodate disturbances in the demand for their products. As opposed to wage flexibility, a rigid wage framework may lead to an adjustment that generates unemployment.

Should wage rigidity differ between native and immigrant workers? The predictions from labour market theories do not all point in the same direction (see Campbell and Kamlani (1997) for a discussion of the alternative theories for wage rigidity). According to the insider-outsider theory (Lindbeck and Snower (1988)), *insiders* have more power to influence the wage-setting process and tend to have higher wage rigidity. As native workers tend to have more power in the wage-setting process, this suggests that they could have higher wage rigidity than immigrant workers. Furthermore, the share of immigrants with permanent contracts is much smaller than the share of natives. So, the contract theory (see, for example, Taylor (1979)) also suggests that native workers would have higher wage rigidity.

In contrast, as discussed in Du Caju et al. (2007), the cost of losing a job is higher for older workers and workers with higher tenure. These workers have, therefore, less incentive to

[10] All distributions are available from authors upon request.

shirk or quit, even in presence of wage cuts, implying a higher likelihood of a wage cut for them and, thus, lower wage rigidity, The opposite applies to immigrants, which are, on average, younger and have lower tenures. So, assessing whether wage rigidity is higher for immigrant or native workers is ultimately an empirical question.

5.1 Measuring rigidity

Several attempts have been made in order to assess the causes and gauge the consequences of wage rigidity. One strand of the literature on this topic relies on estimates of rigidity obtained from macro data (see, for instance, Akerlof et al. (1996) and Blanchard and Galí (2007)). Alternatively, another strand of the literature tries to exploit the ever increasing availability of longitudinal databases with extensive information on wages, individuals and firms (see Card and Hyslop (1996) and Kahn (1997), among others). An example of this micro data approach is the International Wage Flexibility Project (IWFP). The IWFP methodology for calculating the wage rigidity measures is based on the analysis of the distributions of wage changes, obtained from databases with information broken down by individual. Estimations of downward nominal and real wage rigidity based on individual data and following the IWFP methodology include, for instance, the works of Dickens et al. (2007), Du Caju et al. (2007), Duarte (2008) and Messina et al. (2010). According to this methodology, the nominal rigidity concept is associated with the share of workers who have nil wage changes and would see their wages fall in the absence of rigidity. In turn, real rigidity reflects the share of workers whose wage change is close to expected inflation, but would be lower in the absence of rigidity.

In a nutshell, the rigidity measures result from comparing the actual distribution of wage changes with a notional distribution that tries to reflect a flexible wage scenario. The notional distribution is approximated by a symmetric Weibull distribution and its parameters are estimated from moments of the actual distribution assumed not to be affected by wage rigidity (for example, the 75^{th} percentile). The higher the concentration in the nil wage change of the actual distribution vis-à-vis the notional distribution, the greater the evidence in favour of nominal rigidity and, hence, the higher the measure of nominal rigidity calculated according to the IWFP methodology. Similarly, the higher the concentration of the actual distribution, compared with the notional distribution, in a wage change close to the expected inflation, the greater the evidence in favour of real rigidity, and the higher the value of the measure.

In case any measurement errors are detected, the procedure for calculating the rigidity measures, developed by the IWFP, tries to purge these errors from the wage change distribution, by computing a new distribution, known as the “true” distribution, which takes the place of

the empirical distribution in the comparison with the notional distribution.[11] Moreover, the calculation procedure of the rigidity measures makes it possible to obtain simultaneously nominal and real rigidity measures, as well as the reference value for the real rigidity.

However, when the reference value is relatively low, close to zero, the best identification conditions for the two types of rigidity cease to occur, making it more difficult to distinguish between nominal and real rigidity. Furthermore, if institutional rigidities (e.g. collectively bargained wages and minimum wages) play a significant role in the wage-setting process, distinguishing the different types of rigidity becomes trickier. For example, if the reference values for collective bargain and minimum wages are similar to the expected inflation rate, the IWFP real rigidity measure will reflect both (strictly) real and institutional rigidities.

5.2 Rigidity results

Given the QP database described in section 3, a 10 per cent random sample of the employees was selected for calculating the rigidity measures. Since the IWFP methodology focuses on wage changes that are not influenced by worker mobility (see Dickens et al. (2007)), this sample was further restricted to include only the employees who worked for at least two consecutive years in the same firm (stayers) and whose tenure increased over time.

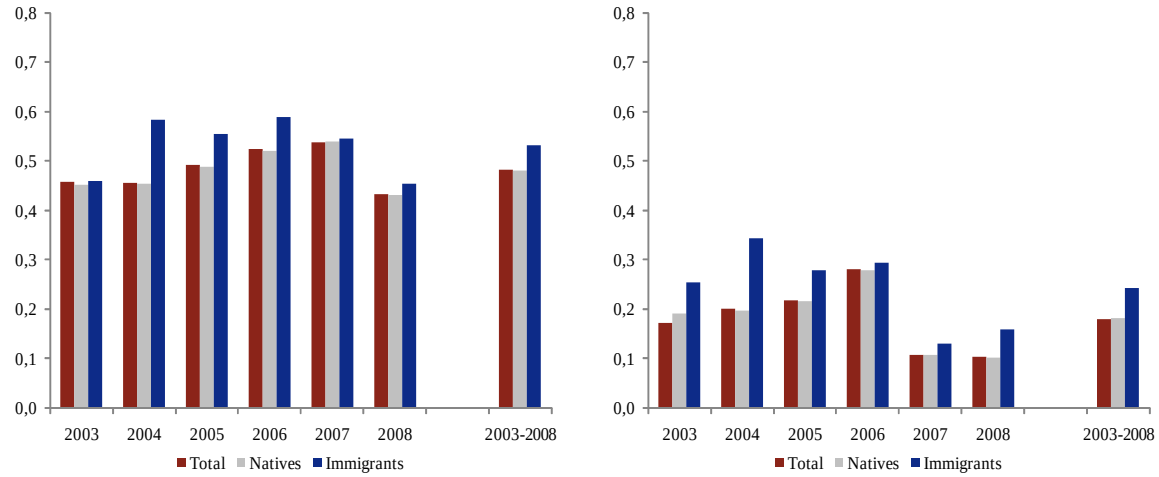
As mentioned above, the empirical distribution of wage changes shows only a small fraction of negative nominal changes and a very high concentration on the nil change, suggesting resistance to nominal wage declines (nominal rigidity). Furthermore, the existence of a second mode near the expected inflation rate (and/or the bargaining and minimum wage reference values) and a smaller concentration in rates immediately below are evidence in favour of real wage rigidity.[12] These results are common to native and immigrant workers.

The hints given by the histograms are confirmed by the results of the nominal and real wage rigidity measures (Figure 21). As expected, the nominal rigidity indicator is high throughout the period analysed. On average, about 50 per cent of the employees who would have a nominal wage cut, in the absence of rigidity, have instead nil wage changes. This result not only is influenced by the legal framework associated with the existing barriers to nominal wage cuts, but is also related to the fact that, even in the absence of legal constraints, firms tend to avoid nominal wage cuts for motivational reasons (see Bewley (1998) and Howitt (2002)). The results are relatively similar when native and immigrant workers are analysed separately. However, throughout the period analysed, the nominal wage rigidity tended to be slightly higher for immigrants than for natives (5 percentage points higher, on average).

[11] The detection of measurement errors is based on the analysis of the wage change autocorrelation. Positive changes followed by negative changes are assumed to be a sign of the existence of measurement errors (for further details, see Dickens et al. (2007)).

[12] Comparing the empirical distribution with the "true" distribution, one can conclude that the differences between the two are virtually nil, thus suggesting that measurement errors are limited in QP database.

Figure 21: Nominal and real wage rigidity in Portugal



(a) Downward nominal wage rigidity

(b) Downward real wage rigidity

Sources: *Quadros de Pessoal* and authors' calculations.

The real wage rigidity measure shows more irregular developments. Given its definition, and taking into account the low inflation in Portugal in the period analysed, calculating and interpreting this measure is naturally more challenging.[13] On average, about 18 per cent of the total workers who would face a decline in their real wages, in a context of wage flexibility, see their wages increase in line with the expected inflation rate. In the case of native workers, this percentage is similar, while for immigrants the real wage rigidity was on average 6 percentage points higher (24 per cent).

Regarding total workers, these results are qualitatively similar to those previously reported in Banco de Portugal (2004), for a previous period, and in Duarte (2008) for a similar time span. Even though obtained from an alternative database (Instituto de Informática, Portuguese social security data-processing office), results in the latter also point to high nominal wage rigidity and a more irregular evolution of the real wage rigidity measure.

Over the period analysed, the real rigidity measure for total workers steadily increased from 2003 to 2006 and in 2007 and 2008 decreased significantly to about half of the average value on the previous years. The sharp reduction in the real rigidity measure in the last two years was common to native and immigrant workers. This decrease reflected to a large extent the evolution of the minimum wage. In 2007 and 2008, the minimum wage increased significantly (4.4 and 5.7 per cent, respectively). While in the previous years the minimum wage grew approximately at the same pace as prices, in 2007 and 2008 the minimum wage grew well above prices (inflation rate of 2.4 per cent in 2007 and 2.7 per cent in 2008).

So, up to 2006, the real wage rigidity measure combined both (strictly) real and institutional rigidities, related to collective bargaining and mandatory minimum wages. In the empiri-

[13] To improve identification conditions we imposed a lower bound of 2.5 per cent for expected inflation.

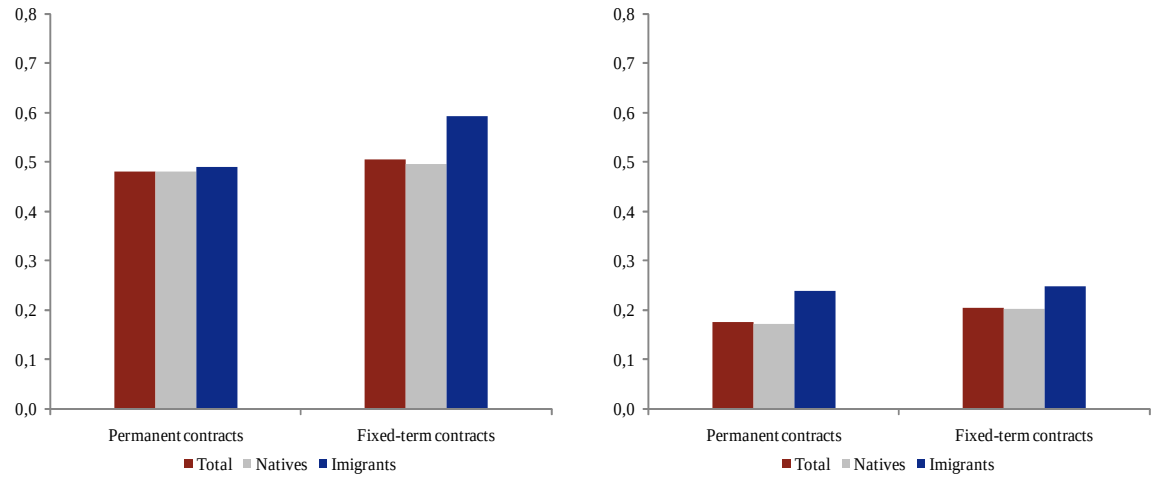
cal distribution of wage changes, the share of individuals covered by collective bargaining and/or earning the minimum wage contributed to reinforce the spike at the expected inflation rate value (the same as the bargaining and minimum wage reference values). In contrast, in 2007 and 2008, instead of having a two-spike distribution of wage changes, the distribution of wage changes has three spikes - at zero, at the expected inflation rate value (and the bargaining reference value) and at the rate of change of the minimum wage. In these years, for calculating the real wage rigidity measure, the IWFP methodology only takes into account one of the two non-zero spikes - or at the expected inflation rate value (and the bargaining reference value) or at the rate of change of the minimum wage.

The developments in the minimum wage induced a break in the series of the real wage rigidity measure. Consider, for example, the year of 2006, in which the rate of change of the minimum wage was equal to the inflation rate (3 per cent). In this year, 28 per cent of the total workers who would face a decline in their real wages, in a context of wage flexibility, see their wages increase in line with the expected inflation rate (and the bargaining and minimum wage reference values). Now, for the sake of the argument, assume that in 2007 the proportion of employees who, in the absence of rigidity, would face a decline in their real wages was the same as in 2006. In practice, within this group of employees, the wage of some of them would grow 4.4 per cent (of those who earned the minimum wage), while the wage of the others would grow in line with the inflation rate and the bargaining reference value (2.4 per cent). Although the proportion of workers whose wage is conditioned by the existence of (real and institutional) rigidity would be the same as in 2006, the value of the real rigidity measure calculated through the IWFP procedure would necessarily be lower, reflecting the three-spike distribution. Although this example is for the total workers, the same is also true for native and immigrant workers.

Nevertheless, in both sub-periods (pre- and post-break) the results obtained also suggest slightly higher values of the real rigidity measure for immigrants. The higher percentage of fixed-term contracts and minimum wage earners within immigrants makes this group of workers more prone to institution-related wage rigidity, whether through sector-level wage setting agreements or the mandatory minimum wage. Regarding the different types of contracts, to better assess this question we use separate samples for permanent and fixed-term contracts for calculating the measures of wage rigidity. Although differences are small, except for immigrants' nominal wage rigidity (10 percentage points) our results suggest that downward wage rigidity is always higher in the case of fixed-term contracts (see Figure 22). Moreover, for both permanent and fixed-term contracts, immigrants' wages tend to be more rigid than natives' wages.

Furthermore, in the case of minimum wage earners, consider the following example. In 2007 and 2008, the real wage rigidity measure only reflected one of the two non-zero spikes - the one which was the most significant, i.e., the one for which the difference between the notional

Figure 22: Nominal and real wage rigidity in Portugal by type of contract
average 2003-2008



(a) Downward nominal wage rigidity

(b) Downward real wage rigidity

Sources: *Quadros de Pessoal* and authors' calculations.

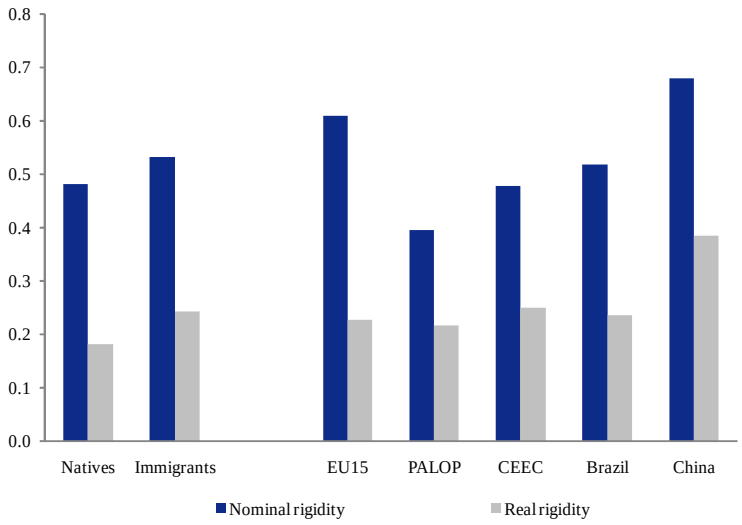
and the empirical distributions was greater. In both years, the focal points implicit in the real rigidity measures were associated with the rate of change of the minimum wage.[14] So, in these circumstances, greater concentration of workers in the minimum wage led to greater values of the real rigidity measure. Not surprisingly, within immigrants, Chinese workers have the highest value of the real rigidity measure (Figure 23).[15] Apart from China, the results for other countries of origin are relatively close to each other and to the average value for immigrants as a whole. Regarding nominal wage rigidity, the heterogeneity among different groups of immigrants is much higher. While the results for immigrants from PALOP and CEEC are close to the observed for native workers, the measure of nominal wage rigidity for immigrants from China and EU countries is higher than for immigrants as a whole and even higher than for natives. The result obtained for Brazilian workers is virtually the same as for total immigrants.

When assessing the differences on the results of rigidity measures across sectors, previous evidence suggested that both nominal and real rigidity tended to be higher in services and construction than in manufacturing (see Duarte (2008)). As already mentioned, immigrants are highly concentrated on construction and services - namely hotels and restaurants, real estate and business services, and wholesale and retail trade. So, the higher relative concentration of immigrants in these sectors could also contribute to higher overall rigidity for immigrant workers.

[14] By restricting the range over which the IWFP routine searches for signs of real wage rigidity one could force the results to reflect the expected inflation rate spike. We opted against imposing a tight range, based on a priori judgment, letting the routine freely select the most significant non-zero spike.

[15] Although with higher values, results for the real rigidity measure would not qualitatively change for the period 2003-2006.

Figure 23: Nominal and real wage rigidity in Portugal by main nationalities
average 2003-2008



Sources: *Quadros de Pessoal* and authors' calculations.

Again, the results presented in Table 9 point to the existence of significant heterogeneity among the different sectors. When looking at results for total employees and/or total economy, this heterogeneity can be masked. In particular, for total employees, the values of the rigidity measures are, in general, higher in the sectors in which the concentration of immigrants is also higher. As stark examples of this cleavage, the real rigidity measure for hotels and restaurants is almost twice as high as for the total economy and the nominal rigidity measure for wholesale and retail trade is more than 15 percentage points higher than for the total economy.

Table 9: Nominal and real wage rigidity in main sectors of immigrant employment
average 2003-2008

ISIC code		Nominal rigidity			Real rigidity		
		Total	Natives	Immigrants	Total	Natives	Immigrants
45	Construction	0.50	0.49	0.52	0.13	0.14	0.13
50-52	Wholesale and retail trade	0.65	0.65	0.65	0.09	0.09	0.25
55	Hotels and restaurants	0.53	0.53	0.58	0.35	0.36	0.36
70-74	Real estate and business services	0.52	0.52	0.49	0.18	0.18	0.18
	Total	0.48	0.48	0.53	0.18	0.18	0.24

Sources: *Quadros de Pessoal* and authors' calculations.

In general, the differences in the rigidity measures between natives and immigrants within each sector are small and tend to be smaller than for the whole economy. In the case of the real estate and business services, nominal wage rigidity appears to be lower for immigrants than for natives. In contrast, the nominal rigidity measure is higher for immigrants than for native workers in hotels and restaurants and in construction. Regarding real wage rigidity, the

results between immigrants and natives are very similar with the exception of wholesale and retail trade. However, the results for this sector should be interpreted with extreme caution as the best identification conditions of the focal point for calculating the real rigidity are not verified.

Hence, the results point to a higher concentration of immigrant workers on construction and services sectors, which tend to have higher downward wage rigidity. Additionally, according to Centeno et al. (2008), the services sector has higher worker flows and churning rates than manufacturing.[16] Churning flows can be interpreted as a strategy to improve the quality of matches and/or to rearrange the workers' skill mix (see, for example, Burgess et al. (2000)). This evidence is consistent with the higher worker rotation rates, higher share of fixed-term contracts and lower tenure of immigrants than natives. Our results suggest that this positive relation between worker rotation rates and wage rigidity could be stronger in the case of immigrant workers.

6 Conclusions

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. More recently, there was a very significant increase in the arrivals of immigrants from Brazil. Immigration from China, although growing strongly in the last decade, still represents a small percentage 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. The increase in immigration flows and the substantial change in its composition makes it relevant to describe and analyse the characteristics of immigrant workers in Portugal, especially given that empirical evidence about immigration in the Portuguese labour market is still relatively scarce.

In this paper, we used a longitudinal matched employer-employee database (*Quadros de Pessoal*) to examine the main characteristics of immigrants in the Portuguese labour market in the 2002-2008 period. We found substantial differences in labour market outcomes between native and immigrant workers and within immigrants. Full-time employed immigrants in Portugal increased by 46.2 per cent in cumulative terms from 2002 to 2008, representing 6.3 per cent of total in 2008. More than half of immigrant workers has a fixed-term contract in 2008, a much higher share than native workers. Immigrant workers in Portugal are slightly younger than natives and the percentages of females in immigrant employment is lower than

[16] Churning flows or excess worker rotation are defined as the difference between total worker flows and the absolute value of job flows.

in native employment. Given the recent nature of most immigrant flows in Portugal and the relatively high incidence of fixed-term contracts, the tenure of immigrant workers is much lower than that of natives. In addition, worker rotation rates are higher for immigrants than for natives. In terms of geographical location within the country, immigrants are more concentrated in the Lisboa district than natives, with Faro appearing as the second major location of immigrant workers. The sectoral distribution of immigrant employment differs markedly from that of native workers. Immigrant workers in Portugal are mostly concentrated in four sectors of activity, construction, hotels and restaurants, real estate and business services, and wholesale and retail trade. The differences in educational attainment between natives and immigrants as a whole are not significant, but there are substantial differences between the main immigrant groups. Immigrants from Cape Verde and China stand out by its extremely low education level, while the educational attainment of immigrants from the other 14 initial Member-States of European Union (EU15) is significantly higher than that of all other nationality groups, including the natives.

Similarly to other countries, immigrants in Portugal are, on average, paid below the wages of native workers over the 2002-2008 period. The differences between native and immigrant workers in terms of age, gender, education, type of contract, tenure, region and sector, contribute to the positive wage gap between the wages of natives and immigrants. However, these variables do not fully explain the observed wage gap in this period. This average wage gap decreased throughout the period 2002-2008, as the cumulative growth of wages was higher for immigrants than natives. This stronger growth was mainly driven by developments in the wages of CEEC workers, particularly in the construction sector, whose tenure also rose steadily over the period.

The percentage of native workers with permanent contracts is higher than the percentage of immigrants, and higher than the percentage of natives with fixed-term contracts. So, given that wages associated with permanent contracts are on average higher, this wage gap between permanent and fixed-term contracts contributed positively to the gap between average wages of natives and immigrants. Moreover, the percentage of minimum wage earners is higher for immigrants than natives. This percentage is particularly high in the case of Chinese workers, which earn, on average, the lowest wages of all main immigrant groups examined. Across different education levels, immigrants also tend to be more concentrated on lower wages, with the positive wage gap between natives and immigrants rising steadily from the bottom to the top of the wage distribution. However, this does not happen in the case of illiterate workers, whose wage gap between natives and immigrants is virtually nil. Additionally, immigrants with tertiary education are more concentrated on both tails of the wage distribution of workers. In the left tail of the wage distribution the wage gap is again positive, but, as one moves to the right, the positive wage gap progressively diminishes, reversing its sign as one approaches the top-end of the wage distribution.

Regarding wage changes at the individual level, the main features of the distributions are common to both natives and immigrants: negative nominal changes almost do not exist; very high concentration on the nil change; existence of a second mode near the expected inflation rate (and bargaining reference value); and, from 2007 onwards, a third spike in the rate of change of the minimum wage. This evidence suggests the existence of both nominal and real wage rigidity for natives and immigrants, which is confirmed by the results for the measures of downward wage rigidity, calculated using the IWFP methodology. Given the specific characteristics of the Portuguese labour market, institutional factors - particularly mandatory minimum wages and sectoral agreements - play a crucial role in the wage-setting procedures. In the case of workers with lower tenures and with fixed-term contracts, such as immigrants, these factors are particularly stringent, inducing higher wage rigidity. Not surprisingly, Chinese workers (with a very high percentage of minimum wage earners) have the highest value of the real rigidity measure within immigrant workers. Moreover, immigrants are very concentrated on construction and services, which are sectors typically with higher wage rigidity.

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