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# IMMIGRATION AND FIRM GROWTH: EVIDENCE FROM SPANISH CITIES

Mercedes Teruel-Carrizosa  (GRIT)
Agustí Segarra-Blasco (GRIT)

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# Immigration and Firm Growth: evidence from Spanish cities

Mercedes Teruel-Carrizosa (♣)
Agusti Segarra-Blasco (♣)

## ABSTRACT

This article analyses the effect of immigration flows on the growth and efficiency of manufacturing firms in Spanish cities. To date, most studies have tended to focus on the effect immigrants have on labour markets at an aggregate level. Here, however, we undertake an exhaustive analysis at the firm level and report conclusive empirical findings. Ten years ago, Spain began to register massive immigration flows, concentrated above all on its most dynamic and advanced regions. Here, therefore, rather than focusing on the impact this has had on Spain's labour market (changes to the skill structure of the workforce, increase in labour supply, the displacement of native workers, etc.), we examine the arrival of immigrants in terms of the changes this has meant to the structure of the country's cities and their amenities. Thus, we argue that the impact of immigration on firm performance should not only be considered in terms of the labour market, but also in terms of how a city's amenities can affect the performance of firms. Employing a panel data methodology, we show that the increasing pressure brought to bear by immigrants has a positive effect on the evolution of labour productivity and wages and a negative effect on the job evolution of these manufacturing firms. In addition, both small and new firms are more sensitive to the pressures of such immigrant inflows, while foreign market oriented firms report higher productivity levels and a less marked impact of immigration than their counterparts. In this paper, we also present a set of instruments to correct the endogeneity bias, which confirms the effect of local immigration flows on the performance of manufacturing firms.

## 1. Introduction

Massive immigration flows increase the supply of workers and alter the skill composition of local labour markets. A large body of economic literature has tried to determine the impact of immigration on the equilibrium of the labour market and, in particular, its effects on wages and employment in host countries (Borjas, 1989, 1994; Card, 2001). In general, these empirical studies conclude that immigrants are complementary to native workers and the increase in the available workforce has little effect on wages and income. Usually this literature adopts a labour market aggregate perspective, but international immigration flows are unequally distributed among countries and cities. When the labour market approach adopts a spatial dimension, the correlation between the proportion of immigrants in a population and wages is low and sometimes virtually non-existent. How do we account for what is happening here? Immigration is a complex phenomenon and commonly held beliefs are often incorrect.

This paper analyses the consequences of immigrant inflows into manufacturing firms in Spanish cities. In particular, we are interested in determining the effects of immigration on jobs, wages and productivity in such firms. Spain is an exceptional case in international immigration, since the foreign-born population has increased considerably over the last decade. However, the distribution of immigrants is not homogeneous; there is a concentration in highly dynamic regions. These regions experience a significant transformation in the social dimension –religions, languages, cultures- which affects the local economy in terms of the diversity of skills and capabilities among its workforce. Today, many Spanish cities have a high proportion of immigrants and have become veritable 'melting pots' of peoples and cultures.

The increasing role of international migration in developed countries has given rise to a body of wide-ranging and interesting theoretical and empirical research (Dustman and Gliltz, 2005). Economic literature has focused mainly on the analysis of the economic impact of immigration on the labour market, emphasizing the wage differential and its reduction over time (Borjas, 1989, 2006; Ottaviano and Peri, 2006). A further wave of literature analyses the human capital effect of international immigration, in particular examining its effect on the countries of origin, and portraying it as an engine that drives the leading economies (Torben, 2007). Finally, a third group of research focuses on immigration policy in host countries (Winter and Zweimüller, 1996; Lundborg and Segerstromc, 2002).

Previous empirical studies have suggested that immigrant populations generally arrive with few skills and considerable economic disadvantages, but their economic opportunities improve rapidly over time. And, within a decade or two following their arrival, immigrant earnings converge with those of native workers. There is also little empirical evidence suggesting that immigrants have an adverse impact on native employment

opportunities. In general, immigrants complement native workers (Borjas, 1994, Card, 2001). In spite of the fact that skilled workers are relatively scarce in poor countries, the latter send skilled as well as unskilled workers. As Jones (1998) remarks "Why, then, does not skilled labour migrate from the United States to Zaire?" As we will observe in the case of Spain, low-skilled workers predominate among the immigrant population, while only a fraction of new immigrants are skilled workers with prior experience in manufacturing industries in their countries of origin.

In general, the empirical literature examining the impact of immigrants on labour market and economic growth adopts an aggregate perspective. But if we observe the locational patterns of immigrants we find that new immigrants are concentrated in municipalities with more job opportunities and more highly developed networks of immigrants. When this fact is included in the analysis, the need to analyse firms' responses to immigration flows becomes apparent. For this reason, the main purpose of this article is to deal with the impact of immigration on firm growth at the municipal and firm level. We focus on the effect that the share of immigrants located in each municipality has on a firm's performance. In the econometric specification the local share of immigrant population is a dependent variable given that migration is a mobile factor that seeks out job opportunities across cities. Firm performance in terms of increased labour productivity, employment and wages play the role of the independent variable.

How do firms respond to immigration in terms of employment, wages and productivity? Are there any differences that can be attributed to the age or size of a firm? Does external activity condition the response of the firm? This article aims to identify the determinants of firm growth and the effect of immigrant populations on such growth. Our database compiles information on Spanish manufacturing firms located in cities with more than 1000 inhabitants during the period 2001-2005, while our results emphasise the response of firms to immigration from three different dimensions (employment, wages and productivity).

There are three main contributing factors to consider. First, we analyse the effect of a firm's response to immigration flows. The arrival of new contingents has increased the labour force and firms may have modified their incentives to invest. Second, we consider the fact that the arrival of new immigrants has also put pressure on rental prices and has changed the appearance of municipalities. Third, our analysis adopts a municipal- and firm-based approach, in contrast with previous studies on immigration that tend to adopt a macroeconomic or individual approach.

The rest of the paper is organized as follows: in the second section we review recent literature examining the impact of immigration flows on the labour market and growth. In the third section we look at a simple derivation of Roback's (1982) model that interprets local differences in wages and rents in

relation to the pressure of immigrants on the labour market and local factors. This section presents the theoretical foundations for our analysis of the effect of immigration on firm performance. In the fourth section, we set out the characteristics of two data sources related to immigration flows in Spanish cities and Spanish manufacturing firms. The fifth section presents various econometric methodologies and our main hypothesis supporting the subsequent empirical analysis. In the sixth section, we report the main empirical results obtained and, in the last section we present our main conclusions.

## 2. Immigration and its effects on firm performance

The earth is not flat, but barriers to mobility have diminished and international immigration has appeared as one of the main characteristics of the 21st century. To a certain extent, the world is becoming an open space where differences in lifestyle and income inequalities persist between ethnic groups, regions and countries. As a consequence, flows of international immigration are common nowadays. After the immigration from Europe to the American continent during the 18th and 19th centuries, new immigration flows began arriving in the United States and, more recently, in Germany, France, the United Kingdom and other European countries. Although flows of immigrants are a historical phenomenon, the intensity of flows increased in the last decades of the 20th century.

Spain became a host country later than most, but with the same migration intensity of current flows. Until the seventies, Spain was primarily a country of origin and recorded flows of internal migration between regions. However, in the last decade of the 20th century, Spain became one of the main host countries for international immigration. Because of this unusual circumstance, the inflow migration pattern in Spain today is clearly an interesting case to observe and study.

The data that are available point to the intensity of the arrival of immigrants in Spain in recent years. In the last years of the 20th century the foreign-born population in Spain was small compared with that of other developed countries. The fraction of immigrants was just 1.6 percent of the Spanish population in 1998, but the immigrant population increased to 7.0 percent in 2004 and rose to 11.3 percent in 2008[1]. In a short period, the foreign population in Spain has increased significantly. There were 637,085 immigrants in 1998 and this number increased to 5,220,577 in 2008 (see yearly evolution in Table A-1). The recent wave of international immigration in Spain is intense and has had a significant effect on society and the economy.

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[1] The Spanish Statistics Institute considers an immigrant to be a foreign-born person who has lived in Spain for one year or more and who intends to live in Spain for at least one year. It does not include minors of 16 years of age or younger, foreigners that were born in Spain, or Spanish citizens who were not born in Spain.

With this migratory phenomenon came economic effects predominantly related to job opportunities in the host country or the lack of them in the country of origin. Over the last few decades there has been a profusion of literature on the determinants of international flows. On the one hand, theoretical models have tackled immigration as a "push" or "pull" phenomenon. In other words, they emphasise the factors that explain migration and those that determine the attractiveness of a country or a region. On the other hand, the empirical literature reveals several interesting empirical facts (García and López, 2005). For one, there is a positive relationship between immigration and the differential gap of income per capita between the host country and the country of origin; in general, economic growth in the host country has a positive effect on migratory flows. The lower the fixed costs of migration (policies of family regrouping, regularization of illegal immigrants, labour contracts at origin), the more intense the flows are. The existence of previous immigrants in the host country diminishes the cost of immigration and facilitates networks of reception and solidarity. Finally, underground economies facilitate the arrival of illegal immigrants[2]. Borjas (1999) also points out that there are "welfare magnets" explaining the increase in immigrant inflows in some regions.

Apart from the differences between countries, the literature has widely studied the impact of immigrants on the labour market of the host countries. The empirical results can be summarized as follows: flows of immigrants have a slightly negative impact on wages in the host country in the short term (Borjas, 2003)[3], but native workers have the same labour opportunities because '*immigrants do jobs that natives do not want to do*' (Borjas, 1994). Native workers also obtain lower salaries in labour markets with a high percentage of immigrants. However, in those markets immigrants enjoy fewer labour opportunities than native workers (Borjas, 2006). In general, immigrants are less skilled than natives and their salaries are lower, but over time their salaries grow faster than those of native workers (Borjas, 1994). And finally, after one or two decades immigrants attain the same wage level as native workers with the same skills.

In an attempt to decipher the effect of immigrants in host countries, Peri and Sparber (2008) analyse the effects of immigration on the wages of

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[2] For 17 countries of the OECD between 1980 and 2000, García and López (2005) show that the main variables related to the "pull effect" of immigrants are income per capita (monetary income, not actual), growth rate and the existence of networks of immigrants in the host country.

[3] During the period 1980-2000 in the United States, empirical evidence suggests that an increase in immigration of 10 percent had the following effects (Borjas, 2006): it reduced the wages of native workers in that same skill group by 3.5 percent; it reduced the wages of native workers who had the same education but who differed in their experience by 0.7 percent; and it increased the wages of native workers with different educational attainment by 0.5 percent. In the short run, immigration reduces the earnings of native workers by 3.3%; but in the long run, it increases them by 0.1%.

native workers with low education and job training levels. They found two critical factors. The first is immigrants taking jobs similar to those of native workers or taking different jobs due to inherent comparative advantages between native and foreign-born workers in performing particular tasks. The second is whether native workers respond to immigration and adjust their occupational choices to shield themselves from competition with immigrant labour. Immigrants with little education or job training have a comparative advantage in manual and physical tasks, while natives of similar levels of education have a comparative advantage in communication and language-intensive jobs. When immigration generates large increases in manual labour supply, the relative compensation paid for communication skills rises, thereby rewarding natives who progressively move towards language-intensive jobs.

In general, flows of immigrants are a complement to some groups of native workers and produce an increase in low-skilled workers (Quispe and Zavodny, 2002), a moderating effect on wage growth (Borjas 2003, 2006), an increasing asymmetry in the levels of productivity and efficiency across firms and across jobs and a positive impact on economic growth. Thus, these studies adopt an aggregate perspective from the labour market and do not approach the diversity of the reality in terms of local labour markets.

In fact, the territorial dimension has been neglected by several different fields studying industrial organisation and only in recent decades has there been any interest in analysing its effects. On this note, the majority of studies analysing firm performance have focused almost exclusively on firm variables (Fotopoulos and Louri, 2000). This lack of interest in territory is more pronounced in the analysis of firm performance (Hoogstra and van Dijk, 2004). However, the location of a firm influences its behaviour and, as a consequence, influences post-entry firm performance and firm survival. Although interest in the effect of territorial variables on firm performance has increased over the last decade, there are still crucial aspects which need further study such as the effect of immigration on firm performance.

The impact of the increasing number of foreign-born workers on the labour market is intense and affects firm performance. The rapid economic growth experienced in recent decades is due to an increase in the number of workers. However, productivity has remained unchanged. One cannot help but wonder whether this increase in the number of workers in the labour market has affected firms' decisions regarding growth via productivity versus the employment of more workers.

To summarise, the literature analysing the effect of immigrants on firm performance is scarce and usually analyses the impact on economic growth at the countrywide level and, usually does not consider the substitution effect of capital intensity and the labour market. Thus, there is a gap which should be filled, given the social consequences and the economic impact of immigration on our economies.

## 3. Theoretical arguments

Recent empirical papers have observed the economic implications of immigration at the metropolitan, regional and local levels (Grossman, 1982; Borjas, 1987). Some papers report a negative correlation between the rate of immigration and wages across cities. These results show that native wages are lower in markets with many immigrants and suggest that immigrants reduce the opportunities of native workers in the labour market. However, recent research has found no correlation between immigration and wage levels in cities, evidence that immigration has no effect on local labour markets. George Borjas (2006) offers two interpretations of such results. On the one hand, immigrants may not be randomly distributed across labour markets. For example, in a case such as that of Spain, if immigrants tend to cluster in cities with thriving economies and high wages we obtain a positive correlation between immigration and wages. Thus, we expect a positive correlation in the level of wages but a negative correlation with wage growth rates in local labour markets. On the other hand, the pressure of immigrants on local labour markets may produce a displacement effect for native workers, especially in groups of natives that compete with immigrants for the same jobs.

However, the effects of immigration should not be observed only from a macroeconomic perspective but also from the microeconomic dimension, i.e., at the business level, so as to take into account the different pressures caused by the influx of immigration in cities. Analyses of the effects of immigration acquire much more interest when a territorial, rather than a macroeconomic, approach is adopted.

In order to analyse the effects of immigration on host cities we can turn to Roback's (1982) model, which explains local differences in wages and rents as a result of differences in amenities. The formalisation of the idea that local differences in wages and rents compensate people and businesses for differences in desirable local amenities is attributable to Jennifer Roback (1982) and the seminal work by Sherwin Rosen (1974). The studies of Roback (1982) and Rosen (1979) were pioneering in that they offered a framework in which to quantify hedonic prices for certain urban characteristics. Roback's model offers a hedonic analysis of cities and several attempts to develop quality-of-life indexes for cities or metropolitan areas. Of particular note for our purposes is the analysis of the effects of immigration on wages and housing prices in host cities. Today a large body of urban literature highlights the importance of amenities in retaining workers and businesses in cities (Florida, 2000a, 2000b, 2000c; Gyourko et al, 1999). In general, these studies suggest that amenities have not yet been fully capitalized into wages or rents. Here we would like to provide a simple theoretical framework for immigration flows, within which rents, wages and city population can be interpreted as implying that immigration to larger

cities is primarily driven by productive amenities (Krupka and Donaldson, 2007) [4].

Suppose we have an economy with a large number of cities (M) where businesses and workers incur no costs for relocation to other cities. Every worker may choose to look for work in the city with the characteristics that will provide the highest level of satisfaction for them, given a utility function which features the characteristics of the city in which they live and work. The vector of characteristics only varies in terms of the level of amenities ($s$) in a continuous manner from $s$ $s\in(1..n)$. The residents of each city consume and produce a composite commodity, $X$, whose price is fixed by global markets and will be taken as numeraire.

Roback's (1982) framework presents a simple general equilibrium model in which both capital and labour are assumed to be completely mobile across cities. In this context the cost of changing residences or firm location are zero, but intercity commuting costs are high and we assume that workers find jobs in their cities. In a state of equilibrium in terms of the distribution of workers among the cities and firms, wage and rent differences can be characterized as functions of the amenities in the city ($s_i$). The problem for the workers is, given a level of $s_i$ in their city, to choose quantities of $x$ –the composite commodity consumed, and $k$ –the residential land consumed- to satisfy a budget constraint,

$$Max\ U(x,\ k;\ s_i) \qquad \text{subject to} \qquad w + I = x + kr$$

Where $w$ is an individual wage, $I$ is a non labour income, and $r$ is a house rent. From this equation we can easily derive the indirect utility function, V. In conditions of market equilibrium, the utility function for workers is given by the following formula,

$$V(w,\ r,\ s_i) = \alpha$$

Where $\alpha$ is a constant and wages and rents must adjust in such a way that the utility function of the workers is the same in all $M$ cities. The implication of this adjustment is that the workers have no incentive to move from one city to the next. This in turn implies, for example, a higher level of the $s_1$ characteristics of the city, but also lower wages so that the level of utility remains the same. The model also assumes that partial derivatives of the utility function, as the latter relates to wages and city amenities, are positive, and that the partial derivatives related to rent are negative. So,

$$V_w \geq 0, \quad V_r \leq 0, \quad V_{si} \geq 0$$

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[4] The literature classifies amenities in three categories: productive, non-productive and unproductive. Productive amenities increase utility and business profits; non-productive amenities increase utility but do not affect business profits, and unproductive amenities increase utility but reduce business profits.

Firms located in a particular city produce commodities according to a production function with constant returns to scale, $X = f(l^p, N, s_i)$, where $l^p$ is the land used in production, $N$ is the total number of the workers in the city and $s_i$ is the local amenities. The problem that each firm located in a city $M$ faces is to minimize costs subject to the production function. Under these conditions, the businesses located in the various cities are limited to adjusting real salaries to comply with this condition. So,

$$C = C(w, r, s_i) = 1, \text{ where } Cw \geq 0 \text{ and } Cr \geq 0$$

As usual the unit cost function increases in both factor prices, but the effect of local amenities is more ambiguous. Amenities can either be productive (cost reducing) or unproductive (cost enhancing), and when the nature and the dimension of local amenities change, the effect on production costs is indeterminate in sign.

In a state of equilibrium, workers and firms have no incentive to relocate to another city. A spatial equilibrium means that the workers cannot increase their utility and businesses cannot reduce costs by relocating. Equilibrium of real salaries is obtained through an equality of utility among the workers and an equal per unit cost of production in firms across all cities. The real salary of the workers is determined by the interaction of the conditions for equilibrium in such a way that the economic effect of the different levels of $s_i$ in $M$ cities is seen in the differences in real salary between the cities. In equilibrium, we have:

$$C(w, r, s_i) = 1 \qquad \text{and} \qquad U^0 = V^0 = V(w, r, s_i) \qquad (6)$$

Notice that real wages and rents are determined by the interaction of the equilibrium conditions of the two sides of the market –land and labour markets, and wages and rents can be solved as functions of the city amenities, given a level of α. The result of this structure is the fact that in the cities where there is a higher level of the city variable $s_i$ real wages are lower, and in cities in which the variable is lower, real wages are higher. In this model the factor prices offer a balance between the locational preferences of the firms and those of the workers. Firms prefer locations with low rent levels and low wages, while workers may accept lower real wages in cities with high rents as long as the city offers more amenities that serve to increase their welfare.

According to the above model, the impact of massive immigrant inflows on local factor prices, labour market and amenities may vary. These situations are a particular focus of the empirical work that we undertake below. In essence, massive immigration affects local prices and the evolution of the firm in three main ways,

a) Immigration can generate productive amenities that increase utility and business profits. Here, we expect a pressure on rents and a positive impact on real wages, which in terms of the dynamics of firm evolution, results in an increase in employment in the location, an increase in the

level of heterogeneity of efficiency between firms and an ambiguous effect on labour productivity. In this case, industries with a large share of unskilled workers registered a decrease in productivity levels and generated the majority of new local jobs, while firms that operated in industries with high skills and high technological levels registered an increase in labour productivity, a moderation in employment growth and an increase in wages.

b) Immigration can generate non-productive amenities in the city that increase utility but which do not affect business profits. Here, we expect a rise in housing rents and a negative effect on wages that lead to an increase in employment and which have a negative impact on labour productivity.

c) Finally, if immigration generates non-productive amenities in the city that increase utility but which cause business profits to fall, then we can expect an ambiguous effect on rents and a reduction in real wages that lead to a decrease in the number of local workers and which have a negative impact on labour productivity.

If a city receives massive immigration flows, then this host city will be affected in several ways. On the one hand, immigration flows lead to an increase in total population, affect local factor prices related to housing rentals and produce an increase in the local labour supply. Rising immigrant populations and productive amenities that positively affect wages increase housing demand, provide incentives for the real estate sector and increase rents (Glaeser and Gyourko, 2005). On the other hand, immigration flows produce amenities and disamenities in the city. The former are related to the increasing cost of housing and changes in the composition of the population. The latter are related to linguistic and cultural diversity which positively affects the creativity and initiative of the native population. The net effect of immigration may be ambiguous; however, the recent literature stresses that the positive aspects outweigh the negative (Ottaviano and Peri, 2005).

Intense pressure from immigrant workers on a local labour market may displace native workers with more experience, and force them to move to new areas. The presence of significantly large groups of immigrants will, in the short run, lead to salary inequalities and less pressure to acquire more efficient technologies. This results in a reduction in the capital to work ratio and in productivity in areas that demand workers with fewer qualifications. Massive immigration flows in cities tend to displace native workers to industries that need workers with more skills and inter-relational capabilities, and to displace native workers to manufacturing industries. Furthermore, technological changes in manufacturing firms tend to eliminate unskilled or semi-skilled jobs, while new jobs being created require the workers to have technological experience (Lewis, 2005). In addition, the migration of skilled workers is a significant way of generating

interregional spillovers and facilitating regional learning effects (Faggian and McCann, 2006).

## 4. Data

### 4.1. The database

The database we use in our analysis is the Spanish Mercantile Registry for the years 2001 to 2005. The data include all manufacturing firms that are required to declare the number of employees on their books. What is crucial to our analysis is that we are able to identify where the firms are located and, moreover, we can obtain additional information about the firms. Since the aim of this paper is to analyse the response of firms at the municipal and firm levels, our database constitutes a useful tool for analysing the Spanish case.

Data related to population and immigration at the municipal level are provided by the Spanish Statistics Institute obtained from the website of the *Anuario Económico de España* (2007). This information has been cross-referenced with the information on firms.

The selection process for the information was as follows. First, we considered only those firms that were in our database for at least three years, in order to avoid the appearance of firms that had entered the market as part of a financial strategy. We considered only firms with more than three employees and we excluded all firms that were outliers. Specifically, we did not include any firms where the average wage was more than 80 thousand euros, or any with negative investment, negative productivity, or where the productivity per worker exceeded 300 thousand euros per worker. Likewise firms with excessive growth ratios in terms of employment, productivity and wages were also excluded. Finally, the total number of firms considered was 43,115 and the number of observations was 119,564.

Table 1 provides detailed information of these Spanish manufacturing firms. It shows whether a firm belongs to a region with a higher or lower than average share of immigration. In general, one thing was apparent: firms in regions with a high percentage of immigrants are larger, they have more sales, greater value-added, increased labour productivity, and they pay higher wages and experience a higher degree of growth. However, sales growth, value-added productivity and wages do not change as rapidly for firms in regions with a low percentage of immigrants.

Several different patterns emerge depending on the individual characteristics of the firm. As expected, new and small firms have more difficulties competing than their counterparts regardless of the region in which they are located. In fact, the smaller they are the lower the sales-generating capacity, value-added and labour productivity they have. Furthermore, they pay lower wages compared to the average of 21,010 and

23,430 euros. However, there are differences in growth rates since new firms perform better than small firms, especially when we observe the rate of growth in terms of size, sales and value-added.

| Table 1. Statistical description of firm characteristics depending on immigrant population in regions. Year 2001-2006 | | | | | |
|---|---|---|---|---|---|
| **Regions with low share immigrants** | | | | | |
| | All firms | Young Firms | Small firms | Export-Import Firms | Non export-Import Firms |
| Number of firms | 16908 | 5478 | 7256 | 2261 | 14647 |
| Size (employees) | 32.97 (87.90) | 21.97 (76.39) | 6.30 (1.68) | 78.55 (176.48) | 24.86 (55.94) |
| Gross Sales (thousands euros) | 5005.52 (27134.74) | 3255.55 (21496.15) | 612.17 (1296.96) | 14914.45 (58940.43) | 3242.51 (15122.79) |
| Value Added (thousands euros) | 1328.38 (5206.55) | 850.10 (5004.53) | 175.44 (576.87) | 3696.52 (10993.65) | 907.46 (3045.18) |
| Labour Productivity (thousands euros) | 31.72 (58.89) | 27.16 (19.99) | 27.71 (86.66) | 40.25 (30.94) | 30.20 (62.44) |
| Wages (thousands euros) | 21.01 (8.31) | 18.81 (7.60) | 18.96 (7.99) | 24.82 (9.02) | 20.34 (7.99) |
| Growth Size | 10.30 (127.15) | 28.28 (122.63) | 9.23 (44.05) | 9.44 (272.95) | 10.45 (76.17) |
| Growth Sales | 20.63 (1000.76) | 49.23 (720.45) | 12.80 (140.44) | 42.71 (2426.40) | 16.69 (363.03) |
| Growth Value Added | 10.63 (131.60) | 29.55 (134.16) | 9.77 (49.61) | 9.82 (280.38) | 10.77 (80.15) |
| Growth Labour Productivity | 1.77 (23.34) | 3.53 (27.97) | 2.45 (26.12) | 1.07 (22.18) | 1.89 (23.53) |
| Growth Wages | 2.92 (13.97) | 3.77 (16.47) | 3.61 (16.17) | 2.50 (11.93) | 2.99 (14.30) |
| **Regions with high share of immigrants** | | | | | |
| Number of firms | 26207 | 6877 | 11258 | 4962 | 21245 |
| Size (employees) | 35.89 (163.34) | 22.15 (94.18) | 6.36 (1.69) | 73.49 (314.36) | 25.97 (84.65) |
| Gross Sales (thousands euros) | 6516.37 (68571.62) | 3504.84 (30415.4) | 631.20 (872.02) | 16766.37 (134447.2) | 3809.78 (33701.01) |
| Value Added (thousands euros) | 1653.24 (10828.74) | 888.16 (5810.10) | 189.45 (150.45) | 3894.04 (20705.89) | 1061.67 (5776.05) |
| Labour Productivity (thousands euros) | 34.06 (23.60) | 28.96 (19.47) | 29.74 (21.55) | 42.15 (31.37) | 31.93 (20.56) |
| Wages (thousands euros) | 23.43 (9.21) | 20.84 (8.70) | 21.57 (9.17) | 26.82 (10.13) | 22.54 (8.74) |
| Growth Size | 11.27 (167.89) | 29.07 (176.18) | 6.23 (41.76) | 9.31 (207.06) | 11.79 (155.91) |
| Growth Sales | 14.45 (302.13) | 35.30 (270.70) | 9.11 (116.90) | 9.15 (214.22) | 15.85 (321.34) |
| Growth Value Added | 10.83 (161.85) | 28.42 (145.81) | 6.65 (43.21) | 8.35 (199.32) | 11.49 (150.41) |
| Growth Labour Productivity | 1.56 (22.84) | 2.97 (27.46) | 2.57 (25.87) | 0.81 (22.10) | 1.76 (23.02) |
| Growth Wages | 3.05 (13.91) | 3.64 (16.37) | 3.74 (16.30) | 2.92 (12.06) | 3.08 (14.35) |
| Note: Young firms are less than six years old. Small firms have between three and ten employees. Export-Import firms are those that declare they export and import. Source: Spanish Statistics Institute and Sabi (*Sistema de Análisis de Balances Ibéricos*) | | | | | |

There are also several differences between those firms that report export-import activity and those without. In general, firms with external activity are larger and perform better in terms of sales, value-added, labour productivity and wages. However, firms without external activity obtain larger growth rates in terms of size, value-added, labour productivity and wages. This provides evidence that, in general, foreign market oriented firms must reach a critical size in order to compete in international markets.

## 4.2. Spanish immigration evidence

Immigrant inflows from developing countries to Spain were intense in the period from 1998 to 2008. In this decade, the majority of immigrants were new, regardless of gender, had few qualifications, had difficulties speaking Spanish, and came from underdeveloped countries in Africa, South America, Asia and East European countries. Recently, family reunification processes have led to the migration of wives/husbands, children and, less often, parents. The main consequence of this large migration has been a rise in the population of Spain, although there is an unequal distribution across regions.

When we observe the distribution of immigrants across Spanish regions, we find large differences between rural and urban regions. According to the municipal registry, as of the 1st January 2008 in Spain there was a foreign population of 5,220,577 inhabitants, or 11.3% of the total population. The distribution of immigrants is heterogeneous among Spanish regions (Map 1). Regions with an immigrant share exceeding the Spanish average form two different groups. In the first, we have two sets of islands where the presence of immigrants is high due to the fact that they are traditional destinations for retired immigrants from Northern Europe. In the Balearic Islands, immigrants make up 20.8% of the population and in the Canary Islands, 13.6%. In the second group we find regions such as Madrid which are among the most economically dynamic areas of the Spanish economy. These areas include the Mediterranean arc (Murcia - 15.7%, Valencia-16.7%, and Catalonia - 14.9%) and the Corridor of the Ebro (La Rioja - 13.7%, and Aragón - 11.6%). In our analysis, we only considered regions on the mainland peninsula. We did not consider the Canary Islands or the Balearic Islands since a major share of immigrants there are tourists who stay for many months at a time. In general, the locational patterns of immigrants is related to the economic dynamism and the manufacturing specialization of the regions, with the exception of Navarra (10.4%) and the Basque Country (5.4%) which have low percentages of immigrants.

**Map 1. Distribution of immigrants in Spanish cities (with more than 1,000 inhabitants).**
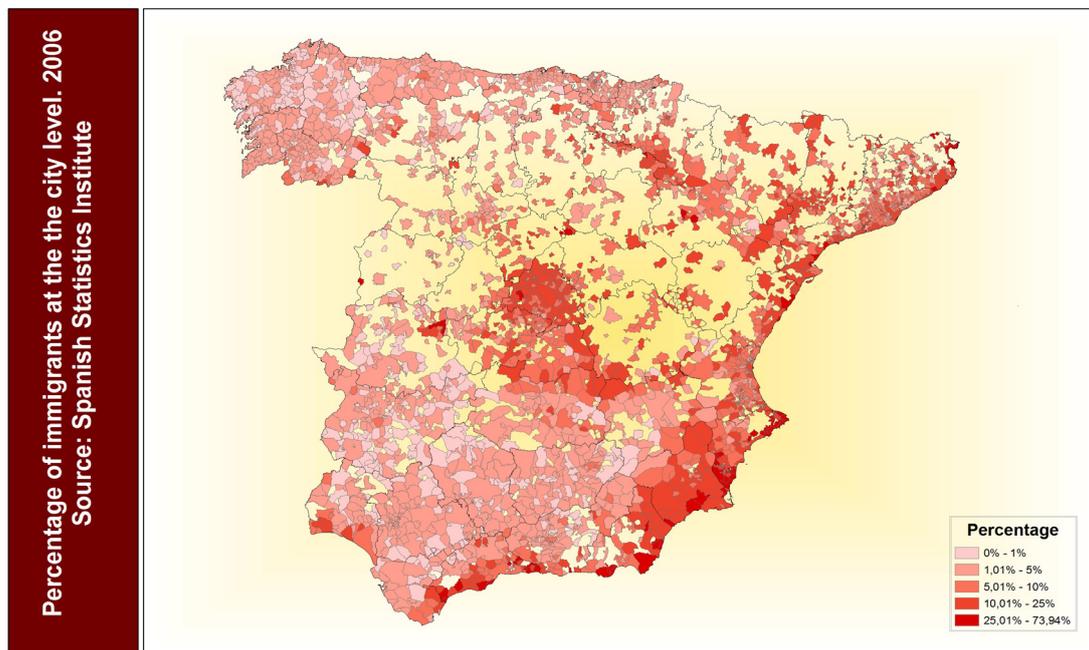


*Source: Anuario Económico de España 2007 (La Caixa)*

The Spanish case seems to be highly illustrative of the riddle: "Do firms follow people or do people follow firms?" Immigrants tend to settle in dynamic regions that offer more labour opportunities and which have a higher proportion of foreign population (the pull effect) (Map 2). The proportion of immigrants differs in regions and cities. Immigrants concentrate in dynamic cities with diversified industrial-mixes that have a diversity of labour alternatives. Obviously, the concentration of inflows of immigrants in some cities has an immediate effect on the demand for housing and in the labour market.

Apart from the regional distribution, another interesting way to examine the phenomenon of immigration in a territory is to analyse the location of immigrants by city size. Table 2 shows the distribution of population and immigrants according to whether the municipality is in a region with a higher or lower proportion than average of immigrants. In order to demonstrate the large influx of immigrants in numerical terms, we show information from 2001 to 2006. We found considerable differences in immigration rates between cities located in industrialized and those in more rural regions. For example, in the first group the share of immigrants is high (Madrid - 14.0%, Barcelona - 15.2% and Valencia - 12.1%), while in less industrialized regions the presence of immigrants is more scarce (Seville - 3.5%, Valladolid - 4.3% and Vigo - 3.8%). Here, the case of the Basque

Country is worth mentioning, as it is a dynamic, industrialized region with low immigration rates (Bilbao - 5.5%, Vitoria - 6.3% and Donostia - 4.5%)[5].

Table 2 shows that of the 1,992 municipalities, the percentage of immigrants was 1.71%, while in 2006 this percentage had increased to 5.06%. The total growth of the population during this period was 5.35%, while the increase in the percentage of immigrants was 211.15%. At the same time, Table 2 shows that the percentage of immigrants in 2001 was 4.64%, while in 2006 this percentage had increased to 13.12%. The total growth rate during the period was 12.60% while the growth rate of immigrants was 218.14%.

**Map 2. Distribution of employees in Spanish cities (with more than 1,000 inhabitants).**
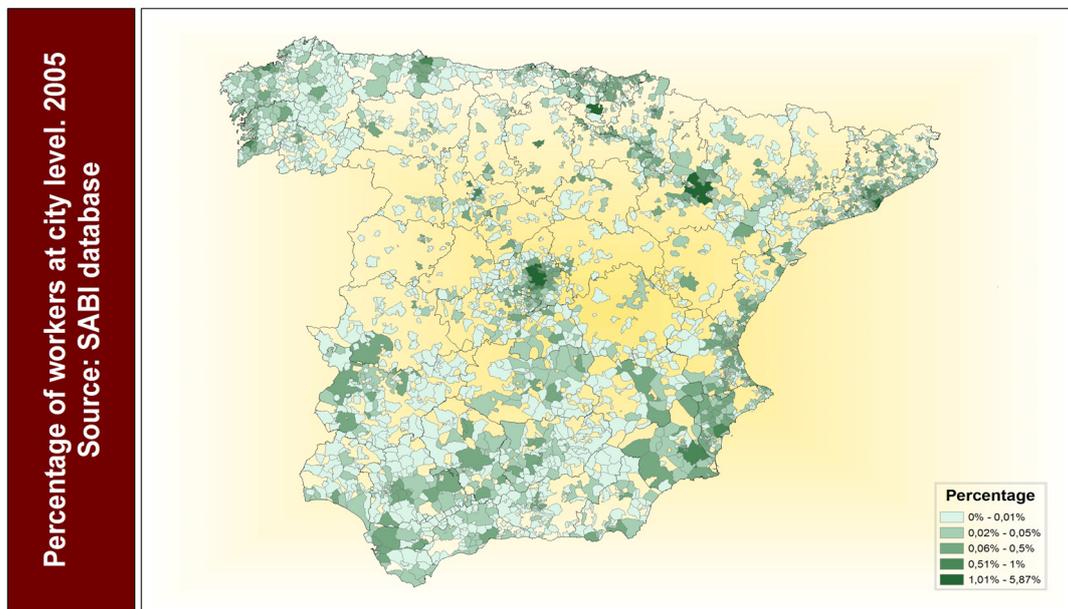


*Source: Sistema de Análisis de Balances Ibéricos*

Thus, three different patterns describing the flow of population to Spanish cities emerge. First, population growth in cities with fewer than 5,000 inhabitants was negative. This expulsion of population from large metropolitan areas reflects the disadvantages suffered by large metropolitan areas in comparison with less densely populated areas. Second, for cities with between 20,000 and 99,999 inhabitants the growth rate in terms of population and immigrants was higher than in larger or smaller cities. Third, there is an inverse U-shaped relationship between city size and percentage of immigrants. This is the result of the capacity of large metropolitan areas to attract young, highly-qualified population that can compensate for the large number of immigrants.

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[5] *Anuario Económico de España,* 2007.

| Table 2. Immigrant location according to city population and regional rates of immigration | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Regions with low relative immigrants rate** | | | | | | | | | | |
| | 2001 | | | | 2006 | | | | | |
| | N | Total Population | Total Immigrants | % | N | Total Population | Total Immigrants | % | Growth (%) Population | Growth (%) immigration |
| *More than 100000 inhab.* | 28 | 6,155,386 | 99,485 | 1.62 | 28 | 6,330,312 | 304,294 | 4.81 | 2.84 | 205.87 |
| *Between 20000-99999 inhab.* | 119 | 4,752,229 | 107,603 | 2.26 | 136 | 5,507,090 | 363,515 | 6.60 | 15.88 | 237.83 |
| *Between 5000-19999 inhab.* | 489 | 4,652,386 | 72,267 | 1.55 | 508 | 4,797,373 | 201,328 | 4.20 | 3.12 | 178.59 |
| *Fewer than 5000 inhabitants* | 1,356 | 3,096,937 | 40,022 | 1.29 | 1.320 | 3,020,441 | 124,592 | 4.12 | -2.47 | 211.31 |
| Total | 1,992 | 18,656,938 | 319,377 | 1.71 | 1,992 | 19,655,216 | 993,729 | 5.06 | 5.35 | 211.15 |
| **Regions with high relative immigrants rate** | | | | | | | | | | |
| | 2001 | | | | 2006 | | | | | |
| | N | Total Population | Total Immigrants | % | N | Total Population | Total Immigrants | % | Growth (%) Population | Growth (%) immigration |
| *More than 100000 inhab.* | 24 | 9,412,904 | 421,629 | 4.48 | 27 | 10,462,391 | 1,375,075 | 13.14 | 11.15 | 226.13 |
| *Between 20000-99999 inhab.* | 116 | 4,461,951 | 222,584 | 4.99 | 138 | 5,413,831 | 760,313 | 14.04 | 21.33 | 241.58 |
| *Between 5000-19999 inhab.* | 289 | 2,861,338 | 145,147 | 5.07 | 318 | 3,185,158 | 404,158 | 12.69 | 11.32 | 178.45 |
| *Fewer than 5000 inhabitants* | 649 | 1,381,134 | 51,748 | 3.75 | 595 | 1,339,320 | 136,383 | 10.18 | -3.03 | 163.55 |
| Total | 1,078 | 18,117,327 | 841,108 | 4.64 | 1,078 | 20,400,700 | 2,675,929 | 13.12 | 12.60 | 218.14 |
| Note: Regions with low relative immigration rates: Andalucia, Asturias, Cantabria, Castilla y León, Castilla-LaMancha, Extremadura, Galicia, Navarra and Basque Country.  Regions with high relative immigration rates: Madrid,Murcia, Valencia, Catalonia, La Rioja and Aragón<br>Sources: Spanish Statistics Institute | | | | | | | | | | |

When immigrants settle in a country they do not distribute themselves homogeneously throughout the territory. Indeed, immigrants are heterogeneous groups made up of individuals that are motivated to uproot themselves for different reasons; some wish to leave a place behind, others wish to be somewhere new. Of particular interest here are data that distinguish between emigration flows from countries with higher or lower income levels than those of the country of destination. According to the municipal registry office, as of the 1st January 2008, 18.4% of immigrants came from countries with higher income levels (the UK - 6.7%, Germany - 3.5%, Italy - 3.0%, and France - 2.2%) while the remaining 71.6% came from less developed countries (Rumania - 14.0%, Morocco - 12.3%, Ecuador - 8.0% and Colombia - 5.4%).

Of equal interest is a determination of the main sectors of activity that employ foreign-born immigrants. In general, men find largely permanent jobs in the construction, commercial and tourist sectors, while women work in domestic service, and less frequently, in the tourist and commercial sectors. The manufacturing sector is an option for a smaller number of immigrants. According to the *Encuesta de Inmigración* (immigration census) in 2007, a total of 2,269,092 foreign-born immigrants have jobs. The sectors with the highest percentages of immigrants are construction (19.3%), the hotel and catering industry (13.1%), the commercial sector (12.6%) and manufacturing (11.0%). In 2007, Spanish manufacturers employed 249,857 immigrants. Although the percentage of immigrants in manufacturing jobs stands at 10% of total employees in Spanish manufacturing, they apply considerable pressure on the labour market because the total volume of employment has fallen moderately and access to jobs for immigrants in the industrial sector is a recent phenomenon[6]. The *Encuesta de Inmigración* offers information about the work immigrants performed in their country of origin. In Spanish manufacturing industry, 44.3% of immigrants have worked previously in manufacturing jobs in their countries of origin and 55.7% have had work experience in other sectors (agriculture - 14.1%, construction - 8.6%, the hotel and catering industry - 7.4% and the commercial sector - 6.7%). The lack of experience and qualifications of immigrant workers increases the costs of adjustment and adaptation in manufacturing jobs. This situation hinders job efficiency and lowers job productivity.

## 5. Econometric methodology and variables

## 5.1. Econometric methodology

In keeping with the main premise underlying Roback's model, we propose three equations for analysing the effects of immigration on a firm's

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[6]  In 2000 there were 2,577,929 employees in manufacturing jobs and 2,511,279 in 2006. *Encuesta Industrial de Empresas*, Spanish Institute of Statistics.

performance. Thus, our main purpose is to analyse the impact of immigration on the dynamics of the firm. However, we also analyse this impact on levels (Tables A.2 and A.3) and we obtain similar results[7]. Since our main purpose is to analyse the response of firms to the percentage of immigration, we use Gibrat's Law, which assumes that the firm growth ($g_{i,t}$) of firm "i" in period "t" is independent of firm size($\ln(S_{i,t})$):

$$g_{i,t} = \alpha + \beta_1 \ln(S_{i,t-1}) + u_{i,t}$$

Since some firms are more likely to be efficiently organized because of industry-specific differences in fixed costs or because they are located in certain regions with access to specialised raw materials, we include firm-specific variables and territorial variables that influence firm behaviour, and obtain the following equation:

$$g_{i,t} = \alpha + \beta_1 \ln(S_{i,t-1}) + \beta_2 \ln(Age_{i,t}) + \beta_3 Dens_{i,t} + \beta_4 \operatorname{Im}mig_{i,t} + u_{i,t} \qquad \text{(Eq. 1)}$$

Where $g_{i,t}$ is the dependent variable calculated as the difference between firm size "i" in year $t$ and period $t$-1, $\ln(S_{i,t})$ is firm size, $\ln(Age_{i,t})$ is firm age, $Dens_{i,t}$ is the municipality density, $\operatorname{Im}mig_{i,t}$ is the share of immigrants and $u_{i,t}$ is an error term.

Departing from Gibrat's Law (Equation 1), in order to analyse whether flows of immigration in each Spanish municipality influence patterns of firm growth in terms of employees (Equation 2), wages (Equation 3) and productivity (Equation 4) we calculate the following equations:

$$
\begin{aligned}
growthE_{i,t} &= \ln(E_{i,t}) - \ln(E_{i,t-1}) \\
&= \alpha + \beta_1 \ln(S_{i,t-1}) + \beta_2 \ln(Age_{i,t}) + \beta_3 Dens_{i,t} + \beta_4 \operatorname{Im}mig_{i,t} + u_{i,t}
\end{aligned}
$$
(Eq. 2)

$$
\begin{aligned}
growthW_{i,t} &= \ln(W_{i,t}) - \ln(W_{i,t-1}) \\
&= \alpha + \beta_1 \ln(S_{i,t-1}) + \beta_2 \ln(Age_{i,t}) + \beta_3 Dens_{i,t} + \beta_4 \operatorname{Im}mig_{i,t} + u_{i,t}
\end{aligned}
$$
(Eq. 3)

$$
\begin{aligned}
growthLP_{i,t} &= \ln(LP_{i,t}) - \ln(LP_{i,t-1}) \\
&= \alpha + \beta_1 \ln(S_{i,t-1}) + \beta_2 \ln(Age_{i,t}) + \beta_3 Dens_{i,t} + \beta_4 \operatorname{Im}mig_{i,t} + u_{i,t}
\end{aligned}
$$
(Eq.4)

In addition, these equations are estimated for both small and new firms and according to the external activity of firms.

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[7] Our results confirm our hypothesis: a higher percentage of immigration has a negative impact on job performance, but a positive impact on the level of wages and labour productivity.

Our econometric methodology involved the application of panel data with fixed effects (GLS, Generalised Least Squares) to control for individual characteristics that may affect firm performance. Hausman tests were performed to confirm its suitability for these estimations.

The variables applied were the following:

| Variables | Description | Database |
|---|---|---|
| | **Dependent variable** | |
| $growthE_{i,t}$ | Firm growth equal to the logarithmic difference of employees (E). | SABI |
| $growthW_{i,t}$ | Firm growth equal to the logarithmic difference of wages (W). | SABI |
| $growthLP_{i,t}$ | Firm growth equal to the logarithmic difference of labour productivity (LP) | SABI |
| | **Explanatory variables** | |
| $\ln(S_{i,t})$ | Logarithm of firm size measured in number of employees | SABI |
| $\ln(Age_{i,t})$ | Logarithm of firm age | SABI |
| | **Territorial variables** | |
| Dens $_{i,t}$ | Density of population where the firm locates | INE |
| Immigration $_{i,t}$ | Share of immigrants in the municipality | INE |
| *Source: authors' own* | | |

The relationship between firm growth and firm size measured in terms of the number of workers allows us to conduct our analysis using Gibrat's Law, which assumes that firm growth follows a random path. However, a large body of empirical literature reports a negative relationship and, thus, refutes this hypothesis (for Spain, see Fariñas and Moreno, 2000; Peña, 2004; Calvo, 2006; Teruel, 2008). Two factors explain this negative relationship. First, new firms tend to be smaller than those that have been operating for a longer time, and so are unable to exploit scale economies in the sector. Second, the literature points to the existence of a minimum efficient size. Thus, firm growth should favour the likelihood of a firm's survival.

A firm's age translates as market experience (Jovanovic, 1982). Although, in general, there is a negative relationship between firm growth and age, a diversity of results are, in fact, to be found. On the one hand, new firms are usually small and seek to grow to achieve the minimum efficient size. On the other hand, these new firms suffer from a lack of experience in the market and are unaware of their level of efficiency. Cabral and Mata (2003) report that new firms present a more asymmetric distribution, which approaches normality over time. According to these authors, such differences reflect the financial restrictions with which new firms have to contend. Recently, this hypothesis has been confirmed by Barrios et al. (2005) while Fagiolo and Luzzi (2006) fail to find empirical evidence of greater financial constraints among new firms.

Keeble and Walker (1994) maintain that population density represents the existence of agglomeration economies or diseconomies. These can be related to labour costs, knowledge spillovers, market demand, accessibility and congestion. Population density can have two different effects on a firm's performance. On the one hand, it may have a positive impact thanks to the effects of a competitive environment and because of the amenities that are available in culturally diverse cities[8]. But, on the other hand, cities with high population densities may act to eliminate negative impacts on firm performance, if firms do not benefit in some other way. Higher wages, congestion problems and higher land prices are among the drawbacks a firm faces if choosing to locate in a densely populated city. Recently, Duranton and Puga (2001) reported a positive relationship between population and location when firms use highly skilled workers and the firms are knowledge intensive, while firms based on scale economies and which are land intensive tend to locate in less densely populated cities.

Here, we considered the number of immigrants as a proportion of the total population. There is a wide body of evidence suggesting that immigrants are unskilled and occupy jobs with low levels of productivity. Kim (2007) considers the share of foreign-born population (FB/(FB+NB)) to be a useful measure of the relative supply of unskilled to skilled workers (L/H). Some authors, such as Salerian, (2006) propose that the arrival of immigrants has an effect on labour skills. Skilled workers are more productive and, thus, are paid higher wages than unskilled workers. As a consequence, the arrival of immigrants negatively affects average wages, productivity and skill levels. However, Ottaviano and Peri (2005, 2006) reported a positive impact of immigrants on wages and employment. This positive impact occurs via productivity, since a higher number of low-skilled immigrants implies an increase in skilled workers, which has a compensating effect on the productivity average.

Whether there is labour displacement or compensation in the labour market, it is unlikely that the percentage of immigrants in this market is directly affected. However, the foreign-born population rate is subject to two significant sources of measurement error: (1) a considerable number of foreign-born workers in manufacturing industries are skilled and (2) not all native-born workers are skilled. Due to these measurement errors, the share of foreign-born immigrants must be interpreted carefully. An additional reason for caution is the fact that not all immigrants participate in the labour market, particularly following an intense process of family regrouping in recent years. Moreover, immigrants who participate in the

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[8] Agglomeration economies can have five different effects, they might: i) increase *knowledge spillovers* (Morrison and Siegel, 1999); ii) generate economies of localization because of production inputs that are shared (Quigley, 1998); iii) exploit specialisation and scale economies in local transport networks (Ciccone and Hall, 1996); iv) reduce transaction costs (Quigley, 1998); v) increase the adoption of new technologies due to the higher capacity for R&D (Keller, 2002).

labour market may work in industries other than manufacturing. However, here we propose interpreting immigration from a different perspective. Foreign-born inhabitants shape cities as well as natives, so the arrival of contingents of immigrants in Spanish cities has modified the urban structure, city lifestyle and land prices. In other words, there are different amenities. According to Duranton and Storper (2006), "*a location with good amenities will be more attractive. In turn, this will raise land prices. But then higher land prices will affect the choices made by firms regarding factor usage. In turn, this can affect the local composition of economic activity (away from land intensive activities) and local wages (which will also capitalise these amenities)*". For this reason, we propose that the share of immigration not only captures the displacement or compensation of skills in the labour market, but it also measures a type of amenity related to the city life style.

## 5.2. Hypotheses

Given the above interpretation of the immigration variable, this subsection presents the hypotheses that will be analysed empirically. Our hypotheses regarding the effect of immigration on firm performance are as follows:

**5.2.1.** For **employment growth**, we will analyse the following hypotheses:

> *Hypothesis 1 In general, immigration has a negative effect on employment growth in manufacturing firms.*

We expect that firms which greatly increase their production (employing more workers) will not be so keen to be located in large cities with their similarly large proportions of immigrants, because these cities are characterised by high land prices and their labour markets for skilled workers are highly competitive. There is in fact empirical evidence for Spain that manufacturing firms have moved from metropolitan areas to nearby cities to avoid such land competition.

> *Hypothesis 2 Small and new manufacturing firms are more sensitive to immigration.*

Small and new firms tend to report lower value-added and sales, and as such they usually suffer certain financial constraints. These firms may be located in economically and socially dynamic areas, which can lead to opposing effects. On the one hand, they might benefit from dynamic environments, while, on the other, the pressure of competition is higher in more dynamic cities. Small and new manufacturing firms may, therefore, be more strongly affected by immigration.

> *Hypothesis 3 Manufacturing firms with external activity are more sensitive to immigration.*

Firms operating in foreign markets need to be more competitive and, as a consequence, they have to capture any kind of external spillovers. However, their impact on employment rates may be more markedly negative if immigration behaves as a non-positive amenity.

**5.2.2.** For **wages**, our proposed hypotheses are the following:

*Hypothesis 4 The effect of immigration on wage increases is undetermined.*

Given the ambiguous results in the literature, no specific result can be expected (Borjas, 1986, reports a slightly negative short-term impact, though even this disappears in subsequent time periods). A positive impact of immigration on wages can be interpreted as evidence for the existence of urban amenities. In other words, immigrants are located in dynamic urban areas where firms compete for skilled workers. Wages are the main factor attracting workers. However, a negative impact of immigration on wages can be interpreted as evidence for the existence of urban diseconomies such as high land prices. Recently, authors such as Ottaviano and Peri (2005) and Card (2007) found that a diversity of production skills, abilities and occupations enhances productive performance. This better performance is supported by the existence of a *diversity wage premium*: richer diversity is associated with higher wages for natives. According to these authors, this positive relationship can be interpreted in terms of higher productivity.

*Hypothesis 5 Small and new manufacturing firms are more sensitive to increasing wage levels in municipalities with a high share of immigrants.*

According to Jovanovic (1982), both new and small firms tend to be less efficient on average than their counterparts. As we have observed in our empirical data, small and new firms in Spain are similarly less productive. As a consequence, they are not able to raise salaries with the same degree of freedom as their more established counterparts. Furthermore, they usually face more severe financial problems and so have less capacity to increase wages.

*Hypothesis 6 Foreign market oriented firms are more sensitive to immigration.*

Depending on their key variable of competitiveness, foreign market oriented firms might have to increase wages in highly competitive environments or, alternatively, reduce them. For instance, firms employing a large share of skilled workers in urban areas are more likely to have to increase wages.

**5.2.3.** For **labour productivity**, we propose the following hypotheses:

*Hypothesis 7* *Immigration has a positive effect on labour productivity in manufacturing firms.*

No specific result can be expected regarding the impact of immigration on labour productivity given that there is a wide range of possible responses. First, some theories point towards a process of displacement between low unskilled labour and capital investment. Thus, immigration has negative impact on labour productivity. However, a recent line of research offers an alternative explanation. Due to skill complementarity, a higher number of unskilled workers tends to mean more skilled workers are employed, which leads to an increase in average productivity. This result is in line with Ottaviano and Peri (2005) who show that multicultural diversity has a positive impact on wages via higher productivity. According to these authors, this positive relationship can be interpreted in terms of higher productivity. As a consequence, a positive impact of immigration on labour productivity growth can be expected.

*Hypothesis 8* *Small and new firm productivity is more sensitive to the arrival of immigrants.*

Given that small and new firms are usually less labour productive, we expect their productivity to increase more markedly when they are in local environments characterised by a large share of immigrants.

*Hypothesis 9* *Immigration does not affect the productivity growth of foreign market oriented firms.*

When firms are competitive in knowledge-intensive sectors, characterised by the employment of skilled workers, they will experience a positive impact. However, when firms depend on scale economies, labour productivity growth will not be affected by staying in environments with a high share of immigrants.

## 6. Results

This section presents our empirical results in three stages. First, we analyse the impact of immigration on the growth of employment rates, wages and labour productivity in all the firms contained in our database. Second, we pay particular attention to the effects of immigration flows on new and small firms. Here, we expect increased sensitivity for both new (firms operating for fewer than six years) and small (firms operating for more than three years and employing fewer than ten employees) firms in terms of their productivity due to the amenities generated by immigrants. Third, we draw

a distinction between firms oriented towards foreign markets and those oriented towards the domestic market.

According with Table 3, immigrant flows have a positive (albeit not significant) impact on wage growth and labour productivity, and a negative impact on the number of workers employed by manufacturing firms. In line with previous findings, in cities with high immigrant inflows, firms come under greater pressure to increase wages, improve labour productivity and to regulate the growth of their workforce. The increase in the share of immigrants in cities leads to an increase in housing costs, a replacement effect for native workers and a positive effect for skill composition and productivity in manufacturing firms. In this causal link, immigration does not affect the labour market directly, but rather does so via a city's amenities. Immigrants produce positive and negative amenities. Thus, a multicultural environment might be positively valued by a more open-minded firm, while immigrants can produce unproductive amenities in terms of the cost of living in multicultural neighbourhoods and the pressure placed on the local housing market and public services.

| Table 3. Workers, wage and productivity regressions. Whole database. GLS fixed effects estimations. | | | |
|---|---|---|---|
| | Workers | Wage | Productivity |
| $\ln(S_{i,t})$ | -0.8010 (0.0029)* | 0.1457 (0.0023)* | 0.1950 (0.0044)* |
| $\ln(Age_{i,t})$ | 0.0689 (0.0048)* | -0.0927 (0.0038)* | -0.1439 (0.0071)* |
| Density $_{i,t}$ | -0.0745 (0.0116)* | 0.0135 (0.0091) | -0.0225 (0.0173) |
| Immigration Rate $_{i,t}$ | -0.1107 (0.0568)*** | 0.0337 (0.0447) | 0.1818 (0.0848)** |
| Constant | 2.2588 (0.0253) | -0.1919 (0.0199)* | -0.1744 (0.0378)* |
| $R^2$ | 0.5086 | 0.0512 | 0.0270 |
| Wald test | 19776.40 | 1031.03 | 530.70 |
| Hausman test | 64229.87 | 3625.03 | 1705.28 |
| Firms | 43115 | | |
| Observations | 119,564 | | |
| Dependent variable: yearly change in logarithm. * significant at 1%, **significant at 5%, ***significant at 10% | | | |

Conversely, immigration may negatively affect the decision of firms to employ more workers. One hypothesis that might account for this is that firms may not value the existence of large immigrant populations in the city as a way to increase employment. However, according to Duranton and Puga (2001), a more plausible hypothesis is that firms that decide to grow significantly (using more resources) prefer environments that are less densely populated and that have less immigration. We should not overlook the fact that immigration puts housing prices under greater pressure, so firms wishing to acquire new buildings might face more difficulties, especially if they own large factories. In this sense, Spanish cities are currently witnessing the movement of large factories away from the biggest

cities towards the smaller cities, which do not suffer the same problems of population density.

A further piece of evidence supporting this last hypothesis is the fact that immigration has a positive impact on wage growth. Knowledge-intensive firms with a need to attract skilled workers usually locate in large cities. A multicultural environment has a positive effect, since nowadays highly skilled workers tend to be attracted to cities. Moreover, large cities provide a pool of highly skilled native workers, and so wages must be attractive if a firm wishes to engage the most efficient workers.

As far as the other variables are concerned, previous firm size was found to present the expected negative sign, given that large firms are more productive and pay higher wages, while they tend to grow less in terms of the number of workers they employ. Conversely, the age of a firm positively affects employment growth decisions, but negatively affects wage and productivity growth. But, of course, old firms tend to be larger in terms of workers and sales, paying higher wages and having greater labour productivity than their counterparts. Finally, local population density negatively affects employment growth (Duranton and Puga, 2001).

Table 4. Workers, wage and productivity regressions. Small and young firms. GLS fixed effects estimations.

| | Small firms | | | Young firms | | |
|---|---|---|---|---|---|---|
| | Workers | Wage | Productivity | Workers | Wage | Productivity |
| $\ln(S_{i,t})$ | -0.8486 (0.0045)* | 0.2372 (0.0051)* | 0.3329 (0.0094)* | -0.8536 (0.0065)* | 0.1230 (0.0055)* | 0.1801 (0.0105)* |
| $\ln(Age_{i,t})$ | 0.0521 (0.0060)* | -0.1121 (0.0069)* | -0.1773 (0.0126)* | 0.0678 (0.0089)* | -0.1183 (0.0075)* | -0.1711 (0.0144)* |
| Dens $_{i,t}$ | -0.0396 (0.0171)** | 0.0227 (0.0195) | -0.0105 (0.0357) | -0.0536 (0.0463) | -0.0059 (0.0389) | -0.0483 (0.0745) |
| Immig $_{i,t}$ | -0.3228 (0.0884)* | 0.3160 (0.1008)* | 0.4667 (0.1842)** | 0.2506 (0.2340) | 0.9729 (0.1967)* | 1.0365 (0.3769)* |
| Constant | 1.5374 (0.0362)* | -0.2373 (0.0412)* | -0.2511 (0.0753)* | 2.0541 (0.0761)* | -0.1613 (0.0640)** | -0.1963 (0.1226) |
| R² | 0.6429 | 0.0924 | 0.0579 | 0.6784 | 0.0528 | 0.0328 |
| Wald test | 9532.23 | 539.42 | 325.57 | 5386.08 | 142.22 | 86.54 |
| Hausman test | 30318.53 | 435.82 | 243.31 | 3344.40 | 843.68 | 415.69 |
| Firms | 18,514 | | | 12,355 | | |
| Observations | 39,700 | | | 22,570 | | |
| Dependent variable: yearly change in logarithm. * significant at 1%, **significant at 5%, ***significant at 10% | | | | | | |

When considering firm size and age, we expected the effects of immigration to be more marked in small and new firms and, indeed, Table 4 shows that these firms are more sensitive to the number of immigrants. In all our estimations the coefficients of immigration are larger than they are for the whole sample. Firms with fewer than ten employees located in cities with high immigration registered a positive impact on wage growth and productivity growth and regulate increases in their employment growth

compared to those of their counterparts. This evidence is particularly marked in the sample of new firms. Thus, firms that are set up in cities with proportionally higher immigrant populations are more likely to increase their wages and productivity.

In the third stage, we classified the firms in two groups according to their market orientation. Firms that are oriented to foreign markets are more able to face the competitive pressures of international markets, given that they have previously improved productive technologies that require skilled and qualified workers and have obtained productivity gains. Conversely, Spanish firms oriented to the domestic market are under less competitive pressure and must overturn a large differential if they wish to change to a new technological state and improve labour productivity.

| Table 5. Workers, wage and productivity regressions. Geographical orientation market. GLS fixed effects estimations. | | | | | | |
|---|---|---|---|---|---|---|
| | Non-export/import firms | | | Import-export firms | | |
| | Workers | Wage | Productivity | Workers | Wage | Productivity |
| $\ln(S_{i,t})$ | -0.7836 (0.0033)* | -0.8676 (0.0064)* | 0.1609 (0.0027)* | 0.0882 (0.0045)* | 0.2170 (0.0049)* | 0.1109 (0.0097)* |
| $\ln(Age_{i,t})$ | 0.0592 (0.0051)* | 0.1024 (0.0162)* | -0.1025 (0.0041)* | -0.0634 (0.0116)* | -0.1541 (0.0075)* | -0.1413 (0.0248)* |
| Dens $_{i,t}$ | -0.0750 (0.0132)* | -0.0610 (0.0243) | 0.0213 (0.0106)** | 0.0033 (0.0173) | -0.0068 (0.0196) | -0.0600 (0.0372) |
| Immig $_{i,t}$ | -0.0619 (0.0635) | -0.2872 (0.1312) | 0.1021 (0.0510)** | -0.1948 (0.0935)** | 0.2266 (0.0943)** | 0.1439 (0.2007) |
| Constant | 2.1064 (0.0271)* | 2.9277 (0.0745)* | -0.2132 (0.0218) | -0.1028 (0.0531)*** | -0.2268 (0.0402)* | 0.1377 (0.1140) |
| $R^2$ | 0.4972 | 0.5554 | 0.0578 | 0.0283 | 0.0325 | 0.0113 |
| Wald test | 15170.39 | 4706.09 | 941.90 | 109.69 | 515.11 | 42.94 |
| Hausman test | 45543.79 | 3241.05 | 1598.47 | 17709.17 | 410.89 | 139.22 |
| Firms | 97,267 | | | 22,297 | | |
| Observations | 35,892 | | | 7,223 | | |
| Dependent variable: yearly change in logarithm. * significant at 1%, **significant at 5%, ***significant at 10% | | | | | | |

As shown in Table 1, foreign market oriented firms are larger in terms of number of employees and sales volume, have higher labour productivity levels, and pay higher wages than firms oriented to the domestic market. However, import and export firms registered lower rates of growth size, wages and productivity than those of their counterparts. Since the advent of the euro, the Spanish economy has witnessed a continuous fall in its competitive advantages due to the negative inflation differential compared with that recorded in other countries in the Euro-zone, and this has placed Spanish firms operating in international markets under increasing pressure. Our econometric study presents interesting findings. In relation to wage increases, one of our most notable results was that immigration has an additional and negative impact on foreign market oriented firms, while immigration has a positive impact on productivity. One explanation for this

might be that large multicultural cities provide more competitive environments for firms. Thus, immigration enhances labour productivity.

Finally, firm size affects non-foreign market oriented firms more positively. One hypothesis is that firms with external activity pay higher wages regardless of their size, and the age of a firm has a more significant negative impact on wage growth among non-export/import firms. In line with our expectations, non-foreign market oriented firms are more sensitive to local population density, but import-export firms present low sensitivity to agglomeration economies. In short, migration flows increase population density and increase population size and domestic demand, thereby increasing the generation of external and agglomeration economies; but population density and size may be less relevant to internationally traded goods and services sectors because economies of scale can be achieved through international trade.

## Endogeneity bias

In seeking to interpret the relationship between immigration and firm performance we must recognise the potential endogeneity bias. This bias is attributable to the fact that firms might enjoy higher wage and productivity growth because of a positive economic shock, disproportionately attracting immigrants who are more productive and who have a greater capacity to grow, thus giving rise to a considerable increase in immigrants. In the event of such an economic shock, the impact of the number of immigrants on firm performance will be upwardly biased. Therefore, in order to isolate the correlation between the share of immigration and firm performance we have introduced several instrumental variables.

The set of instruments we use is an index of industrial, commercial and tourist activity and an index of the level of immigration in the region[9]. The underlying idea is that over the last decade, Spain has experienced a large increase in immigration for reasons exogenous to the events of any

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[9] The manufacturing index is a comparative index of the importance of industry (including construction). This index is drawn up according to the tax on economic activities corresponding to industrial activity in Spanish cities. The value of the index reflects the relative weight of industry in a municipality, province or autonomous community compared to that of Spain as a whole.

The commercial index is a comparative index of the importance of trade (both wholesale and retail). This index is also drawn up using the tax on economic activities in this sector. The value of the index reflects the weight of the commercial activity of a municipality compared to that of Spain as a whole.

The tourist index is a comparative index of the importance of tourism. It is obtained in accordance with the quota of economic activities that correspond to tourist activities, which is based in turn on the category of the tourist establishment (hotels and motels, hotel-apartments, hotels and *pensions*, inns and boarding houses, campsites and apartments managed by firms), number of rooms and annual occupation (all year round or for part of the year). As such it constitutes an indicator of tourist attraction. The value of the index indicates the participation of each municipality.

particular firm. Thus, the existence of a region with more immigrants or one that showed itself to be more dynamic was reason enough to transfer to one particular city. Since our instrumental variables are related to the economic dynamism of the city and the social opportunities in a region, we suppose that these variables do not have such a great direct impact on workers, wages and productivity growth.

Table 6 strengthens the hypothesis that while the effect of immigration on workforce growth is negative and significant, it is positive on wage and productivity growth. The estimated coefficient is significant and very large for workforce growth. Furthermore, our results show that our instrumental variables can explain 22% of the share of immigrants.

| Table 6. Workers, wage and labour productivity regressions. IV estimation, GMM. | | | |
|---|---|---|---|
| | Workers | Wage | Productivity |
| Second stage | | | |
| $\ln(S_{i,t})$ | -0.0445 (0.0011)* | 0.0100 (0.0004)* | 0.0153 (0.0009)* |
| $\ln(Age_{i,t})$ | -0.0457 (0.0014)* | -0.0089 (0.0006)* | -0.0119 (0.0013)* |
| Density $_{i,t}$ | -0.0037 (0.0023)** | -0.0028 (0.0012)** | -0.0066 (0.0025)* |
| Immigration Rate $_{i,t}$ | -0.1605 (0.0388)* | 0.0621 (0.0210)* | 0.0174 (0.0445) |
| Constant | 0.2814 (0.0045)* | 0.0111 (0.0019)* | -0.0278 (0.0041)* |
| $R^2$ | 0.0670 | 0.0047 | 0.0028 |
| Wald chi$^2$ | 3879.59 | 677.94 | 285.54 |
| First stage | | | |
| IndexIND | -0.0035 (0.0005)* | -0.0035 (0.0005)* | -0.0035 (0.0005)* |
| IndexCIAL | -0.0186 (0.0006)* | -0.0186 (0.0006)* | -0.0186 (0.0006)* |
| IndexTUR | 0.0216 (0.0005)* | 0.0216 (0.0005)* | 0.0216 (0.0005)* |
| NivPobEst | 0.0347 (0.0003)* | 0.0347 (0.0003)* | 0.0347 (0.0003)* |
| Constant | 0.0351 (0.0004)* | 0.0351 (0.0004)* | 0.0351 (0.0004)* |
| $R^2$ | 0.2216 | 0.2216 | 0.2216 |
| F test | 10924.74 | 10924.74 | 10924.74 |
| Firms | 43,115 | | |
| Observations | 119,564 | | |
| Instruments are an index of manufacturing, commercial and tourist activity as well as the level of immigrant population in the region. Dependent variable: yearly change in logarithm. * significant at 1%, **significant at 5%, ***significant at 10% Heteroskedasticity-robust standard errors are reported in parentheses. | | | |

## 7. Conclusions

In the 20th century Spain played an important role as a country of net emigration, but since the nineties it has become one of Europe's major host countries. These massive immigration flows have been largely concentrated in the country's most dynamic and advanced regions. These phenomena have had a major impact on the skill structure of the workforce, increasing labour supply and displacing native workers. While in 1998 the share of immigrants was just 1.6 percent of the Spanish population, in 2008 the share of immigrants has reached 11.3 percent. In a short period of time the foreign population has risen considerably: in 1998 there were 637,085 immigrants in Spain and by 2008 the number of immigrants has risen to 5,220,577 people. The recent wave of international immigration in Spain has been intense and has had both a major social and economic impact.

In line with recent research (Salerian, 2006; Ottaviano and Peri, 2005, 2006, Duranton and Stolper, 2006), we have found that the arrival of immigrants in Spain's host cities has led to a redeployment of skills, affecting local amenities and facilitating technological changes in local manufacturing firms. This positive impact has led to an increase in labour productivity, consequently reducing the number of employees needed in manufacturing firms located in cities that register high immigrant inflows. Immigrant inflows seem to affect manufacturing firms in two ways. On the one hand, such inflows have a direct impact on manufacturing jobs as they increase employment supply, especially among firms requiring unskilled or semi-skilled workers. However, immigrants finding jobs in manufacturing firms represent only a small proportion of total immigrants. On the other hand, above all in cities that have recorded a marked rise in the number of immigrants, this phenomenon increases pressure on local factor prices (rents, public services), displaces the native population to more skilled and qualified jobs, and has an indirect effect on manufacturing since it allows a better distribution of labour qualifications.

Our empirical study draws on two sources of information. At the local level we obtained the percentage figure for the foreign-born population in all Spanish peninsular cities with more than 1,000 inhabitants during the period 2001-2006. This information allowed us to track the evolution in the proportion of immigrants making up the population of 3,070 Spanish cities in fifteen regions. Firstly, we observed large differences in the immigration share between cities located in industrialised and rural regions. In 2006, our database showed that the most "receptive" regions included 1,078 cities registering 2,675,929 immigrants, while the least "receptive" regions included 1,992 cities with 993,729 immigrants. In general, we found that the proportion of immigrants in cities located in dynamic regions was higher than that in cities in less industrialised regions. This dataset is exhaustive and covers a large proportion of population and immigrants. For instance, in

2006 we registered an immigration population equal to 3,669,658 people, representing 88.54% of the total immigrants in Spain. Second, our database contains information at the firm level from a large sample of manufacturing firms. Our whole sample contains 43,115 firms operating during the period 2001-2005. We restricted the analysis to manufacturing industries and only considered those employing more than three workers.

These exhaustive data sources enabled us to analyse the impact of immigration on firm performance. In particular, we set out to measure the impact on the growth in labour productivity, wages and jobs in Spanish manufacturing firms located in cities with more than a thousand inhabitants. To the best of our knowledge, such an approach has not been undertaken before and, so, we are able to offer additional insights into the ever-increasing research area of immigration and firm performance.

In general, our empirical results show that local immigration flows have a positive impact in terms of increased wage and labour productivity and a negative impact on the number of employees engaged in manufacturing firms. In line with previous theoretical findings in cities recording a high inflow of immigrants, firms were placed under greater pressure to increase wages, improve labour productivity and to regulate workforce growth. The increase in the number of immigrants in cities leads to a rise in rents, the displacement of native workers, and a positive effect on skill composition and productivity in manufacturing firms. When we corrected the endogeneity bias with a set of instruments, we obtained similar results, which suggests a causal link between the proportion of immigrant population at the city level and productivity gains in manufacturing firms.

Small and new firms showed themselves to be more sensitive to the proportion of immigrants making up the population of a city. Firms with fewer than ten employees located in cities with the highest immigration rates recorded a positive impact on wage and productivity growth and tend to regulate their workforce more than their counterparts do. This evidence is particularly strong in the sample of new firms. These firms that chose to set up in cities with high immigrant populations were more likely to increase wages and productivity.

Finally, we classified our sample of manufacturing firms into two groups according to their market orientation. Foreign market oriented firms are larger in terms of number of employees and sales volume, obtain a higher labour productivity level, and pay higher wages than firms oriented to the domestic market. However, foreign market oriented firms registered lower rates of growth size, wages and productivity than those of their counterparts. Immigration flows in cities presented a negative impact on wages and employment rates and a positive impact on productivity in domestic market oriented firms, while in import and export firms immigration had a negative effect on job creation and a positive effect on wages.

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Table A.1. Number of immigrants in Spain

| Year | Foreign-born population | Annual rate | Immigrants as proportion of Spanish population |
|------|------------------------|-------------|------------------------------------------------|
| 1998 | 637,085 | -- | 1.6 |
| 1999 | 748,954 | 17.56 | 1.86 |
| 2000 | 923,879 | 23.36 | 2.28 |
| 2001 | 1,370,657 | 48.36 | 3.33 |
| 2002 | 1,977,946 | 44.31 | 4.73 |
| 2003 | 2,664,168 | 34.69 | 6.24 |
| 2004 | 3,034,326 | 13.89 | 7.02 |
| 2005 | 3,730,610 | 22.95 | 8.46 |
| 2006 | 4,144,166 | 11.09 | 9.27 |
| 2007 | 4,519,554 | 9.06 | 10.00 |
| 2008 | 5,220,577 | 15.50 | 11.30 |

Note: Information on the 1st of January.
Source: Padrón Municipal, Spanish Statistics Institute

Table A.2. Workers, wage and productivity regressions. Whole database. GLS fixed effects estimations.

| | Workers | Wage | Productivity |
|---|---------|------|--------------|
| $\ln(S_{i,t})$ | 0.1990 (0.0029)* | -0.0470 (0.0020)* | -0.0525 (0.0038)* |
| $\ln(Age_{i,t})$ | 0.0689 (0.0048)* | 0.0882 (0.0033)* | 0.0611 (0.0061)* |
| Density $_{i,t}$ | -0.7450 (0.116)* | -0.136 (0.0079)*** | -0.7740 (0.1480)* |
| Immigration Rate $_{i,t}$ | -0.1107 (0.0568)*** | 0.8329 (0.0390)* | 0.1604 (0.0726)** |
| Constant | 2.2588 (0.0253)* | 2.9425 (0.0174)* | 3.4990 (0.0323)* |
| R² | 0.0726 | 0.0453 | 0.0039 |
| Wald test | 1495.61 | 906.61 | 74.47 |
| Hausman test | | | |
| Firms | 43115 | | |
| Observations | 119,564 | | |

Dependent variable: logarithmic value of the variable.
* significant at 1%, **significant at 5%, ***significant at 10%

| Table A.3. Workers, wage and labour productivity regressions. IV estimation, GMM. | | | |
|---|---|---|---|
| | Workers | Wage | Productivity |
| Second stage | | | |
| $\ln(S_{i,t})$ | 0.9555 (0.0011)* | 0.0865 (0.0011)* | 0.1204 (0.0017)* |
| $\ln(Age_{i,t})$ | -0.0457 (0.0014)* | 0.0782 (0.0015)* | 0.1002 (0.0023)* |
| Density $_{i,t}$ | -0.0037 (0.0023)* | 0.1000 (0.0032)* | 0.0682 (0.0047)* |
| Immigration Rate $_{i,t}$ | -0.1605 (0.0388)* | 1.7255 (0.0559)* | 1.5815 (0.0834)* |
| Constant | 0.2813 (0.0045)* | 2.4906 (0.0046)* | 2.6671 (0.0072)* |
| $R^2$ | 0.9329 | 0.1215 | 0.1000 |
| Wald chi$^2$ | 780000 | 22016.71 | 13552.69 |
| First stage | | | |
| IndexIND | -0.0035 (0.0005)* | -0.0035 (0.0005)* | -0.0035 (0.0005)* |
| IndexCIAL | -0.0186 (0.0006)* | -0.0186 (0.0006)* | -0.0186 (0.0006)* |
| IndexTUR | 0.0216 (0.0005)* | 0.0216 (0.0005)* | 0.0216 (0.0005)* |
| NivPobEst | 0.0347 (0.0003)* | 0.0347 (0.0003)* | 0.0347 (0.0003)* |
| Constant | 0.0351 (0.0004)* | 0.0351 (0.0004)* | 0.0351 (0.0004)* |
| $R^2$ | 0.2216 | 0.2216 | 0.2216 |
| F test | 10924.74 | 10924.74 | 10924.74 |
| Firms | 43,115 | | |
| Observations | 119,564 | | |
| Instruments are index of manufacturing, commercial and tourist activity as well as the level of immigrant population in the region. Dependent variable: logarithmic value of the variable. * significant at 1%, **significant at 5%, ***significant at 10% Heteroscedasticity-robust standard errors are reported in parentheses. | | | |

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