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ORIGINAL ARTICLE

# Immigrants' responsiveness to labor market conditions and their impact on regional employment disparities: evidence from Spain

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**Abstract** Using data from the Spanish Labor Force Survey (*Encuesta de Población Activa*) from 1999 through 2007, we explore the role of employment opportunities in explaining the growing immigrant flows of recent years. Subsequently, we investigate whether immigrant inflows have helped reduce regional employment disparities. Our results indicate that immigrants choose to reside in regions with higher employment rates for their particular skills. However, perhaps owing to its recent nature or the ability of the production infrastructure to absorb the increase in immigrant labor, the immigration shock seems to have lowered regional employment rate disparities only temporarily.

**Keywords** International migration · Immigrant workers · Immigrant location · Immigrant responsiveness · Labor market conditions · Regional disparities

**JEL Classification** J61

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## 1 Introduction

Since the 1990s, the Spanish economy has been characterized by a continuous growth in immigrant flows from African, Latin American, and European countries. By January 2007, a total of 4.48 millions of foreigners—the equivalent of 9.93% of the population—resided in Spain (Padrón Municipal, INE 2007). Most immigrants live in Catalonia, Madrid, Andalusia, Valencia, Murcia and the Canary or Balearic Islands. The continuous growth in immigrant flows of the late nineties coexisted with a decrease in net inter-regional flows despite significant unemployment rate differences across regions. We know through previous work by Bentolila and Blanchard (1990), Bentolila and Dolado (1991), Bentolila (2002) and Bover and Velilla (1999) that high unemployment rates are the main reason behind the observed decline in internal migration on the part of natives. However, why have immigrant flows increased? Are immigrants responding to labor market opportunities more than natives and, if so, have immigrant inflows significantly impacted regional labor market disparities?

In this paper, we use data from the Spanish Labor Force Survey (*Encuesta de Población Activa*) from 1999 through 2007 to first examine immigrants' responsiveness to employment opportunities relative to natives and, as such, better understand these new migratory patterns. Given immigrants' heterogeneity by country of origin, we distinguish among three major groups of Spanish immigrants in our analysis: Africans, Europeans, and Latinos. Subsequently, we analyze whether these immigrant flows have altered regional unemployment disparities.

Our work adds to previous work in the literature examining the location choices of immigrants (see, for instance, Bartel 1989; Borjas 2001) and the local labor market implications of immigrant residential choices (e.g. Borjas, Freeman and Katz 1996; Borjas 2001; Card 2001; more recently Borjas 2003). As noted by this second strand of literature, "area-approach" analyses relating regional immigration flows to regional employment opportunities via regression-based analyses are inappropriate because: (1) they fail to account for forces, other than immigrant flows, affecting immigrants' location decisions, and (2) they do not take into account the fact that natives may also be "voting with their feet". Therefore, using skill groups defined for each year and region as our units of observation, we construct indexes capturing the relative supply of immigrants as compared to natives. We then use these indexes as dependent variables when examining immigrant location choices and their potential impacts on regional employment disparities.

Much of the earlier literature examining immigrant location choices has primarily focused on the role played by existing networks of countrymen (e.g. Bartel 1989; Chiswick and Miller 1996). If immigrants from a particular country have similar skills and occupational preferences, they will tend to locate in regions offering better employment choices and higher earnings. The clustering of these immigrants will, in turn, give birth to ethnic enclaves that further raise the marginal benefit of moving to that region via higher wages (e.g. Mouw 2003; Munshi 2003; Amuedo-Dorantes and Mundra 2007), while lowering the associated marginal costs via shorter job searches and lower psychic costs (e.g. Granovetter 1973, 1974;

Bartel 1989; Fernandez et al. 2000; Munshi 2003). However, due to the recent nature of immigration in Spain and the relatively young age of immigrants in our sample,[1] we focus on the role of labor market conditions as a pull factor as networks are likely to develop thereafter.

In addition to networks, the literature examining immigrant location choices has also focused on the role played by wages (e.g. Borjas 2001). Due to the lack of adequate wage data and in light of the traditionally high unemployment rates characteristic of some Spanish regions, we instead examine immigrant responsiveness to labor market prospects relative to natives. Employment opportunities may be particularly relevant in the case of immigrants, for whom accessibility to any type of employment may be crucial for their immediate economic survival upon arrival to the host country. We capture work prospects with regional employment rates for each skill group. We hypothesize that immigrants are more responsive than natives to regional employment opportunities given their lower migration costs across Spanish regions relative to natives. After all, natives have to break up family ties and withdraw from the safety net provided by these strong ties—a psychic costs already incurred by immigrants when deciding to emigrate.

Why should we care about immigrants' responsiveness to regional labor market conditions relative to their native counterparts? In Spain, relatively sticky wages and high costs of adjustment due to union contract provisions, social norms, and government legislation regarding job protection policies have reduced the rate at which new jobs are created and increased the duration of unemployment, leading to higher structural unemployment rates (Bentolila and Blanchard 1990; Bentolila and Dolado 1991; Bentolila 2002). As such, immigrants' greater responsiveness to better employment prospects could play a crucial role in correcting regional employment imbalances (e.g. Blanchard and Katz 1992).

Our results indicate that immigrants choose to reside in regions with larger employment rates and where their likelihood of finding a job is higher. This is particularly true for African and Latino immigrants, who have lesser educational attainment and exhibit higher unemployment rates. Non-15 European immigrants, perhaps owing to their greater skill transferability, do not seem to significantly differ from natives in their response to the employment outlook when choosing where to reside. In any event, the recent immigration shock seems to have only temporarily helped lower regional employment rate disparities.

In what follows, we first describe some of the features of the Spanish labor market, such as its traditionally high unemployment rate and the recent receipt of large immigrant flows. Subsequently, we present our hypotheses and discuss the methodology we rely upon to examine immigrants' responsiveness to regional employment opportunities and its effect on regional employment disparities. Results and conclusions close the study.

[1] As noted by Bartel (1989), young individuals are likely to face lower psychic costs to relocation. This is particularly true among immigrants, who are then less likely to need the emotional support offered by ethnic enclaves.

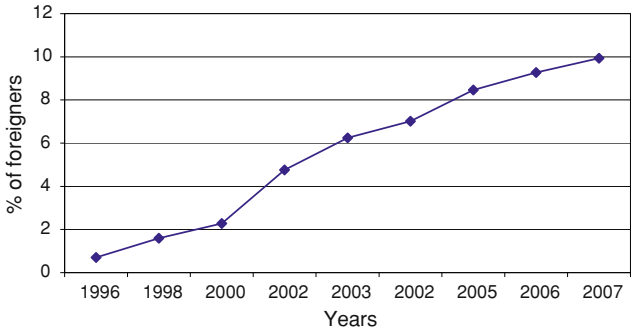


**Fig. 1** Evolution of foreigners as a percentage of the Spanish population (1996–2007). Source: Spanish Institute of Statistics—Padrón Municipal

## 2 Institutional framework

### 2.1 Spanish immigration and migration policy

Up to the mid 1970s, Spain had experienced more out-migration than immigration. As shown by Fig. 1, immigration grew at a particular fast pace from the late 1990s onwards despite the restrictions that the 'Aliens' Law' of 1985 imposed on non-European Union foreigners in order to establish Spanish residency and citizenship.[2]

Over the 12-year period shown in Fig. 1, the number of foreign-born living in Spain grew from less than 1% of the population to approximately 10%. Various elements steered this trend, such as the country's democratization, the rapid economic growth in part fueled by Spain's incorporation to the European Common Market in 1986, the free-entrance of foreigners as tourists together with a lax implementation of immigration laws, and the close linguistic, cultural ties, and preferential treatment to Latin Americans due to colonial history (Escrivá 2000; Ribas-Mateos 2000).

As of today, in spite of augmented immigration restrictions consisting of limited work and residency permit renewals, as well as immigration quotas implemented during the 1990s,[3] Spain is considered the most popular port of entry for Latino immigrants (Millman and Vitzthum 2003). Additionally, Spain receives a significant immigrant flow from Africa, particularly Morocco, given its proximity to the Spanish peninsula. Immigrant flows from these two regions have been primarily propelled by the investment of Spanish companies in Latin America, as well as by the political and economic crises in Latin America and Africa during much of the 1990s. Based on our sample of immigrants from the Spanish Labour Force Survey (1999–2007) and according to the figures in Table 1, the vast majority of immigrants in these regions are primarily Latinos (52.3%). The other two significant

[2] One of these restrictions include the need to acquire a work and a residency permit in order to become legal immigrants, along with the granting of 1-year permits to work in a particular activity and geographic location.

[3] Starting in 1993, the Spanish government has been implementing a quota system for agriculture and domestic services. See Escrivá (2000) for greater details.

**Table 1** A composition of regional immigrant stocks by place of origin (%)

| Distribution of immigrants | Africa | Europe no. 15 | Latin America | Number of immigrants |
|---|---|---|---|---|
| Andalucia | 22.1 | 26.8 | 51.1 | 1,837 |
| Aragón | 27.2 | 34.1 | 38.7 | 1,178 |
| Asturias | 10.5 | 20.4 | 69.1 | 181 |
| Balears | 25.3 | 13.8 | 61.0 | 1,266 |
| Canary Islands | 17.4 | 9.2 | 73.4 | 1,351 |
| Cantabria | 3.0 | 24.3 | 72.7 | 301 |
| Castilla-León | 17.2 | 35.2 | 47.6 | 1,392 |
| Castilla-La Mancha | 21.9 | 38.1 | 40.0 | 1,466 |
| Catalonia | 42.6 | 14.3 | 43.1 | 3,868 |
| Com. Valenciana | 20.5 | 35.7 | 43.9 | 3,319 |
| Extremadura | 47.0 | 15.7 | 37.3 | 236 |
| Galicia | 13.0 | 11.3 | 75.7 | 462 |
| Madrid | 13.0 | 24.1 | 63.0 | 2,717 |
| Murcia | 33.2 | 8.1 | 58.7 | 1,659 |
| Navarra | 11.1 | 21.0 | 67.9 | 539 |
| País Vasco | 19.2 | 20.5 | 60.3 | 532 |
| Rioja, La | 25.9 | 24.5 | 49.6 | 575 |

Source: Spanish Labor Force survey, 1999–2007. Individuals between 16 and 64 years. Immigrants from Asia, North-America and Other are excluded from the sample as they represent less than 5% of total immigrants. Individuals from EU-15 are not considered as immigrants either

groups are immigrants from Africa (24.4%) and non-15 European countries (24.3%).[4] In some regions, as is the case with Catalonia and Murcia, African immigrants constitute the second largest immigrant group after Latinos. Additionally, the figures in Table 2 suggest that most immigrants choose to reside in either Madrid, Catalonia, Valencia or Andalucía.

What is the role played by regional labor market conditions in attracting these immigrant flows? In particular, do job opportunities serve as immigrant magnets to these regions? And, does the location choice of immigrants in turn help correct regional imbalances? Before addressing the aforementioned questions, it is important to highlight some key features of the Spanish labor market.

## 2.2 The Spanish unemployment rate

One of the crucial characteristics of the Spanish labor market has been its traditionally high unemployment rate, particularly during the eighties and early nineties. Still today, despite the impressive economic growth enjoyed by the Spanish economy, Spain continues to have one of the highest unemployment rates

[4] Immigrants from Asia, North America and Oceania represent, altogether, less than 5% of all immigrants. Therefore, we exclude them from the analysis. EU-15 citizens have not been considered under the category of immigrants given their differences with respect to the vast majority of immigrants in our sample.

**Table 2** Immigrant regional distribution by place of origin

| Immigrant regional distribution | Africa | Europe no. 15 | Latin America |
|---|---|---|---|
| Andalucia | 7.3 | 9.2 | 7.9 |
| Aragón | 5.7 | 7.6 | 3.8 |
| Asturias | 0.3 | 0.7 | 1.0 |
| Balears | 5.7 | 3.3 | 6.4 |
| Canary Islands | 4.3 | 2.3 | 8.4 |
| Cantabria | 0.2 | 1.4 | 1.8 |
| Castilla-León | 4.4 | 9.2 | 5.6 |
| Castilla-La Mancha | 5.7 | 10.4 | 4.8 |
| Catalonia | 30.0 | 10.4 | 13.9 |
| Com. Valenciana | 12.3 | 22.3 | 12.2 |
| Extremadura | 2.0 | 0.7 | 0.8 |
| Galicia | 1.2 | 1.0 | 2.9 |
| Madrid | 6.3 | 12.3 | 14.3 |
| Murcia | 9.9 | 2.6 | 8.1 |
| Navarra | 1.2 | 2.1 | 3.1 |
| País Vasco | 1.8 | 2.0 | 2.7 |
| Rioja, La | 2.7 | 2.5 | 2.4 |
| Total | 5,579 | 5,320 | 11,960 |

Source: Spanish Labor Force survey, 1999–2007. Individuals between 16 and 64 years. Immigrants from Asia, North-America and Other are excluded from the sample as they represent less than 5% of total immigrants. Individuals from EU-15 are not considered as immigrants either

among other OECD countries. Table 3 displays average unemployment rates nationwide as well as by region for selected years: 1976, 1991, 2003, and 2005. Average unemployment rates remained well above 10% since the mid eighties for practically a decade. Moreover, there are very important unemployment rate differences across regions. In particular, while unemployment rates in Navarra, Baleares, Aragón, La Rioja or Madrid are below 7%, Extremadura, Andalucía, Canary Islands, Galicia and Asturias exhibit double-digit unemployment rates.

As noted by Bentolila (2002), Bentolila and Blanchard (1990), and Bentolila and Dolado (1991), among others, sticky wages accompanied by limited internal geographic mobility may have perpetuated regional imbalances between labor demand and supply and, therefore, structural unemployment. Consequently, a better understanding of the geographic mobility of immigrants is of great importance as their responsiveness to differences in employment rates across regions could help correct regional labor market imbalances (Blanchard and Katz 1992). Do immigrants locate in regions with better employment prospects? A joint look to the figures in Tables 1 and 3 reveals that some of the regions with the highest incidence of immigration, such as Madrid or Catalonia, have relatively low unemployment rates (approximately 7%) in 2005. Yet, other immigrant receiving regions, such as Andalucía or Valencia, display unemployment rates in the order of 14 and 9%, correspondingly. Therefore, at a descriptive level, it is unclear whether immigrants choose to reside in regions offering better employment prospects.

**Table 3** Regional unemployment rates for selected years

| Regions | Years | | | |
|---|---|---|---|---|
| | 1976 | 1991 | 2003 | 2005 |
| Andalucia | 9.35 | 24.47 | 18.17 | 13.78 |
| Aragón | 2.54 | 9.37 | 6.48 | 6.28 |
| Asturias | 3.08 | 15.69 | 10.74 | 10.82 |
| Balears | 3.32 | 8.5 | 9.18 | 6.03 |
| Canary Islands | 8.55 | 24.49 | 11.56 | 12.38 |
| Cantabria | 2.78 | 15.25 | 10.48 | 9.09 |
| Castilla and León | 2.69 | 14.5 | 11.19 | 8.64 |
| Castilla-La Mancha | 4.57 | 13.71 | 9.74 | 9.35 |
| Catalonia | 3.46 | 11.68 | 9.37 | 7.12 |
| Valencia | 3.23 | 15.78 | 10.94 | 9.24 |
| Extremadura | 4.27 | 24.32 | 16.51 | 15.15 |
| Galicia | 1.56 | 12.56 | 11.85 | 11.11 |
| Madrid | 4.66 | 11.26 | 7.01 | 6.87 |
| Murcia | 4.77 | 16.59 | 9.56 | 8.05 |
| Navarra | 3.94 | 10.24 | 5.15 | 5.12 |
| País Vasco | 3.45 | 18.7 | 9 | 7.57 |
| Rioja | 1.63 | 9.26 | 5.58 | 6.45 |
| Country average | 4.41 | 15.88 | 11.2 | 9.33 |

## 3 Conceptual framework

The migration decision can be viewed as an investment decision where both natives and foreign-born individuals are income maximizers. As such, migration decisions are guided by the comparison of the present value of lifetime earnings in alternative employment opportunities net of migration costs. If migration costs primarily consist of large fixed costs, many individuals may not find it worth while to migrate. Specifically, if the potential earnings differential across regions is not large enough, many natives will choose to stay home as inter-regional wage differences will not compensate for incurred migration costs. In contrast, if most immigrants originate from countries with significantly lower wages (as it may be the case with migrants originating from many African and Latin American nations), the earnings differential between Spain and their home countries is likely to widely exceed any earnings differentials encountered by natives between Spanish regions. In this case, we may observe more international than internal native migration.

Furthermore, once in Spain, foreign-born individuals are likely to exhibit lower migration costs than natives with strong ties to their birth communities. After all, natives have to break up family ties when migrating from one region to another, whereas immigrants have already incurred this psychological cost by choosing to start anew in the host country. At the most, they may have to give up networks of countrymen they may have connected with. Therefore, immigrants should be more likely to choose to reside in the region $r$ where their labor earnings are expected to be larger.

Unfortunately, we know of no data set containing representative individual level information on earnings and immigrant status. Yet, due to traditionally high unemployment rates, workers may be particularly responsive to employment prospects. As such, we focus on the role played by the probability of finding employment ($\phi$) in shaping individual level earnings and, therefore, any residential choice as follows:

$$\phi_{rs} w_{rs} = \max_{j} \{\phi_{js} w_{js}\}, \quad (1)$$

where: $j = 1, \ldots, 17$ for each of the 17 Spanish regions.

Specifically, $w_{rs}$ stands for the wage earned by a person with skills $s$ in region $r$ and $\phi_{rs}$ represents her/his employment likelihood.

In sum, the described framework has some interesting implications for understanding the high immigration rate and, yet, the low internal mobility of natives in Spain. First, immigrants should exhibit a greater responsiveness to employment opportunities than natives. Secondly, by being more responsive than their native counterparts, immigrants may promote employment convergence across regions. Why? As noted by the previous literature (Bentolila and Blanchard 1990; Bentolila and Dolado 1991; Bentolila and Jimeno 1998), the traditionally high Spanish unemployment can be characterized as structural unemployment arising from regional imbalances in labor demand and supply. This type of unemployment typically persists in the presence of sticky wages—typically resulting from union contract provisions, social norms or government legislation concerning (such as minimum wages and job protection policies)—and if internal mobility is low, as argued by Bentolila and Dolado (1991), Bentolila (2002) and Bover and Velilla (1999). Under such circumstances, the higher responsiveness of immigrants to employment opportunities in specific regions could help erode regional imbalances in unemployment (e.g. Blanchard and Katz 1992).

## 4 Methodology

### 4.1 Are immigrants more responsive than natives to employment opportunities?

Traditionally, a variety of studies have relied on regional correlations between immigration rates and labor market conditions to learn about the role of the latter in attracting immigrant flows. However, this "area approach" strategy has come under criticism, notably by Borjas et al. (1996), Borjas (2001), Card (2001) and more recently Borjas (2003) on two counts. First, labor market conditions in a particular region could be affected by native inflows and outflows regardless of immigrant flows. If so, how can we measure the impact of labor market conditions on the supply of immigrants relative to natives when labor market conditions themselves are a by-product of native migration flows? Second, cross-sectional analyses may fail to account for demand shocks affecting local labor market conditions and, as such, incite an erroneous interpretation of the correlation coefficients between immigrant flows and labor market conditions.

To lessen any omitted variable biases, we follow the methodology proposed by Borjas (2001) and used by Carrasco et al. (2008), among others, which consists in simply grouping the individual data in cells defined for different skill groups, regions, and years. This unit of observation recognizes that immigrants are a very heterogeneous group. As such, we assume that natives only compete with immigrants with similar skills. Each skill group is an age-education cell where both age and education are defined over three categories (age: 30 or less, 31–45, and 45 plus; education: primary education or less, secondary education, and university degree). Therefore, we have nine skill groups.[5] We then measure the supply of immigrants (relative to natives) in a particular region at a point in time for each of the nine age-education groups with the following index:

$$K_{rs}(t) = \frac{I_{rs}(t)/I_s(t)}{N_{rs}(t)/N_s(t)} \tag{2}$$

where $I_{rs}(t)$ represents the number of immigrants in region $r$ and skill (age-education) group $s$ at period $t$, and $N_{rs}(t)$ represents the number of natives in region $r$ and skill group $s$ at period $t$. Therefore, the index $K_{rs}(t)$ measures the relative supply of immigrants vis à vis natives in a particular skill group, region, and time period. The index equals 1 when immigrant and native workers of the same skill level have the same geographic distribution, and it is greater than 1 when immigrants in a particular skill group are overrepresented in a particular region at a specific point in time. Since we are working with 9 skill groups, 17 regions (or Autonomous Communities), and 9 years (1999–2007), the index in Eq. 2 is defined for 1,377 groups (i.e. 9 skill groups $\times$ 17 regions $\times$ 9 years).

To the extent that regional employment opportunities and the relative supply of immigrants are likely to be simultaneously determined, instrumenting the former may be necessary. However, as recognized by others (e.g. Borjas 2001), finding a set of valid instruments, i.e. a set of variables that are highly correlated with regional employment opportunities, yet uncorrelated with any of the variables explaining the relative supply of immigrants to natives, is virtually impossible. As such, we instead lag our explanatory variable to at least guarantee its pre-determined character. This model specification is likely to also best reflect how migrants behave. Since migration involves an important human capital investment decision, it is reasonable to observe a time lag between the time period to which the regional employment conditions are referred to and immigrant flows. Therefore, we estimate the following model:

$$K_{rs} = \beta[E_{rs}(t-1)] + v_s + \eta_r + \theta_t + (v_s * \theta_t) + (\eta_r * \theta_t) + (v_s * \eta_r) + \varepsilon_{rs}(t) \tag{3}$$

where $E_{rs}(t-1)$ stands for past employment opportunities for individuals of skill $s$ in region $r$ at time $(t-1)$. Additionally, Eq. 3 includes a series of fixed-effects vectors, such as: $v_s$ stand for skill (age-education) fixed-effects, $\eta_r$ for regional fixed-effects, and $\theta_t$ for time fixed-effects, and their interaction terms. In this manner, we

[5] These nine skill groups are defined as follows: (1) primary or less and 30 years or less, (2) primary or less and 31–45 years, (3) primary or less and 45 plus years, (4) secondary and 30 years or less, (5) secondary and 31–45 years, (6) secondary and 45 years or more, (7) university and 30 years or less, (8) university and 31–45 years, (9) university and 45 years or more.

are able to capture educational, regional and time characteristics possibly affecting the relative supply of immigrants to natives in a particular cell, such as differences in the educational system, regional cost-of-living differences or housing shortages, and macroeconomic trends. Equation 3 is estimated for all immigrants (relative to natives) as well as separately for our most prominent groups of immigrants: Latinos, Europeans (non-EU15), and Africans.

### 4.2 Does immigration help reduce regional employment disparities?

A second question of great interest to us is whether the increase in immigration has brought about regional convergence in employment rates by attracting migrants to regions with higher employment rates versus regions with lower employment rates. As discussed earlier in the paper, much of the Spanish unemployment can be classified as structural unemployment arising from regional imbalances in labor demand and supply. This type of unemployment could be significantly reduced via immigrants' greater responsiveness to employment opportunities in specific regions.

To assess whether immigration inflows can help reduce regional differences in employment rates for a given skill group, we first define our dependent variable as follows:

$$E_{rs}(t) - \overline{E_s}(t) \tag{4}$$

where $E_{rs}(t)$ is the employment rate for skill group $s$ in region $r$ and year $t$ and $\overline{E_s}(t)$ is the average employment rate for skill group $s$ across all Spanish regions in year $t$. Once we have our dependent variable capturing differences in regional employment rates for each skill group and year from the national average, we use the immigrant penetration index defined in Borjas (2001) to examine whether immigration affects regional convergence in employment rates. The immigrant penetration index is defined as:

$$g_{rs}(t) = \ln\left(\frac{I_{rs}(t, t+1)}{N_{rs}(t)}\right) \tag{5}$$

where $I_{rs}(t, t+1)$ is the number of immigrants in skill group $s$ entering a particular region $r$ between $t$ and $t+1$ and $N_{rs}(t)$ is the number of natives in skill group $s$ in region $r$ at time period $t$. We then use our dependent variable from Eq. 3, which we refer to as $y$, and the immigrant penetration index (i.e. $x$ in what follows) to estimate a panel vector autoregressive (panel VAR) model and gauge whether and, if so, to what extent, immigration helps attain regional employment convergence.

Panel VARs are useful in identifying a causal relationship between immigration and employment while addressing: (a) the endogeneity of our series, (b) the unobserved skill group and regional specific heterogeneity, and (c) the low frequency at which they are reported (i.e. annually). Indeed, the use of a panel VAR addresses the endogeneity problem as the methodology treats all the variables in the system as endogenous. Moreover, the panel VAR also helps us address the unobserved skill group and regional specific heterogeneity while, at the same time, overcoming the data limitation problem by stacking the data for the various skill

groups in each region. As such, the use of panel VARs seems appropriate for our analysis. In fact, Holtz-Eakin et al. (1988) argue that panel data are perfectly fitted for VARs as few years of data are required to estimate such models. This is possible because the sampling properties depend on the number of cross-sections ($i$) and not on the number of years ($t$). Some authors even argue that the asymptotic results are easier to derive for panel data than for time series data (see Gilchrist and Himmelber 1998). In what follows, we provide a short description of the methodology used in this analysis.[6]

The $\ell$th equation of a 1 lag panel VAR can be written as:

$$y_{it}^{\ell} = \alpha_i^{\ell} + \gamma_t^{\ell} + x_{it}' b^{\ell} + e_{it}^{\ell}, \tag{6}$$

where $\alpha_i^{\ell}$ is the cross-section [i.e. the (skill, region) groups] specific effect, $\gamma_t^{\ell}$ is the year specific effect, $x_{it}$ is an $\ell x1$ vector of lagged endogenous variables (i.e. the immigration penetration index), $b^{\ell}$ is an $\ell x1$ vector of slope coefficients, and $e_{it}^{\ell}$ is the idiosyncratic error. In order to eliminate year and cross-section fixed effects, we make two transformations. First, we express all variables in the model as deviations from year specific means to remove year specific effects (i.e. the data are time demeaned). Second, we transform all variables in the model to deviations from forward means (Helmert's transformation) to remove cross-section fixed effects. Since the cross-section fixed effects are correlated with the regressors ($x_{it}$) by virtue of the lagged dependent variable, the mean differencing procedure commonly used to eliminate these cross-section fixed effects will create biased coefficients (Love and Zicchino 2006). To avoid this problem, we use forward mean differencing (see Arellano and Bover 1995). Let $\bar{y}_{it}^{\ell}$, $\bar{x}_{it}$ and $\bar{e}_{it}^{\ell}$ denote the means constructed from the future values of $y_{it}^{\ell}$, $x_{it}$ and $e_{it}^{\ell}$. Then, our transformations are given by:

$$\tilde{y}_{it}^{\ell} = \delta_{it}\left(y_{it}^{\ell} - \bar{y}_{it}^{\ell}\right), \tag{7}$$

$$\tilde{x}_{it} = \delta_{it}\left(x_{it} - \bar{x}_{it}\right), \tag{8}$$

$$\tilde{e}_{it}^{\ell} = \delta_{it}\left(e_{it}^{\ell} - \bar{e}_{it}^{\ell}\right), \tag{9}$$

where $\delta_{it} = \sqrt{(T_i - t)/(T_i - t + 1)}$ and $T_i$ denotes the last year of data available for a given (skill, region) cross-section. We are not able to calculate this transformation for the last year of data, since there are no future values for the construction of the forward means. Accordingly, we lose this observation. The final transformed model is thus given by:

$$\tilde{y}_{it}^{\ell} = \tilde{x}_{it}' b^{\ell} + \tilde{e}_{it}^{\ell} \tag{10}$$

Thus, we used an orthogonal deviation, in which we express each observation as a deviation of average future observations. We weight each observation to standardize the variance. If the original errors are not autocorrelated and have a constant variance, the transformed errors should exhibit similar properties. Thus, this transformation preserves homocedasticity and does not induce serial correlation (Arellano and Bover 1995). Additionally, we use lagged regressors as instruments in our GMM estimation. To the extent that the instruments are lagged values of $x_{it}$,

[6] The empirical analysis is conducted using the package in Love (2001).

they remain uncorrelated with the transformed error term, that is: $E\left[x_{it-s}\tilde{e}_{it}^{\ell}\right] = 0$ for all $s \geq 0$ (Holtz-Eakin et al. 1988; Gilchrist and Himmelber 1998).

Our panel VAR model thus has 153 (i.e. 9 skill groups $\times$ 17 regions) groups as cross-sections observed over eight years. We estimate both the variance decompositions (VDCs) and impulse response functions (IRFs). VDCs inform us on the portion of the forecast error variance for each variable that is attributable to its own innovations and to innovations from the other variables in the system. The IRFs further inform on the sign and time trajectory of the impact of a one standard deviation shock to one of the variables in the system on the outcome of interest. To compute VDCs and IRFs, we need to impose some structure on the system. We choose to do so by orthogonalizing the residuals using Choleski's decomposition. The Choleski decomposition imposes a minimal set of assumptions to identify our system. In particular, it implies a recursive ordering of the variables in the VAR according to which variables listed earlier in the ordering are considered to be more exogenous. Therefore, the Choleski decomposition attributes all of the effect of any common component to the variable that comes first in the VAR system. To the extent that we are interested in learning about the impact of an immigration shock on regional employment disparities, it seems reasonable to then list the immigration penetration index at the beginning of the ordering. Finally, what is the meaning of this structure? As noted by Enders (1995), this decomposition implies, in our case, that immigration shocks affect regional employment disparities with a lag. Therefore, the proposed model allows us to assess how immigration impacts regional employment convergence or, alternatively, how regional employment convergence adjusts over time to a shock to the immigration penetration index series.

## 5 Data and descriptive evidence

### 5.1 Data

We use data from the Spanish Labor Force Survey for the period 1999 through 2007. This survey is administered to approximately 60,000 households on a quarterly basis. For the empirical analysis, we use a pooled cross-sectional database of all active immigrants included in the survey. We define immigrants as individuals with a foreign citizenship and exclude those from EU-15 countries as they are not representative of most immigrants in Spain. This definition thus includes individuals with a double nationality –a group that accounts for 3% of our sample. At any rate, we exclude naturalized citizens from our definition of immigrants since questions like the years of residence in the country are only asked to non-naturalized immigrants. As such, the small sample size of individuals with a double nationality from birth ends up not altering our findings. The survey collects detailed personal and job characteristics from every interviewed individual, native or immigrant, with the exception of wages. In addition, for immigrants, we have information on their country of origin and on the number of years residing in Spain.

**Table 4** Mean and standard deviations of key characteristics of natives and immigrants in the sample (%)

| Variables | Natives | Immigrants | Africans | Non-15 Europeans | Latinos |
|---|---|---|---|---|---|
| Female | 50.5 (0.49) | 51.7 (0.49) | 38.3 (0.48) | 52.3 (0.49) | 57.7 (0.49) |
| Age | 38.7 (13.68) | 32.6 (10.20) | 32.19 (9.76) | 32.5 (10.28) | 32.8 (10.35) |
| Head of household | 27.4 (0.44) | 20.5 (0.40) | 24.2 (0.43) | 19.6 (0.40) | 19.23 (0.39) |
| Married | 57.0 (0.49) | 54.13 (0.49) | 59.5 (0.49) | 59.13 (0.49) | 49.4 (0.49) |
| Education | | | | | |
| Primary or less | 27.7 (0.44) | 25.4 (0.44) | 45.13 (0.49) | 14.92 (0.35) | 21.01 (0.41) |
| Secondary | 49.9 (0.50) | 53.7 (0.49) | 36.4 (0.48) | 57.63 (0.49) | 60.11 (0.49) |
| University | 22.35 (0.41) | 20.76 (0.40) | 18.46 (0.39) | 27.44 (0.44) | 18.9 (0.39) |
| Work Status | | | | | |
| Employed | 54.4 (0.49) | 65.4 (0.47) | 54.9 (0.49) | 69.9 (0.46) | 68.21 (0.47) |
| Unemployed | 8.06 (0.27) | 11.2 (0.31) | 14.4 (0.35) | 9.62 (0.29) | 10.3 (0.30) |
| Observations | 981,693 | 225,859 | 5,579 | 5,320 | 11,960 |

Individuals between 16 and 64 years. Immigrants from Asia, North-America and Other are excluded from the sample as they represent less than 5% of total immigrants. Individuals from EU-15 are not considered in the sample of immigrants either. Standard deviations in brackets. All statistics are weighted

It is worth noting that immigrants in the Labor Force Survey reside in registered households; otherwise, they would have never been interviewed by the survey. Therefore, immigrants in our sample are most likely authorized immigrants, restricting the validity of our inferences to this group. At any rate, to ensure the most representativeness of our data as far as immigrant concentration and distribution is concerned, we use the last release of the EPA, where observations are weighted according to the 2001 Population Census believed to better account for the immigrant population.[7] Finally, given our focus on immigrant responsiveness to employment opportunities relative to natives, we restrict our sample to individuals in working age, i.e., 16–64 years of age.

## 5.2 Immigrant and native profiles according to skill

The largest fraction of our immigrant sample, about 52.3% of all immigrants between 16 and 64 years of age comes from Central and South America. An additional 24.4% originates in Africa and 24.3% comes from Non-15 European countries.

What are some of the characteristics of natives and immigrants in our sample? Table 4 addresses this question. For instance, immigrants are approximately 6 years younger than natives and a slightly higher fraction are female relative to natives. Education-wise, natives display a higher educational attainment than the average immigrant in our sample although, as we shall discuss in what follows, there are important differences by immigrant origin.

[7] For more information on the 2005 EPA methodology, please visit: http://www.ine.es.

Table 4 also shows the characteristics of immigrants by region of origin. As reflected by the figures, there are notable differences across the three major migrant groups in our sample: Africans, Non-15 Europeans, and Latinos. For instance, only 38.3% of Africans are female relative to 57.7% of Latinos. Additionally, 24.2% of African migrants are household heads, compared with 19% of Latinos. Education-wise, we also find important divergences across immigrant groups depending on their origin. Forty-five percent of African migrants have no more than a primary education, whereas only 15 and 21% of Non-15 Europeans and Latinos fall within that category. In contrast, only 18% of African immigrants have a university degree compared to 22% of Spanish natives or 27% of Europeans. Lastly, African migrants endure the highest unemployment rate (approximately 14%) of all immigrants and natives.

## 6 Results

Before turning to the first question we want to address in this paper, i.e., whether immigrants are more responsive, in terms of their geographic location, to employment opportunities than natives, it is important to make a clarification regarding our units of observation. As noted in the methodology, the use of age-education cells implicitly assumes similar employment opportunities are within the reach of immigrants and natives with similar skills as captured by age and education. This is a restricting assumption. After all, immigrants may also take jobs typically occupied by natives with lower educational attainment if available. Therefore, we also carry the analysis using age as our skill measure. In this manner, we allow for immigrants to respond to employment rates for groups with other educational attainment.

Additionally, we allow immigrants and natives to respond not only to employment opportunities for individuals within their cell, but also to employment opportunities for workers in adjacent cells. Specifically, in addition to the lagged employment rate for individuals in their particular skill group (as captured by age-education), we also examine the responsiveness of immigrants to employment opportunities (as captured by the employment rate) for individuals in skill groups defined exclusively by age. Because these employment rate measures are highly correlated (the correlation coefficient is above 0.75), we carry out separate estimations for each set of employment rates.

### 6.1 Are immigrants more responsive than natives to employment opportunities?

Table 5 displays the results from estimating Eq. 3 for all immigrants and for separate immigrant groups according to their region of origin, i.e. Africa, Non-15EU, and Latin America. The figures in Panel A in Table 5 reveal that, when skill is defined in terms of age–education categories, immigrants as a whole are more responsive than similarly skilled natives to regional employment opportunities, particularly, those employment opportunities available for their own skill

**Table 5** Immigrant versus native responsiveness to employment opportunities

| Immigrant groups | All immigrants | | Africans | | Non-EU15 European | | Latinos | |
|---|---|---|---|---|---|---|---|---|
| Independent variables | Coeff. | $R^2$ | Coeff. | $R^2$ | Coeff. | $R^2$ | Coeff. | $R^2$ |
| Panel A: dependent variable: $K_{rs_1}(t)$, ($s_1$ = age-education) (Observations = 1,224) | | | | | | | | |
| Lagged employment rate in skill 1 (age-education) | 1.18** (0.55) | 0.86 | 2.22* (1.24) | 0.75 | −0.08 (0.55) | 0.67 | 1.77** (0.75) | 0.78 |
| Lagged employment rate in skill 2 (age) | 1.10 (1.15) | 0.86 | 1.56 (2.29) | 0.748 | 1.10 (1.15) | 0.67 | 0.17 (1.76) | 0.78 |
| Panel B: dependent variable: $K_{rs_2}(t)$, ($s_2$ = age) (Observations = 408) | | | | | | | | |
| Lagged employment rate in skill 2 (age) | 2.33* (1.40) | 0.96 | 0.38 (2.31) | 0.94 | −0.91 (2.64) | 0.89 | 2.76* (1.76) | 0.94 |

The unit of observation is the region-skill-year cell. In Panel A, skill is defined in terms of age and education (3 age groups and three education groups). The coefficients and R-squared shown in the table are the results of different regressions, each of them including as an independent variable the lagged employment rate defined at different levels of aggregation, i.e. skill 1 (defined by age and education) and skill 2 (defined by age). In Panel B, skill is defined in terms of age. All estimations are weighted by cell size. There are region, skill and year fixed-effect dummies. All regressions also include the skill, region, and year fixed-effects fully interacted. Standard errors (in parentheses) are robust to heterogeneity. ** Signifies statistically different from zero at the 5% level or better and * at the 10% level or better

group.[8] By immigrant origin, Africans appear the most responsive to existing employment opportunities for their skill level, followed by Latinos. However, non-15 EU immigrants do not seem to respond any differently than natives to existing employment opportunities. When we use a broader definition of skill in Panel B, we continue to find that immigrants are more responsive than natives to employment opportunities. Yet, by immigrant origin, only Latinos seem to be significantly more responsive than natives to existing employment conditions.[9]

Why would immigrants be more responsive than natives to employment conditions? Immigrants are, by definition, a mobile population. Once they have made the investment of breaking family and friendship ties in their home countries to migrate to another country and start anew, the difference in psychic and economic costs associated with residing in one region versus another in the host country should be significantly smaller than for natives. After all, relative to immigrants, natives still have to break the family and friendship ties and, thus incur, the psychic costs that immigrants have already faced when deciding to come to Spain.

And, why would Africans and Latinos be more responsive than natives to employment opportunities? African and Latino immigrants, perhaps as a result of

[8] When the employment rate for their age-region-year category is used as the independent variable, the sign is also positive. However, the coefficient is never statistically different from zero due to the higher standard errors.

[9] At this juncture, it is worth noting that, although the number of cells without immigrants is negligible when examining all immigrants, the number of cells lacking immigrants when we distinguish immigrants according to their origin is non-negligible. This is particularly the case when skill is defined in terms of age and education. Consequently, we have also carried out the analysis excluding any immigrant-empty cells. The results, which are available from the authors upon request, prove robust to the alternative specification.

**Table 6** Variance decompositions after ten periods

| Variables | Percentage of the variance explained by | |
|---|---|---|
| | Immigration penetration | Regional employment rate disparities |
| Immigration penetration | 0.997 | 0.003 |
| Regional employment rate disparities | 0.065 | 0.935 |

the lesser degree of their skill transferability as compared to other migrants from Europe where educational systems may be more alike owing to geopolitical aspects, may have lower reservation wages than natives. Consequently, both immigrant groups may be more responsive to employment opportunities that alike natives would not even consider.

### 6.2 Does immigration help reduce regional employment disparities?

To further assess whether immigration helps reduce regional employment disparities, we estimate the panel VAR described in Sect. 4.2. Regional employment rate convergence might occur if there is sufficient interregional native mobility. However, native interregional mobility in Spain is very low. A recent report from the Spanish Employment Institute (i.e. "INEM Employment Observatory" 2006) shows that, as of 2006, 78% of Spanish citizens live in the same province in which they were born. Since the province is a narrower geopolitical category than the autonomous community used in this paper, we can exclude native mobility across autonomous communities (so-called regions in this paper) as a potential factor affecting regional employment convergence. Alternatively, it is also possible to not find any significant labor market impacts if changes in the industrial structure accommodate the increase in labor supply (e.g. Lewis 2003; González and Ortega 2010).

To make inferences about the dynamic relationship between immigration inflows and regional employment disparities, we rely on the information provided by the VDCs and IRFs. We first start with the VDCs, which are displayed in Table 6. A couple of things are worth noting. First, each series explains the preponderance of its own past values. Second, and of greater interest to us, is the fact that the VDCs provide information about the relative importance of an immigration shock in affecting regional employment disparities. Specifically, a non-negligible 6.5% of the forecast error variance of regional employment rate disparities by skill group is explained by innovations to the immigration penetration index. In contrast, regional employment rate disparities explain only 0.3% of the forecast error variance of the immigration penetration index for Spain. Therefore, the VDCs suggest that an immigration shock can significantly impact regional employment disparities. However, does it have a long-lived impact?

To answer these questions, we turn to the IRFs displayed in Fig. 2. The IRFs trace the effect of a one-time shock to the immigration penetration index on current and future values of the regional employment disparities. As can be seen from the

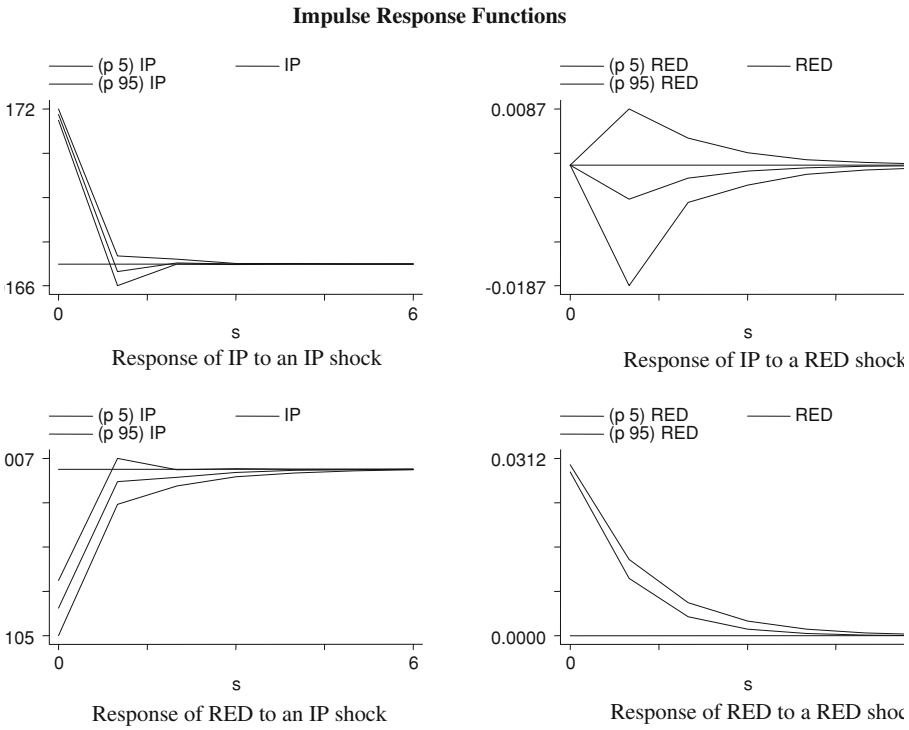


**Fig. 2** Impulse response functions. *RED* stands for "regional employment disparities" as measured by Eq. 4, whereas *IP* stands for the immigration penetration index described by Eq. 5

IRF in the bottom left of Fig. 2, a one standard deviation shock to the immigration penetration index results in an immediate statistically significant drop in the regional employment disparities series. This result appears to be driven by the impact that an increase in immigration inflows has in the regions receiving most immigrants,[10] where the regional employment disparities series takes on negative values following a shock to the immigration penetration index. Consequently, an immigration shock does seem to have a significantly different from zero impact on regional employment rate disparities as defined in this paper. Yet, is this impact short or long-lived? According to the IRF in the bottom left of Fig. 2, the impact appears to be relatively short-lived, lasting a little bit more than 1 year. Why may this be the case? This question is definitely worth exploring in future research. Since the analysis herein does not allow us to address this question, we can only hypothesize as for why and offer some plausible explanations. In particular, as noted earlier, there may not be sufficient interregional native mobility to sustain regional employment convergence or a longer-lived reduction in regional employment rate

[10] These results are shown in the Appendix. We also carried the analysis distinguishing between regions with above and below the national average GDP per capita growth rate, as well as between regions with above and below the national average unemployment rate. Results remained robust to these alternative groupings and are available from the authors upon request.

disparities. Alternatively, as found by Lewis (2003) for the US, industries in high immigration regions may have absorbed immigration by adapting their factor intensities to the change in skill distribution leaving employment rates essentially unaffected (see González and Ortega (2010) for evidence of this being the case in Spain).

## 7 Conclusions

In this paper, we use data from the Spanish labor force survey (*Encuesta de Población Activa*) for the years 1999 through 2006 to assess the role of regional labor market opportunities in explaining the continuous growth in immigrant flows relative to internal migration on the part of natives during the 1990s. Specifically, we ask ourselves whether immigrants are more responsive than their native counterparts to regional labor market opportunities. Additionally, we explore whether the growing stock of immigrants has helped grease the wheels of the Spanish labor market and contributed to reducing labor market disparities across regions by accelerating regional employment convergence.

Following Borjas (2001, 2003) and Card (2001), we estimate the impact of employment opportunities on the relative supply of immigrants as compared to natives using skill cells as units of observations. Subsequently, we analyze whether the growing immigrant stock has helped reduce regional labor market disparities by facilitating regional employment convergence for each skill group.

Our findings indicate that, overall, immigrants choose to reside in regions with higher employment rates and where they also enjoy greater employment opportunities given their skills. When distinguishing according to immigrant origin, we further find that African and Latino immigrants appear more responsive than their native counterparts to higher employment rates as well as to a higher likelihood of employment. Yet, Non-15 Europeans do not seem to respond any different from their native counterparts to existing employment opportunities. As we note in the paper, our findings could be due to a variety of factors. African and Latino immigrants, perhaps as a result of their limited skill transferability relative to immigrants originating from European countries with similar educational systems, in part owing to geopolitical aspects, may have lower reservation wages than natives.

Additionally, the increased immigrant penetration may have accelerated regional employment convergence by reducing regional employment disparities by skill group. In particular, we find that innovations to the immigration penetration index help explain up to 6.5% of the forecast error variance of regional employment rate disparities by skill group. As such, the IRFs show that the immigration shock significantly lowers regional employment rate disparities. However, this effect is short-lived, disappearing after a one year period. We can only hypothesize as for why. Perhaps, limited interregional native mobility is unable to sustain a long-lived impact of the immigration shock on the regional employment rate disparities series we define. Alternatively, industries in high immigration regions may have absorbed immigration by adapting their factor intensities to the change in skill distribution

leaving employment rates essentially unaffected. Finally, the lack of a significant impact could also be partially due to the recent nature of immigration in Spain. Over time, as the immigrant stock increases, it may impact regional employment rates and, in turn, regional employment rate disparities in a more permanent manner. In that case, it would be of interest to monitor this effect as immigration continues to grow.

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## Appendix

See Figs. 3, 4.

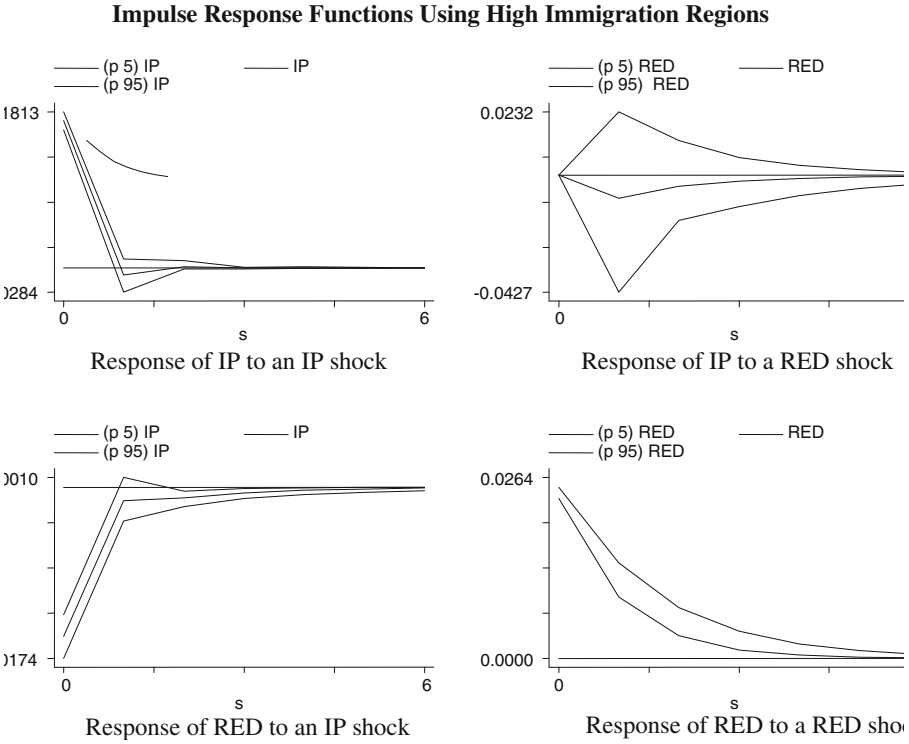


**Fig. 3** Impulse response functions using high immigration regions. *RED* stands for "regional employment disparities" as measured by Eq. 4, whereas *IP* stands for the immigration penetration index described by Eq. 5

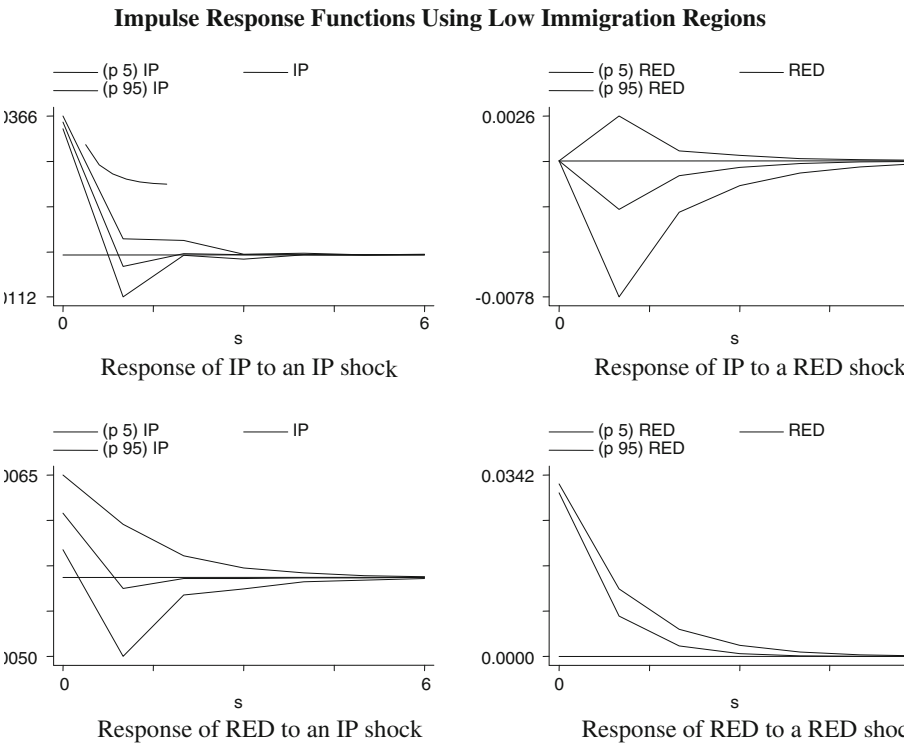


**Fig. 4** Impulse response functions using low immigration regions. *RED* stands for "regional employment disparities" as measured by Eq. 4, whereas *IP* stands for the immigration penetration index described by Eq. 5

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