Do regularization programs of illegal immigrants have a magnet effect? Evidence from Spain*

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May 2011

Abstract

This paper is intended to determine whether regularization programmes of illegal immigrants have a magnet effect. We analyze the latest amnesty carried out in Spain (2005) using a comparative case study approach. We apply a synthetic control method that is suitable for the evaluation of policies at country level. Our results suggest that the stock of immigrants was 8% higher three years after the amnesty took place.

Keywords: Illegal Immigration, Regularization Programs, Magnet Effect, Comparative Case Study, Policy Evaluation

JEL codes: C49, F22, J08, J61

1 Introduction

There is a general consensus in the literature that migrants tend to move from low to high income countries. Furthermore, the larger the income differential, the greater the number of migrants. This not only reflects the desire of people to leave their home countries, but also requires the host country to accept immigration. The latter

*The authors gratefully acknowledge the comments of Jesús Clemente and the financial support received from the research project ECO2009-13675 (Spanish Ministry of Education and Science) and Gobierno de Aragón (ADETRÉ research group).

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aspect might lead countries to restrict the number and types of immigrants allowed to enter through immigration policies like border controls, selection of immigrants and/or international enforcement (Ethier, 1986).

Despite the efforts to limit migratory inflows, many people enter countries illegally with the hope of an eventual legalization. Coppel et al. (2001) have estimated that around 500,000 illegal immigrants enter Europe each year. This figure is 400,000 for the United States (U.S.) (Hoefer et al., 2006). Due to the high number of illegal immigrants in their territories, during the last 25 years, some developed countries have decided to use regularization programs. In these amnesties, workers follow a procedure at the end of which some of them are regularized and, hence, allowed to remain in the host country for a certain period. The main reason why these immigrants are not legalized immediately is that this would encourage foreigners to attempt to enter into the country illegally. This incentive is commonly known as the "magnet effect" and leads immigration to an increase.

The more widespread use of regularizations has heightened the need for further research. Levinson (2005) revises the literature on amnesties and describes the main characteristics of those introduced in the European Union (E.U.) and the U.S. without providing any information about their effects. Epstein and Weiss (2011) study the effects of government actions on migration flows and propose an optimal amnesty policy. Also adopting a theoretical approach, Myers and Papageorgiuou (1999) try to determine the optimal quota of legal migrants in a model with a redistributive public sector facing costly immigration control. Therefore, it can be stated that little attention has been paid to empirically establishing the effects of regularization programs for illegal immigrants. The exceptions are some studies regarding the Immigration Reform and Control Act (I.R.C.A) of 1986 in the U.S. This amnesty is the most outstanding regularization program because it led to the legalization of more than 2.5 million illegal immigrants. The consequences of this program were analyzed by Donato et al. (1992) who, using a descriptive analysis, concluded that it had no effect on the migration received from Mexico. Gang and Yun (2006) developed a theoretical model to determine the effects that amnesties have on the quantity of migration received by the host country. In addition, they studied the effects of the I.R.C.A. on the salaries of immigrants.

Regularization programs have been frequently used on the southern frontier of Europe. Proof of this is that Greece, Italy, Portugal and Spain account for 15 of the 40

\[ \text{1} \text{Nevertheless, rich countries with income maintenance and welfare programs may be interested in allowing some illegal immigrants for their low productivity sector (Karlson and Katz, 2003).} \]
amnesties applied around the world in the last three decades. Of particular interest is the case of Spain, a country that has implemented the highest number of these exceptional measures. The latest of them took place in 2005 and, as a result, almost 600,000 illegal immigrants were legalized. The present paper is intended to empirically determine the effects that this regularization program has had on the stock of immigrants in Spain.

The analysis applies a synthetic control method (Abadie and Gardeazábal, 2003; Abadie et al., 2009) that allows the evaluation of policies at a country level through the comparison of the observed situation with a counterfactual constructed from several potential controls. Our results suggest that the latest regularization program in Spain has had a significant effect on immigration. Specifically, the migration stock as a percentage of the total population was 8% higher three years after the amnesty.

The rest of the paper is structured as follows. Section 2 presents migratory trends in some E.U. countries and regularization programs in Spain. Section 3 describes the main characteristics of the synthetic control method applied. Section 4 presents the estimates of the effects that the 2005 amnesty had on the stock of immigrants. Finally, Section 5 concludes.

2 The migratory phenomenon and regularization programs in Spain

The migratory phenomenon has become extremely important in Spain during the last decade. While the stock of immigrants over total population was less than 2% in the 1990s, this figure was almost 12% in 2008. Nevertheless, not all immigrants have the documents required to reside in Spain. Although there are no official data about the number of irregular immigrants, 700,000 people who arrived in the country between 2002 and 2004 applied for regularization in 2005. The main objective of this amnesty was to incorporate the underground economy into the formal labor market.

The immigrants that could apply for regularization were workers who had resided in Spain for more than six months, without criminal records and with a contract longer than six months (three for workers in the agricultural sector). The number of applications implied that at least 280,000 foreign workers arrived in Spain every year from 2002 to 2004. As the official number is 30,000, this is equivalent to saying that more
than 250,000 immigrant workers were irregular. This amount is important enough to try to establish mechanisms to reduce the related underground economy.

Migratory policies in Spain underwent changes in 1986, 1991, 1996, 2000, 2001 and 2005. The regularization programs implemented until 2001 were not able to cope with the irregular immigration flows but that of 2005 legalized 575,000 foreign workers, more than all the preceding programs put together. After such a massive regularization, the question that arises is whether or not it produced the so-called magnet effect (Gang and Yun, 2006; Epstein and Weis, 2009). This should be taken into account to consider the implementation of further regularization programs.

A tentative way to answer this question is through a descriptive analysis, that is, to examine the effect of the policy through the evolution of the migratory stock before and after the amnesty. This variable is plotted in Figure 1 for Spain and some selected E.U. countries in the period 2002-2008.

[Insert Figure 1 here]

It can be observed in this figure that the stock of immigrants as a percentage of the total population in Spain was quite stable during the first three years. However, this variable follows an increasing trend after 2005, when the last regularization program took place. This is a first indication that might lead us to conclude that the amnesty has had a magnet effect. Nonetheless, the limited amplitude of the period analyzed and the fact that Spain is not the only country that changed its trend during this period does not allow us to draw strong conclusions.

As has already been noted, one of the main determinants of immigration is the income difference between the home and host countries. For this reason, a cross-country comparison of the relationship between the stock of immigrants (as a percentage of the total population) and the Gross Domestic Product (GDP) per capita is also reported. As before, the idea is to compare the situation before and after 2005, and we expect to observe that countries with a higher GDP per capita will have a higher stock of immigrants. The results are displayed in Figure 2.

2 The data from Luxembourg is not reported because its values change the scale of the graphs to such an extent that they mask the trends we are interested in disentangling.
The GDP per capita in Spain was in the middle of the range of the selected E.U. countries during the period 2002-2004. This was also the case for the stock of immigrants in 2004. However, this relationship changed in 2005 when the deviation from average values began to increase.

The results presented in this section lead us to suspect that the amnesty of 2005 in Spain had a magnet effect in subsequent years. Nonetheless, there might be other determinants of this evolution of the stock of immigrants. Therefore, it seems more appropriate to evaluate the effects of the amnesty on the stock of immigrants through a policy evaluation method. The one applied in this paper consists of the construction of a synthetic control that is suitable for evaluations at country level. It will allow us to determine the correct causality, that is, to establish whether the increase in migration is due to the regularization program or to changes in other determinants. The estimation technique is described in the following section.

3 Policy evaluation using synthetic controls

Comparative case studies are commonly used to estimate the effects of policy interventions. These studies compare the evolution of the variables under scrutiny in the case of one agent affected by the policy (‘treated’) with the evolution of the same variables in a group of unaffected agents (‘controls’). The main difficulties when applying this approach are: (i) how to choose the units of comparison, and (ii) the uncertainty about the ability of the controls to reproduce the counterfactual situation of interest.

The proposal in Abadie and Gardeazábal (2003) is an appealing data-driven procedure to build a control group for the study of policies implemented at country level. Its main idea is that a combination of countries is expected to provide a better counterfactual for the treated country than a single one. In the rest of this section, the model used by Abadie et al. (2010) to explain the applicability of synthetic controls in comparative case studies is briefly described, along with its empirical implementation.

Assume that we have information about $J + 1$ ($i = 1, \ldots, J + 1$) countries during $T$ time periods. The first of them ($i = 1$) is the one to which the intervention analyzed has been applied after a certain date $T_0$ ($1 \leq T_0 < T$). Therefore, we have $J$ countries that can be labelled as potential controls. Let $Y_{it}^N$ be the variable of interest observed in the
absence of the policy intervention for country $i$ at period $t$ and $Y_{it}^I$ its corresponding values for the treated country during the implementation period ($t \in \{T_0 + 1, ..., T\}$). Assuming that the intervention has no effect before its implementation, $\alpha_{it} = Y_{it}^I - Y_{it}^N$ is the effect of the policy in the treated country. This allows us to express the observed outcome $Y_{it}$ for country $i$ in period $t$ as:

$$Y_{it} = Y_{it}^N + \alpha_{it}D_{it}$$  \hspace{1cm} (1)$$

$$D_{it} = \begin{cases} 1 & \text{if } i = 1 \text{ and } t > T_0 \\ 0 & \text{otherwise} \end{cases}$$

We want to estimate $\alpha_{it} = Y_{it} - Y_{it}^N$, which is equivalent to estimating $Y_{it}^N$. With this objective in mind, a factor model is specified for $Y_{it}^N$:

$$Y_{it}^N = \delta_t + Z_t \theta_t + \lambda_t \mu_t + \varepsilon_{it}$$  \hspace{1cm} (2)$$

where:

$\delta_t$ is an unknown common factor with the same effect on all countries

$Z_t$ (1 x $r$) are the observed explanatory factors

$\theta_t$ ($r$ x 1) includes unknown parameters

$\lambda_t$ (1 x $F$) are the unobserved common factors

$\mu_t$ ($F$ x 1) are the unknown loadings of the unobserved common factors

$\varepsilon_{it}$ is the error term, assumed to have a zero mean for all $i$

This structure is used to propose $\hat{\alpha}_{it} = Y_{it} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$ as an estimator for $\alpha_{it}$ ($t \in \{T_0 + 1, ..., T\}$), where $w_j^*$ denotes the $j$-th element of a ($J$ x 1) vector $W^*$ of weights. Therefore, an estimation of the counterfactual situation for the treated country in the post-intervention period is obtained as a linear combination of the outcomes in the potential controls:

$$\hat{Y}_{it}^N = \sum_{j=2}^{J+1} w_j^* Y_{jt}; \quad t \in \{T_0 + 1, ..., T\}$$  \hspace{1cm} (3)$$
This estimator will be unbiased if $W^*$ is obtained by solving the following optimization problem:

$$
\min \|X_1 - \chi_0 W\|_V = \sqrt{(X_1 - \chi_0 W)^T V (X_1 - \chi_0 W)}
$$

subject to the following constraints on the weights:

$$
w^*_j \geq 0; \quad \text{for } j = 2, \ldots, J + 1
$$

$$
\sum_{j=2}^{J+1} w^*_j = 1
$$

where:

$$
X_1 = (Z_1, Y_1^1, \ldots, Y_1^M)^T
$$

$$
\chi_0 = (X_2, X_3, \ldots, X_{J+1}); \quad X_i = (Z_i, \tilde{Y}_i^1, \ldots, \tilde{Y}_i^M); \quad i = 2, \ldots, J + 1
$$

$$
\sum_{j=2}^{J+1} w^*_j Y_j^1 = \tilde{Y}_1^1, \quad \ldots, \quad \sum_{j=2}^{J+1} w^*_j Y_j^M = \tilde{Y}_1^M \quad \text{and} \quad \sum_{j=2}^{J+1} w^*_j Z_j = Z_1
$$

$X_1$ is a $(k \times 1)$ vector of pre-intervention ($t \leq T_0$) characteristics in the treated country, $\chi_0$ its equivalent $(k \times J)$ matrix for the potential controls and $\tilde{Y}_i^1, \ldots, \tilde{Y}_i^M$ are $M$ linear functions of the outcomes before the policy was implemented in a given country $i$ satisfying $M \geq F$. $V$ is a diagonal, positive and semidefinite $(k \times k)$ matrix determined by the predictive power of the explanatory variables during the pre-intervention period.

In the application below, we assume the presence of a single unobserved common factor with different effects in each country and that the linear function of the pre-intervention outcomes in (6) is the simple average ($M = F = 1$). $W$ in (4), conditional on $V$, is searched for among all the possible combinations using a fully-nested optimization procedure$^3$. Three different starting points for $V$ have been considered in order to avoid local minima: equal-weighted, regression-based and determined by maximum likelihood.

The measure of the stock of immigrants as a percentage of the total population in a given country ($Y_i$) will be introduced in the following section. Moreover, a justification of the variables included in the vector of observed explanatory factors ($Z_i$) will also be given.

$^3$This methodology has been applied in the subsequent analysis using the Stata version of the related software provided by Jens Hainmueller in his homepage.
4 The effects of the Spanish regularization program of 2005 on the stock of immigrants

4.1 The determinants of immigration

The data used in this paper have been extracted from the Eurostat website\(^4\). The variable that is going to be analyzed is the number of foreigners as a percentage of the total population\(^5\) of a given country during the period 2002-2008. In principle, the potential controls are E.U. member countries that did not carry out a regularization program after 2001. For this reason, Italy does not enter our donor pool. Moreover, there is some missing data in the information regarding the number of foreigners. The reasonable length for the available time series of Luxembourg, Portugal and the UK allows us to interpolate the missing observations using the TRAMO/SEATS software. Nonetheless, this was not possible in the case of Greece and France. As a result, there are eleven potential control countries that could build up the synthetic counterfactual.

In the pioneering model for the economic analysis of migration proposed by Harris and Todaro (1970), salaries and unemployment were the determinants of migration. In addition, Hooghe et al. (2008) concluded that migration reacts to economic incentives, especially those related to the labor markets. Following these studies, the compensation of employees as a percentage of the GDP and the employment rate have been introduced as explanatory variables. While the former is a measure of the wage level in a given country, the latter reflects the labor market conditions. Furthermore, the real GDP per capita and expenditure on social protection per inhabitant have been included in order to proxy for the standard of living in a given country. Both variables are expressed in PPP and in real terms. The economic structure is reflected by the consideration of the shares of Gross Value Added in the agricultural, industrial and service sectors over the total (He and Gober, 2003). Finally, population density has been introduced to control for demography (McConnell, 2008).

\(^4\)http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

\(^5\)The main reason for not analyzing migration flows into Spain, whether in levels or as a percentage of the total population, is that they are of such a magnitude that it is not possible to construct a counterfactual to resemble them. In addition, the possible role of Spain as a "gateway" to the E.U. would make the estimated effects from this variable misleading.
4.2 Results from the synthetic control method

An estimation of the stock of immigrants as the percentage of the total population that would have existed in Spain if the regularization program of 2005 had not been implemented can be obtained through the application of the synthetic control method described in Section 3. The results obtained are presented below.

Weights assigned to each country in the E.U. donor pool when constructing the synthetic stock of immigrants in Spain are found in Table 1. The counterfactual situation that best resembles the observed evolution of this variable before 2005 is built as a linear combination of the stocks in three countries. The highest weight corresponds to Portugal (0.74) and the other two countries from which the synthetic Spanish stock has been constructed are Ireland (0.16) and Luxembourg (0.10).

[Insert Table 1 here]

The suitability of the applied technique in this context can be inferred from Table 2. Average values of the determinants of immigration in the pre-intervention period for Spain and its E.U. synthetic counterpart are shown in the second and third columns, respectively. It can be observed that the synthetic control has mean values for the explanatory variables relatively close to those in Spain before the amnesty. This is especially true with regard to the GDP per capita and the sectorial structure of the economy. The main differences correspond to the labor market indicator and population density.

[Insert Table 2 here]

The main results obtained from the synthetic control approach are shown in Figure 3 where the evolution of the observed values for the stock of immigrants in Spain and those corresponding to its synthetic counterpart are plotted. The stock has experienced a clear upward trend in the period analyzed and became especially steep after 2004. The estimated values for the synthetic Spain have also followed an upward trend after 2005, but less pronounced. Moreover, instead of a sustained increase it experiences a level shift in the year 2007. Observing Figure 1, this seems to be determined by the Portuguese experience because this country has the highest weight when constructing the synthetic control.
The greatest positive difference between the observed stock of immigrants as a percentage of the total population in Spain and that predicted by the synthetic control is 31.22% and corresponds to the year 2006. Furthermore, this differential is equal to 24.29% at the end of the period analyzed. As the difference generated in 2005 by the regularization program between observed data and the synthetic control was 16.32% this implies an extra 8% of migration stock in 2008. Therefore, it can be concluded from the results presented above that the amnesty in 2005 has had a positive effect on the stock of immigrants three years later.

4.3 Assessing the significance of the estimated effect

When working with aggregate data, comparative case studies do not always guarantee that the control group is able to reproduce the counterfactual situation. There are several alternatives for assessing the significance of the estimated effect in the previous subsection.

The first of them was proposed by Abadie et al. (2010) to make exact inferences about the estimated policy effects. Its main virtue is that it does not depend on the number of potential controls and time periods or the type of data analyzed. This method relies on classical permutation tests and consists of applying the synthetic control method to each of the potential controls as if they were exposed to the policy intervention, which was denoted as ‘placebo’ exercises by Abadie and Gardeazábal (2003). The idea is to compare the estimated effect for the treated unit with those of each of the potential controls.

Following this suggestion, the synthetic control method has been applied to the eleven E.U. countries previously used as potential controls. The evolution of the gaps between the observed stock of immigrants in the countries analyzed and their synthetic counterparts during the whole sample period are plotted in Figure 4. For the Spanish case, it can be observed that this difference is close to zero in the pre-intervention period and later increases in 2005. The differential widens further in 2006 and is maintained thereafter. More interestingly, these differences are among the most positive of all the selected E.U. countries. They are only surpassed by those in Luxembourg and Ireland.

Details of the results derived from this analysis, similar to those reported in Tables 1 and 2, are available from the authors upon request.
The resulting values for the former are not reported because there is no synthetic control able to replicate the magnitude of the stock of immigrants as a percentage of the total population in that country and, hence, the results are not comparable. In the case of Ireland, the difference is the highest in the last two years. This does not necessarily reduce the significance of our estimated effect. Because this country is part of the synthetic control, it reflects common factors in the two countries.

[Insert Figure 4 here]

In addition to the placebo exercises carried out above, the significance of the differences between the observed series for the country studied and its synthetic control can be statistically tested following the suggestions in Sanso-Navarro (2011). In order to do so, the Matched-Pairs Signed-Ranks test of Wilcoxon (1945) has been used. This non-parametric test, which is applied to two related samples, is often used to compare the data collected before and after an experimental manipulation. It is an alternative to the paired Student’s t-test when the data cannot be assumed to be normally distributed. Under the null hypothesis, the median of the differences is expected to be zero. In our context, instead of comparing individuals, the observational units will be time periods.

Results obtained from the comparison of the observed values for the stock of immigrants in Spain as a percentage of the total population and those predicted by the synthetic control method are shown in Table 3. When considering the whole post-intervention period, the null hypothesis can be rejected at the 10% significance level. This reinforces the result for the estimated effect in the previous subsection because, although this test can be used with sample sizes as small as the case analyzed here, it is expected to have low power with a reduced number of observations. Tests that suffer from power losses are not able to reject the null hypothesis, even if it is false. Therefore, these findings allow us to state that the values predicted by the synthetic control for the stock of immigrants in Spain are significantly lower than those really observed after the regularization program in 2005 from a statistical point of view.

[Insert Table 3 here]

Another alternative for analyzing the significance of the estimated effect of the policy under scrutiny is to compare the observed values of the stock of immigrants with the
estimated trend of the synthetic control. These results are plotted in Figure 5 with two bands representing the 95% confidence interval for the fitted trend. The observed flows are inside the confidence bands in both the pre-intervention period and the year when the amnesty took place. It is after this latter period that the observed values diverge from the estimated trend and fall outside the upper 95% confidence band.

[Insert Figure 5 here]

Summarizing, it can be concluded that the results presented throughout this subsection corroborate the robustness and significance of the estimated positive effect of the regularization program of 2005 on the stock of immigrants in Spain in the following years.

5 Concluding remarks

The effects that regularization programs have on the stock of immigrants have been theoretically established in the literature. Nonetheless, little effort has been made in order to establish this link from an empirical point of view. We have tried to contribute further to this strand of the literature by analyzing the case of Spain, an important country in this respect because it has implemented the highest number of those exceptional measures. We have focused on the amnesty that took place in 2005 and legalized more irregular workers than any of the previous ones.

The analysis has been carried out through a comparative case study and the use of a synthetic control method that is suitable for policy evaluations at a country level. Our results suggest that 8% of the stock of immigrants in 2008 can be attributed to the amnesty that was implemented three years before. This result is in line with the theoretical predictions that regularization programs produce a magnet effect.

References


Tables and Figures

Table 1: Weights assigned to selected E.U. countries in order to construct the Spanish synthetic stock of immigrants (as % of total population).

<table>
<thead>
<tr>
<th>Country</th>
<th>Belgium</th>
<th>Denmark</th>
<th>Germany</th>
<th>Ireland</th>
<th>Luxembourg</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.16</td>
<td>0.10</td>
<td>0</td>
</tr>
<tr>
<td>Denmark</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.74</td>
<td>0</td>
</tr>
<tr>
<td>Germany</td>
<td>0.16</td>
<td>0.10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.74</td>
</tr>
<tr>
<td>Ireland</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>0.10</td>
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<td>0</td>
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</tr>
<tr>
<td>Netherlands</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: RMSPE is the root mean squared prediction error in 2002-2005.

Table 2: Mean values for the determinants of the stock of immigrants in Spain and its synthetic control in the pre-intervention period (2002-2004).

<table>
<thead>
<tr>
<th></th>
<th>Spain</th>
<th>Synthetic Spain from EU countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP per capita</td>
<td>23942.43</td>
<td>23953.06</td>
</tr>
<tr>
<td>GDP share of agriculture</td>
<td>3.87</td>
<td>2.87</td>
</tr>
<tr>
<td>GDP share of industry</td>
<td>19.00</td>
<td>19.87</td>
</tr>
<tr>
<td>GDP share of services</td>
<td>46.53</td>
<td>46.44</td>
</tr>
<tr>
<td>Compensation of employees</td>
<td>48.27</td>
<td>47.98</td>
</tr>
<tr>
<td>Social protection expenditure</td>
<td>4623.86</td>
<td>5075.20</td>
</tr>
<tr>
<td>Employment rate</td>
<td>59.80</td>
<td>67.29</td>
</tr>
<tr>
<td>Population density</td>
<td>83.00</td>
<td>110.69</td>
</tr>
</tbody>
</table>

Table 3: Wilcoxon Matched-Pairs Signed-Rank test. Differences between the observed stock of immigrants (as % of total population) in Spain and its synthetic control.

<table>
<thead>
<tr>
<th>Number of observations</th>
<th>Positive</th>
<th>Negative</th>
<th>Total</th>
<th>W+</th>
<th>W-</th>
<th>Test statistic (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td>1.83 (0.07)</td>
</tr>
</tbody>
</table>
Figure 1: Migration stock (as % of total population). Selected E.U. countries, 2002-2008.
Figure 2: Evolution of the relationship between the stock of immigrants (as % of total population) and GDP per capita. Selected E.U. countries, 2004-2008.
Figure 3: Stock of immigrants (as % of total population) in Spain (bold) and synthetic control constructed from selected E.U. countries (dotted).

Figure 4: Stock of immigrants (as % of total population). Observed minus synthetic gaps. Spain (bold) and selected E.U. countries (light lines).
Figure 5: Stock of immigrants in Spain (as % of total population) and fitted trend for the synthetic control constructed from selected E.U. countries (dotted, 95% confidence bands reported).