Selective international immigration and economic growth of Italian provinces: The importance of origins and destinations

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Abstract

The present paper examines empirically the impact of international immigration on the growth of the Italian provinces over the period 2004-2012, showing that the effects of international immigration depend on the characteristics of origins and destinations of these flows. In particular, the analyses indicate that migration flows from countries with a higher socio-economic and institutional level of development lead to benefits in terms of economic growth only in the high-income Central-Northern provinces. In contexts characterized by a strong internal dualism, such findings are especially relevant as they give evidence of self-reinforcing dynamics which contribute to further widen internal disparities.

Keywords: International immigration, economic growth, Italian provinces.

Subject classification codes: F22, J61, O15

Introduction

A recent stream of literature has presented compelling evidence of the significant role played by exogenously sourced knowledge on economic growth (Frankel & Romer, 1999; Keller, 2004; Prescott, 1998). A wealth of literature, in fact, is focused on the process of international knowledge diffusion, by analysing the set of factors that affect the capability of a country to grow and catch up with the global technology frontier through processes of international learning and imitation activities, (Castellacci & Natera, 2013).

Among the factors through which knowledge is spread across the globe, migration emerges as a crucial mechanism to promote knowledge diffusion by means of indirect channels of interaction (Andersen & Dalgaard, 2011; Bahar & Rapoport, 2018; Kang & Kim, 2018), together with more

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formal channels such as the cross-border flows of goods (international trade) and capital (FDI)[3]. Migrants, becoming embedded at the local level of the receiving areas, represent natural carriers of tacit knowledge that can promote development in the host regions through their own set of intangible assets (D'Ambrosio, Montresor, Parrilli, & Quatraro, 2019; Parrilli, Montresor, & Trippl, 2019).

Moreover, it has been documented that the characteristics of the origin of immigration flows represent an element of selectivity of migration able to affect growth dynamics in the destinations. Yet, the results do not appear definitive and in some cases are controversial. In particular, some studies show that the inflow of migrants from more advanced countries can have growth-enhancing effects on destination places as it creates more suitable conditions to adopt advanced technologies and market-supporting institutions (Andersen & Dalgaard, 2011; Kang & Kim, 2018). The interactions between the local population and immigrants from countries that have better economic and institutional conditions are an informal mechanism of knowledge diffusion through which better ways to organize the economic system can be implemented. However, it has been highlighted that positive economic effects on destinations may be associated to immigration flows that originate in countries with lower GDP *per capita*, and thus, when migration consists of less productive individuals. This is due to the fact that these immigrants are more productive when performing simple task leading to an increase in the relative value added of the simple-task intensive sector, i.e. the manufacturing sector (De Arcangelis, Di Porto, & Santoni, 2015).

Furthermore, the effects of international migration on economic growth are expected to be different for different stages of development of the destinations. The international knowledge diffusion, in fact, is a complex process involving the absorptive capacity of the receiving places, which is shaped by their level of development, their set of socio-economic and institutional characteristics (i.e. their level of education and social networking, see Castellacci & Natera, 2013; Williams, 2007; Williams & Baláž, 2014).

However, the analysis of the relationship between immigration and economic growth carried out only at the national level can lead to misleading conclusions since they neglect the significant heterogeneity among local productive systems within countries characterized by marked internal dualism.

On the basis of such grounds, our paper aims at evaluating whether and to what extent the effects of international immigration on economic growth across Italian provinces (NUTS3) depend on the characteristics of origin and destination places. The Italian context, in fact, with its internal socio-economic and institutional disparities represents an interesting case study for the investigation of this indirect mechanism of knowledge diffusion. Our empirical approach follows three conceptual

[3] See e.g. Keller (2004) for a comprehensive literature survey.

steps. We first estimate the impact of total immigration on economic growth for all migrants. Second, we measure the effect of a specific group of immigrants, those from countries with a higher development level (which we will refer to as "frontier countries"). To this end, frontier countries are defined as those characterized by a level of institutional quality higher than Italy for all its dimensions, consistently to the definition proposed by Kaufmann, Kraay, and Mastruzzi (2011), and have a GDP *per capita* higher than Italy. Third, we investigate whether the effects of international immigration differ across Centre-North and South provinces, areas characterized by different levels of development.

Our contribution to the literature debate is therefore twofold. First, we find that immigration from frontier countries produces the main benefits in terms of regional growth. Second, once we break down the set of host provinces on the basis of their level of development, the effect on growth of immigrants from frontier countries is more marked for high-income Central-Northern provinces. In contrast, for low-income provinces of the South of Italy, the most significant growth-enhancing effect is associated to the whole international immigration flow.

The remainder of the paper is organized as follow. Section 2 provides the literature background. In section 3 and 4, the descriptive analysis, the econometric model and the results are presented. Section 5 concludes the paper.

2. Mobility and knowledge diffusion: A literature review

There is broad agreement in the literature that interactions between countries are vehicles for the exchange of knowledge, stimulating self-enforcing processes that increase the regional knowledge base (Keller, 2004). What facilitates knowledge diffusion at the international level, or in other words, the channels through which knowledge is spread, is a topic around which the debate is still lively. Frankel and Romer (1999) and Keller (2004), for instance, focusing on the empirics of international diffusion of knowledge and its economic effects, underline the importance of international trade and FDI as major channels to strengthen ties between countries resulting in a positive impact on income.

However, the flows of goods and capital are only some of the possible mechanisms of knowledge transfer. Among the others, migration represent a powerful channel that shapes a country's capability to import international advanced technologies (Andersen & Dalgaard, 2011). According to Bodvarsson and Van den Berg (2013), in fact, the movement of people, by carrying ideas and knowledge, contributes to increase the transfer of knowledge between countries, affecting the growth dynamics in both sending and receiving places.

In other words, "migration flows have been claimed to act as 'information brokers' between host and home regions, working as a transnational knowledge link" (D'Ambrosio et al., 2019 p.8). Therefore, at this historic moment when increasing international migration trends have contributed to modify the national and regional traits, scholars have been encouraged to reconsider the consequences of migration by looking at the interdependence between international labour migration and tacit knowledge transfer (Williams, 2007). The diffusion of tacit knowledge (Polanyi, 1962) - knowledge that is internalized and does not follow a structured communication process given its difficulty to be codified and taught - requires more direct forms of human interaction (Arrow, 1969), implying that international migration represents the main driver of its diffusion (Bahar, Hausmann, & Hidalgo, 2014; Bahar & Rapoport, 2018).

Andersen and Dalgaard (2011), for instance, find that human mobility is one of the channels that contribute to stimulate economic growth by strengthening the international interactions across countries. In a similar vein, Bahar and Rapoport (2018) explore the role of migrants in shaping the comparative advantage of both sending and receiving countries, and find that migrants represent a source of tacit knowledge transfer that favours sector-specific productivity shifts in tradable goods. In particular, immigrants from countries/exporters of a particular good increase the likelihood that the receiving country start exporting the same good.

Among the recently published contributions it has been highlighted that the effects of immigration on economic growth could be influenced by different peculiar characteristics of the origins. In particular, once the effects of migration are investigated taking into account the productivity of immigrants, i.e. by considering the level of development of the origin country in terms of GDP *per capita*, controversial results are reached. De Arcangelis et al. (2015) assuming that migrants have a higher relative productivity than natives when performing simple tasks and that the manufacturing sector are intensive in simple rather than complex tasks, show that the largest effect on the relative value added of the simple-task sector is expected in those places where immigration has been more intense. Furthermore, this effect is even more pronounced and stronger when considering migrants coming from countries with low GDP *per capita* (more diverse migrants). In their theoretical model, in fact, it has been shown that: (i) an increase in the share of foreign-born residents reduces the supply of overall complex tasks and this is due to the fact that migrants are relatively more productive when performing simple tasks. Therefore, (ii) the inflow of less productive migrants from less developed countries further lowers the relative supply of complex tasks since the composition effect gives more weight to the migrants who are relatively less productive in complex tasks. In other words, the more similar the foreign-born residents to natives in terms of relative

productivity of simple-to-complex tasks, the smaller the impact of a change in the migrants' share on the local production structure.

In contrast, Kang and Kim (2018) argue that the magnitude of the effects of immigration is the largest when the flow of immigration is from more advanced countries to developing ones. The authors, in fact, claim that migrants from these countries carry embodied intangible assets, such as knowledge on technology and institutions, to less developed countries. In particular, the authors assess the different magnitudes of the growth-enhancing effects of immigration while explicitly accounting for the characteristics of the origin places. On the theoretical grounds, within a Solow model augmented with migration the authors introduce a new role of immigrants as natural carriers of higher-quality knowledge on advanced technology and market supporting institutions, which is regarded as an additional channel to promote economic growth. Their main empirical findings reveal, in fact, that the immigration flows from countries with a higher level of development have a stronger effect on income *per capita* than that of total immigration.

Furthermore, the effects of immigration on economic growth also depend on the level of development of destination areas, as implied by recent empirical findings revealing significant differences in terms of absorptive capacity of economies with different socio-economic and institutional conditions (see e.g., Acemoglu, Aghion, & Zilibotti, 2006; Aghion, Boustan, Hoxby, & Vadenbussche, 2005).

According to a number of studies from the endogenous growth literature, in fact, the capability of different economies to exploit skills and knowledge is strongly related to their degree of proximity to the global technological frontier (Vandenbussche, Aghion, & Meghir, 2006). According to Aghion et al. (2005), for instance, while the *imitation* stage of development mainly requires physical capital and less skilled labour, countries in the *innovation* stage of development benefit the most from high-skilled labour force. According to such theoretical approach, the most significant advantages that stem from selective immigration are associated to developed economies. Immigrants from more developed countries, in fact, represent a source of innovation and technological progress; like the level of education, the level of intangible assets embodied in the migration flows should enhance human capital formation and favour the adoption of new technologies with most growth-enhancing effects for countries closer to the technological frontier. However, the only empirical evidence in this regard is provided by Kang and Kim (2018) who, focusing the attention on economic growth in both developed and developing countries, show that the magnitude of the economic effects of immigration are stronger for flows from more advanced to less advanced countries than from developing to developed ones. The authors argue that immigrants from frontier countries help less developed ones to get closer to the global technology frontier to a greater extent: the underlying idea is that the wider

the distance from the world frontier, the stronger should be the growth-enhancing effects of immigration from developed countries.

Another issue is related to the territorial level at which the relationship between immigration and economic growth should be investigated. In particular, focusing only on the national level can lead to misleading conclusions, especially for those countries where the productive system is characterized by the coexistence between very backward areas and modern and dynamic ones. The heterogeneity within a country production system raises questions on what lies "beneath the national averages", and in particular if the relationship between international immigration and growth dynamics can have different declensions at the local level. Yet, scant is the evidence on the impact of international immigration at the regional level and none encompasses the role played by origins and destinations in terms of selection process of migration. Coulombe and Tremblay (2009), for instance, analyse a sample of international immigrants in order to assess the role of migration on the skill disparities across Canadian provinces, highlighting the positive contribution of international migration to the reduction of provincial skill intensity disparities.

The significant territorial disparities between Centre-North and South provinces make Italy a particularly interesting case of receiving developed country. The existence of two different stages of development for the provinces in the Centre-North and in the South implies a different absorptive capacity of the international knowledge which can condition the way economic growth is affected in the long-run (Castellacci & Natera, 2013). In fact, the new regional innovation scoreboard (RIS) developed by the European commission, besides classifying Italy among the moderate innovators, confirms the presence of a significant internal dualism: regions in the Centre-North are classified as "moderate (plus) innovators", while Southern regions are classified as "moderate (minus) innovators", reflecting differences between these two macro-regions in terms of innovation capacity.

The choice of investigating these effects at the intra-national level can be ascribed to different reasons. First, whereas the national scale represents the optimal level to regulate international migration and to identify actors and relationships resulting in the national innovation system, a smaller scale is particularly important because it represents the level where many of the key institutions and infrastructures are constituted and shape the relationship between international immigration and economic growth (Williams & Baláž, 2014). Second, one of the main obstacles to the knowledge diffusion is related to structural economic differences and institutional peculiarities in terms of norms, practices, and cultures at the local level (Williams & Baláž, 2014). As a consequence, empirical analyses at the national level could lead to inaccurate results, due to the significant variability of the socio-economic and institutional characteristics among regions and provinces of the same country, in most cases much stronger than across countries (Charron, Dijkstra, & Lapuente,

2014; Rodríguez-Pose, 2013). Finally, empirical analyses that look at intra-national dynamics benefit from a higher heterogeneity of the structural characteristics, which are generally constant across countries, that contribute to explain economic growth.

3. Data and descriptive analysis

The analyses are carried out at the provincial level (NUTS3) and over the period 2004-2012. The data used in this study originate from the EUROSTAT's and from the Italian National Statistics Institute's (ISTAT) official economic databases. The dependent variable in our analysis is the GDP at power purchasing standard (PPS) and the data are provided by the EUROSTAT. Migration data are collected by the ISTAT in the *'Statistics of Foreign-Born Residents'*[4]. Finally, the other control variables are taken from ISTAT's '*Development Policy Statistics'* database.

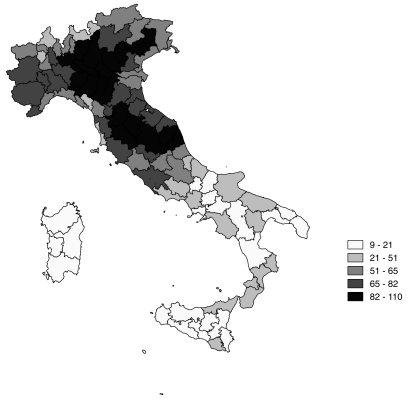
The available data on migration provide information on both the country of birth and the destination province of international migration flows. Consequently, we define immigrants those who were born in a different country (Kang & Kim, 2018; Özden, Parsons, Schiff, & Walmsley, 2011). This is consistent with the idea, underlying the approach adopted in the present paper, that each immigrant carries a specific knowledge which is related to the economic and institutional conditions of his origin country. Furthermore, we identify two aggregates of immigrants: total immigrants, i.e. the stock of all the immigrants in a specific Italian province, without any distinction based on their country of origin; selective immigrants, i.e. the stock of immigrants, in a specific Italian province, from "frontier countries"[5].

As for the identification of the "frontier countries", previous studies at the country level investigate whether the effects of immigration vary depending only on the level of GDP *per capita* of the country of origin (De Arcangelis et al., 2015; Kang & Kim, 2018). We extend such perspective by considering, as frontier countries, a set of developed nations belonging to the OECD that not only have a higher GDP *per capita* with respect to the Italian income *per capita*, but also show a level of institutional quality, in all its different dimensions[6] (*voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption*), higher than

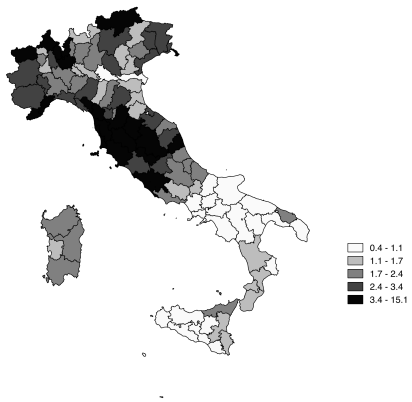
[4] Dataset: *Foreign-born residents at 1st January by citizenship*.
[5] In order to account for the different population scale of the destination province, for each category we divide the number of immigrants by the resident population of the destination province.
[6] These dimensions capture the political and economic characteristics of institutions according to the World Governance Indicators (WGI) of the World Bank proposed by Kaufmann et al. (2011).

Italy. Such criteria are met by 17 countries[7]. The ranking of the sub-sample of major developed countries for all the different institutional dimensions as well as the countries' ranking in terms of GDP *per capita* are reported in the "Appendix" (Table A1 and in Figure A1, respectively). The data are averages over the period 2004-2012.

In Figure 1 we report the distribution of immigrants across provinces (2004-2012). In particular, Italian provinces are divided in quantiles according to the incidence of immigrants. By comparing provincial immigration rates, substantial differences arise between the Central-Northern and the Southern provinces, with the former showing higher total (Figure 1.a) and selective (Figure 1.b) immigration rates.



(a) Foreign-born residents from all countries



(b) Foreign-born residents from frontier countries

Figure 1: Distribution of immigrants across provinces (immigrants over population per thousand inhabitants). Data are averages over the period 2004-2012.

[7] These 17 frontier countries are: Australia, Austria, Belgium, Canada, Germany, Denmark, Finland, France, UK, Ireland, Netherlands, Norway, New Zealand, Sweden, US, Switzerland, Luxembourg.

Some differences emerge within each of the two macro-regions as well. In fact, on average, the correlation between the two immigration rates (total and selective) takes on a value equal to 0.37. This means that only in few cases the provinces with a higher immigration rate from all countries are also those with a higher immigration rate from frontier countries. This is also evident by comparing the situation of the first five destination provinces for both types of immigration (see Table 1). None of them appears in both the rankings.

Furthermore, a preliminary, descriptive analysis shows that the territorial disparities are wider when the immigration rate from frontier countries is taken into account (Table 2): the coefficient of variation calculated in this case is 0.84 and remains constant during the whole period, in the face of the one concerning total immigration (0.55). In addition, when the coefficient of variation for selective immigration is calculated by distinguishing between Central-Northern and Southern provinces, it can be noticed that the wider disparities occur within the Centre-North.

[insert table 1]

[insert table 2]

4. Empirical analysis

4.1 Econometric model and results

The empirical analyses presented below rely on the theoretical framework developed by Kang and Kim (2018) which modify the Dolado, Goria, and Ichino (1994) and Boubtane, Dumont, and Rault (2016) augmented neoclassical Solow growth model with migration by specifying a technology term in the production function in accordance with Andersen and Dalgaard (2011). In this manner, the authors introduce a new role of immigrants who carry better knowledge about technology and market-supporting institutions, which can be considered as an additional channel to promote economic growth. Differently from Dolado et al. (1994) and Boubtane et al. (2016), the stock of already accumulated skills and knowledge that immigrants bring with themselves when they enter the country are proxied through the development level of the origin country, rather than through the years of schooling. Thus, in accordance with Kang and Kim (2018), we start our empirical analysis with an initial specification to assess the extent to which total immigration contributes to the

economic growth of Italian provinces over the time period 2004-2012, by estimating the following equation:

$$\text{growth}_{\text{I,t}} = \alpha + \beta_1 \text{gdp}_{\text{I,t}-1} + \beta_2 tot\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \varepsilon_{\text{I,t}} \quad (1)$$

This is a standard growth model where the dependent variable is the regional growth rate of *per capita* GDP at power purchasing standard (PPS) of province I between t-1 and t. $\text{gdp}_{\text{i,t-1}}$ is the natural logarithm of the GDP *per capita* at t-1 which allows us to consider whether the difference in terms of economic growth between provinces is widening or narrowing. The immigration rate from all countries has been calculated as the number of immigrants over population (thousands of persons). The regression also includes a full set of time dummies τ_t which represent time-specific factors that can affect the provincial economic growth (i.e. macroeconomic shocks) and provincial time-invariant characteristics μ_{I} while $\varepsilon_{\text{I,t}}$ is the idiosyncratic error term. By including provincial and temporal fixed effects as well as the lagged level of GDP *per capita*, the set of omitted variables is reduced (Fratesi & Percoco, 2014).

A set of control variables, well-established in the literature, is included in the regression as well ($X_{\text{ni,t}}$). The natural log of the population density is used to capture the extent to which agglomeration economies affect regional growth (Granato, Haas, Hamann, & Niebuhr, 2015). Among the regressors, R&D expenditure from business sector as a percentage of provincial GDP, besides representing a standard innovation input largely adopted in the literature, is used to capture the different innovation potential of Italian provinces (Crescenzi, Gagliardi, & Percoco, 2013; Rodríguez-Pose & Di Cataldo, 2015). We also include the percentage of total employment in manufacturing sector and the share of agriculture in the total labour force to account for the provincial productive structure. While there is a wide development economics literature affirming the role of manufacturing as an engine of growth (Cantore, Clara, Lavopa, & Soare, 2017), the weight of employees in the agriculture is expected to have a negative effect on the provincial economic growth, which is generally explained with the lower productivity associated to this sector (Niebuhr, Granato, Haas, & Hamann, 2012). Another important factor that may affect both provincial growth dynamics and the relationship between immigration and economic growth is the level of education of the resident population (Østbye & Westerlund, 2007). A higher human capital base, in fact, is expected to produce several beneficial consequences for the province where they are located. Therefore, the stock of provincial human capital proxied by the natural logarithm of graduates as a percentage of total population is included among the regressors. Finally, we include the sum of import and export over GDP as a proxy for the degree of openness. As largely emphasized, in fact, the international openness of a region plays a crucial role for its

economic performance (Gambardella, Mariani, & Torrisi, 2009). A detailed description of the variables included in the econometric analysis is reported in Table A2 of the "Appendix".
The second specification of the model uses selective immigration in place of total immigration, in order to assess the effect on provincial GDP growth of international immigration from frontier countries. The model is modified as follow:

$$\text{growth}_{\text{I,t}} = \alpha + \beta_1 \text{gdp}_{\text{I,t}-1} + \beta_2 selective\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \varepsilon_{\text{I,t}} \quad (2)$$

Table 3 presents the summary statistics of the variables which will be included in the econometric models.

[insert table 3]

Table 4 sets out the results of the ordinary least square (OLS) (model 1 and 2) and fixed-effect (FE) (model 3 and 4) estimates. In particular, the negative and statistically significant *beta* parameter of the lagged level of GDP *per capita* supports the view of an overall convergence process over the period 2004-2012. The gap between less developed and more advanced provinces has narrowed over the considered period. Moreover, the coefficient associated to the share of tertiary educated individuals is positive and significant, suggesting that a higher human capital base represents a crucial engine of provincial economic growth (Kang & Kim, 2018; Østbye & Westerlund, 2007). The positive coefficient related to the degree of openness implies that the provinces with a higher share of import and export over the GDP are also those that have shown higher GDP growth rates (Freund & Bolaky, 2008). Concerning the immigration-related variables, both the total and selective immigration appear to have an impact (statistically significant at 10%) on the provincial growth.
A result confirmed also when the provincial time-invariant characteristics are considered (FE models). The total and selective immigration coefficients, in fact, remain positive and statistically significant, with the latter being larger than the former: immigration from frontier countries has a bigger effect on the economic growth at the local level. In the FE models, what contributes most to boost provincial economic growth – and remains robust in the following specifications of the model – is the employment in manufacturing sector: the share of manufacturing is positively associated with GDP *per capita* with a 5% significance level. This result indicates that at the Italian provincial level an increase in the weight of manufacture still represents an important engine of economic growth in terms of GDP *per capita* (Cantore et al., 2017). On the contrary, the degree of openness, the stock of human capital, and the R&D expenditure are no longer significant.

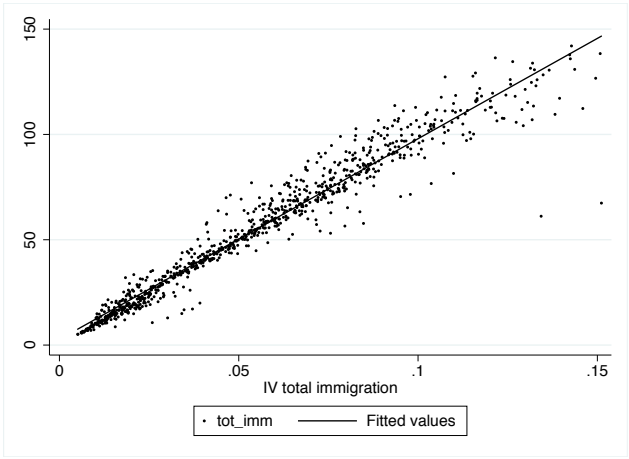
[insert table 4]

However, the potential endogeneity due to the reverse causality between regional growth and the decision on whether and where to move could result in biased estimates. In order to address such issue, we adopt an instrumental variable approach (two-stage least squares procedure) aimed at obtaining an exogenous variation in the inflows of people. The presence of two potentially endogenous variables, i.e. the total immigration rate and the immigration from frontier countries, requires the specification of two different instruments. The migration literature provides many solutions on exclusion restrictions that can be relied on. The most common strategy is to adopt the supply-push of migrants elaborated by Altonji and Card (1991) where the share of immigrants remains unchanged from the first available period (in our case, 2004). In particular, our external instrumental variables are obtained by distributing the stock of (total and selective) immigrants in Italy to each province and for each year by using the number of foreign-born residents of a particular province in 2004 over the total number of immigrants present in the country in 2004. The two instruments are calculated as follows:

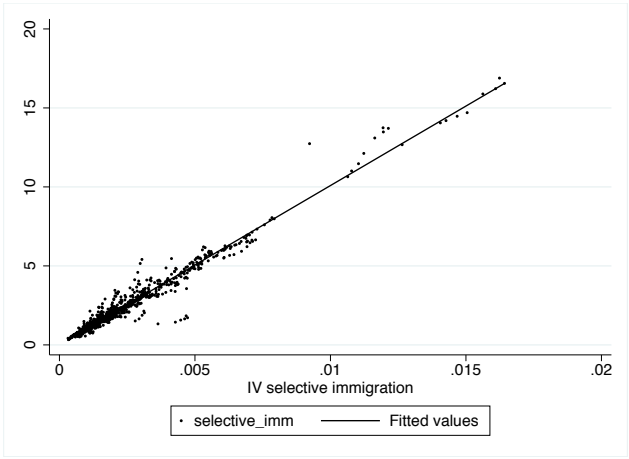
$$IV\_tot\_imm_{\mathrm{I,t}} = \delta_{i,2004} \frac{tot\_imm_t}{Population_{i,t}} \quad (3)$$

$$IV\_sel\_imm_{i,t} = \lambda_{i,2004} \frac{sel\_imm_t}{Population_{i,t}} \quad (4)$$

where tot_imm_t is the total number of immigrants, from all available countries included in the sample of origin countries, that are resident in Italy at time t; and $\delta_{\mathrm{I},2004}$ represents the ratio between the total number of immigrants of province I in 2004 and the total number of immigrants of the country in 2004. Similarly, sel_imm is the total number of immigrants from frontier countries that resides in Italy at time t; and $\lambda_{\mathrm{I},2004}$ is the ratio between immigrants from frontier countries of province I in 2004 and the total immigrants from frontier countries in 2004. Fig. 2.a and 2.b show the correlation between the two instruments and the actual total and selective immigration rates.



(a) Correlation with the total immigration rate



(b) Correlation with the selective immigration rate

Figure 2: Relationship between the immigration variables and the corresponding instrument.

Although the evidence on our instruments is rather comforting, the instruments need to be justified in terms of relevance and orthogonality to the error terms in equation (1) and (2). First, in order to verify the relevance of the instruments, we report tests of both under-identification and weak identification. The former is a Lagrange multiplier (LM) test of whether the equation is identified, i.e., that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Yet, when the i.i.d. assumption is dropped, as in our case where the errors are clustered by province, the LM and Wald versions of the Kleibergen and Paap (2006) rk statistics are reported instead of the Anderson LM and Cragg-Donald Wald statistics which are no longer valid. The test indicates that the null hypothesis can be rejected, confirming that the model is identified. Moreover, in order to verify if the excluded instruments are weakly correlated with the endogenous regressors, the weak identification test is carried out. In particular, we rely on the framework provided by Stock and Yogo (2005) who have identified critical values with which the Kleibergen-Paap Wald rk (KP) F statistic has to be compared. As the KP F-statistic value is higher than the critical value reported by Stock and

Yogo (2005) we can argue that the instruments are strongly correlated with the endogenous regressors.

The results of the 2SLS procedure are reported in Table 5. The share of immigration from frontier countries and the share of total immigrants are, again, positive and statistically significant at 1% and 5%, respectively. Moreover, once the endogeneity issue is controlled for, the magnitude of the coefficients associated to our key variables becomes larger than in the FE estimates. More specifically, the larger magnitudes of the effects associated to the selective immigration seems to confirm the evidence provided in the migration literature according to which selective immigrants have more significant growth-enhancing effects.

Concerning the other variables, the results are qualitatively and quantitatively confirmed, with a share of manufacturing always positive and significant indicating the importance of this sector for the Italian economic growth. Moreover, the coefficient for the natural logarithm of population density is negative and statistically significant at 5%, suggesting a detrimental crowding effect on GDP *per capita*.

Finally, a further interesting element is associated to the coefficient of private sector R&D expenditure as a share of provincial GDP. The fact that this variable takes on a positive and statistically significant coefficient (at 5%) only in the model with selective immigration can be interpreted as a confirmation of the relevance of the absorptive capacity of destination provinces when the quality of the knowledge embedded in the migration flows is taken into account.

As previously discussed, all the diagnostic statistics reported in Table 5 are satisfactory.

[insert table 5]

4.2 Centre-North versus South

As anticipated, the economic and institutional conditions vary substantially between the Centre-North and the South of Italy, and it is reasonable to expect that the effects of total and selective immigrations be different as well, on the assumption that lagging provinces have lower capabilities to absorb externally generated knowledge. In order to check whether this is the case, we distinguish between Central-Northern (more advanced) and Southern[8] (less developed) provinces (see Table 6 for the descriptive statistics drawn up on the basis of this categorization). The Central-Northern

[8] The Southern provinces are those belonging to Abruzzo, Molise, Apulia, Calabria, Basilicata, Campania, Sicily and Sardinia.

provinces exhibit a higher initial level of income *per capita* in logs (10.218). At the same time, Southern provinces show a slightly higher average value of the GDP growth rate over the considered period. As regards our key variables, strong differences emerge in the total international immigration share (72.4 in the Centre-North versus 22.4 registered in the South) and in the share of immigration from frontier countries (3.28 and 1.23, respectively). The two macro-regions also differ in terms of productive structure. In particular, as extensively pointed out in the economic literature, the Italian Centre-North presents a higher share of manufacturing (22.1% versus 13.2% registered in the South), a greater critical mass of R&D (1.3% versus 0.8%), and a greater degree of openness (46.9% versus 24.3% of the Southern provinces); on the contrary, the weight of the agricultural sector is still significant in the South (9.4%).

[insert table 6]

The regression results for these two separate categories are presented in Table 7. The estimates confirm the presence of significant differences in the economic consequences of international immigration between the Centre-North and the South of Italy. In the former, economic growth is primarily explained by immigrants from countries with higher institutional quality and better socio-economic conditions. The provinces that already show better socio-economic and institutional conditions benefit the most in terms of economic growth from the presence of selective immigrants. As for the less developed provinces located in the South, only total immigration plays a role.

Our findings corroborate the idea of different demands for skills, knowledge and competences between the two macro-regions due to the different intrinsic needs of the receiving provinces. Provinces that belong to the richer and more advanced macro-region, in fact, seem to take advantage of migration flows from frontier countries. Central-Northern provinces, with a more developed and efficient productive structure, are capable to absorb and exploit the greater knowledge embedded in the international flows of human capital from frontier countries, favouring the creation of new jobs and opportunities in line with the ability, the skills and the attitude of the workforce and also because of the peculiar necessity of the production structure of this macro-region (Dotti, Fratesi, Lenzi, & Percoco, 2014; Iammarino & Marinelli, 2015).

In the South, instead, characterized by a significant demand of low-skilled jobs, the relatively lower knowledge-intensity which characterizes these tasks contributes to explain why a (positive) role is played only by total immigration. As clarified in the descriptive analysis, in fact, in the South the immigration of foreign-born population has mainly occurred from countries with low GDP *per capita* and lower institutional quality than Italy.

Further interesting elements that deserve particular attention involve the coefficients associated to the employment in the manufacturing sector and to the R&D expenditure which are positive and statistically significant only for the Central-Northern provinces. Concerning the former, this result, in the light of the wide wage differentials between these two macro-regions, could contribute, at least partially, to explain the greater productivity in the Centre-North with respect to the Southern provinces for blu-collar workers (Fratesi & Percoco, 2014) and the absence of a statistically significant effect in the South.

Regarding the private R&D investment, the findings seem to reveal the greater deal of effort put in the Central-Northern provinces, which in turn, is able to stimulate stronger innovative process within this macro-region, as confirmed from the European Commission in the regional innovation scoreboard (RIS), where the mapping of Italian territory shows a clear dualism between Centre-North and South in terms innovative performance. In other words, in the peripheral areas of Italy, the lower returns from technological investments may be the consequence of an incapability of these regions to attain a critical mass of R&D (Rodríguez-Pose & Di Cataldo, 2015 p.686).

[insert table 7]

4.3 Robustness check: addressing spatial dependence

Although previous results provide insights on the effect associated with the international immigration on GDP *per capita* growth rate at the Italian provincial level, the possible spatial spillovers among neighbouring provinces raise an important econometric issue that needs to be addressed. Therefore, in this section, as a robustness check, we control for the effects of spatial dependence. The presence of endogenous regressors among the explanatory variables as well as the questionable assumption regarding the random effects impose the adoption of a spatial fixed-effects estimators and a two-stage least squares procedure (Millo & Piras, 2012). In particular by implementing a GM estimation of panel data models with spatially correlated errors components, we are able to deal with: (i) individual heterogeneity that possibly affect growth dynamics, (ii) endogeneity of immigration variables that could result from the reverse causality between GDP *per capita* and immigration, and (iii) spatial dependence.

In detail, the latter could be addressed by introducing in the model a spatially lagged dependent variable, a spatial error component or both these variables.

Firstly, by including the spatially lagged dependent variable among the regressors, we extend the equations (1) and (2) as follows:

$$\text{growth}_{\text{i,t}} = \alpha + \rho \sum_{j=1}^{R} \omega_{ij} Y_{it} + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 tot\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \varepsilon_{\text{i,t}} \quad (5)$$

$$\text{growth}_{\text{i,t}} = \alpha + \rho \sum_{j=1}^{R} \omega_{ij} Y_{it} + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 sel\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \varepsilon_{\text{i,t}} \quad (6)$$

Secondly, by including a spatial error component, the equations (1) and (2) are modified as follows:

$$\text{growth}_{\text{i,t}} = \alpha + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 tot\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \lambda \sum_{j=1}^{R} \omega_{ij} \varepsilon_{jt} + \nu_{it} \quad (7)$$

$$\text{growth}_{\text{i,t}} = \alpha + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 sel\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \lambda \sum_{j=1}^{R} \omega_{ij} \varepsilon_{jt} + \nu_{it} \quad (8)$$

Finally, the complete model (spatial autoregressive error model) is given by the following equations:

$$\text{growth}_{\text{i,t}} = \alpha + \rho \sum_{j=1}^{R} \omega_{ij} Y_{it} + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 tot\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \lambda \sum_{j=1}^{R} \omega_{ij} \varepsilon_{jt} + \nu_{it} \quad (9)$$

$$\text{growth}_{\text{i,t}} = \alpha + \rho \sum_{j=1}^{R} \omega_{ij} Y_{it} + \beta_1 \text{gdp}_{\text{i,t}-1} + \beta_2 sel\_imm_{i,t-1} + \sum_{n=1}^{N} \gamma_{\text{n}} x_{\text{ni,t}} + \mu_{\text{i}} + \tau_t + \lambda \sum_{j=1}^{R} \omega_{ij} \varepsilon_{jt} + \nu_{it} \quad (10)$$

ω_{ij} is an element of the row-standardized spatial weights matrix Ω[9]. The estimation results of these specifications are reported in Table 8. As regards the effects of total immigration, as emerged in the non-spatial version of our analysis, the coefficients are always positive and statistically significant in all the spatial models, and thus confirming the results presented so far. Moreover, when the attention is turned to the consequences of selective immigration, the stronger positive role played by the individuals from frontier countries is largely confirmed. Actually, even if total and selective immigration positively affect the GDP *per capita* of a province, as in the non-spatial model, immigrants with better knowledge on technology and institutions have a wider effect on economic growth.

Concerning the spatially lagged dependent variable, the absence of statistical significance of the coefficients associated to this variable indicates that the growth dynamics of Italian provinces do not seem to affect the economic growth of the neighboring provinces. In contrast, as shown in the models where a spatial error component is included, a potential source of transmission of spatial

[9] The paper implements an inverse-distance matrix Ω between the centroids of province i and j.

effects is represented by the shock that can affect a particular province. Therefore, Italian provinces are also influenced by common global factors such as macroeconomic shocks or financial crisis as demonstrated by the positive and statistically significant *lambda* parameter. With respect to the control variables, the results confirm the positive role played by the share of employees in the manufacturing sector and by the private R&D expenditure. The detrimental crowding effect on GDP *per capita* associated to the population density seems to be confirmed.

[insert table 8]

5. Conclusions

During the past few decades, the economic literature has highlighted the significant role played by exogenously sourced knowledge and the importance of exploring the different channels through which knowledge spreads across the globe in order to provide a potential explanation of the causes of economic disparities across countries. Among these factors, migration represents a crucial mechanism that favours the diffusion of knowledge between countries, thus affecting the growth dynamics in both the sending and receiving places. However, although the characteristics of the origins and destinations of migration can influence knowledge, practices and culture of immigrants as well as the process of knowledge transfer, few empirical analyses consider the level of development of origin and destination places as important elements that affect the relationship between immigration and economic growth.

By using a FE-2SLS procedure to account for province-specific effects and for the endogeneity of immigration, this paper provides an original contribution to the literature by empirically investigating the relationship between immigration and economic growth, while explicitly accounting for the socio-economic and institutional characteristics of both origins and destinations. In particular, this study, focusing on the Italian provinces, analyses the extent to which immigration flows from countries with a higher level of development has a stronger effect on GDP *per capita* and whether or not the capacity of international immigration to transfer tacit knowledge across international boundaries, could vary for different stages of development of the destination areas. Interesting novel evidences emerge, paving the way for further research on other national contexts characterized by a strong internal dualism.

First, the results show an overall positive relationship between immigration and economic growth of Italian provinces, which appears to be stronger once the immigration from frontier

countries (selective immigration) is specifically taken into consideration. Yet, future research could shed further light on such circumstances. In particular, while we treat international immigration by distinguishing the country of origin, we do not control for the number of foreign residents broken down by educational attainment because of the unavailability of these data. This could improve the understanding of the phenomenon to the extent to which the educational level contributes to affect the selectivity of immigrants, which in turn influences the process of transfer of tacit knowledge.

Second, when the immigration effects are assessed giving relevance to the different stages of development of the destination regions, further differences emerge in the role of total and selective immigration. As for the Centre-North, in fact, economic growth is primarily explained by immigrants from countries with higher institutional quality and better socio-economic conditions, while for the poorer provinces that belong to the South, only total immigration plays a role. The more advanced production structure and the higher productivity of the industrialized Central-Northern provinces plausibly imply a higher capacity to attract, absorb and exploit international migration flows from frontier countries.

On the same grounds, in the South, characterized by a backward production structure, still mainly based on less knowledge-intensive works, it is the total immigration to play a significant role, while immigration from frontier countries appears not to be relevant.

Further research could provide some more background on these issues. In fact, an interesting, recent stream of migration literature has been focusing on the relationships between increasing immigration and the capacity of different economies, with different initial level of development, to exploit skills and knowledge carried by human mobility (Bove & Elia, 2017; Kalaitzidakis, Mamuneas, Savvides, & Stengos, 2011).

An extension of our empirical model in such direction would allow a more refined comprehension of the local mechanisms that trigger the effects on GDP growth. The identification of the reasons for which the total and selective international inflows of individuals positively affect, in different ways, the GDP *per capita* of Italian provinces could have relevant policy implications on strategic regional policies.

These aspects are especially crucial within the Italian national context, characterized by territorial disparities and by an internal dualism between the Centre-North and the South. In particular, as shown, if the preferred destinations of selective immigrants are the Central-Northern provinces and at the same time these provinces grow faster than the less advanced ones, then a self-reinforcing dynamics emerges which further widens internal disparities.

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Table 1: Provinces ranking by total and selective immigration rate. Average 2004-2012.

Total immigration		*Selective immigration*	
Ranking	Province	Ranking	Province
1	Prato	1	Imperia
2	Brescia	2	Bolzano
3	Milano	3	Grosseto
4	Reggio nell'Emilia	4	Siena
5	Piacenza	5	Varese

Source: our elaborations. ISTAT data.

Table 2: Coefficient of variations of total and selective immigration rate. Average 2004-2012.

	Coefficient of variation (2004-2012)	
	Total immigration	Selective immigration
Total	0.5479	0.8441
Centre-North	0.2669	0.7237
South	0.5079	0.4514

Source: our elaborations. ISTAT data.

Table 3: Summary statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Annual GDP *per capita* growth rate	927	0.008	0.045	-0.212	0.132
Log of GDP *per capita*	927	10.063	0.259	9.465	10.832
Total immigration	927	54.925	32.524	5.073	141.981
Selective immigration	927	2.568	2.195	0.330	16.893
Manufacturing employment	927	0.190	0.078	0.059	0.397
Agricultural employment	927	0.055	0.042	0.003	0.202
Openness	927	0.390	0.301	0.011	3.043
Graduates	927	0.173	0.046	0.053	0.350
Private R&D	927	0.011	0.004	0.003	0.021
Population density	927	245.547	326.478	37.275	2603.165

Source: our elaborations. ISTAT and EUROSTAT data.

Table 4: Estimation results for all the Italian provinces.

	OLS	OLS	FE	FE
Dependent variable	GDP growth rate	GDP growth rate	GDP growth rate	GDP growth rate
	(1)	(2)	(3)	(4)
ln $Y_{i,t-1}$	-0.0214**	-0.0172***	-0.3823***	-0.3836***
	(0.0087)	(0.0054)	(0.0272)	(0.0267)
Total immigration	0.0001*		0.0004**	
	(0.0001)		(0.0002)	
Selective immigration		0.0011*		0.0087**
		(0.0006)		(0.004)
Manufacturing employment	-0.0325**	-0.0066	0.3629***	0.3341***
	(0.0146)	(0.0121)	(0.1149)	(0.1169)
Agricultural employment	-0.0861***	-0.0572**	-0.0618	-0.0419
	(0.0292)	(0.0283)	(0.1319)	(0.1374)
Openness	0.0073***	0.0077***	0.0025	0.0027
	(0.0026)	(0.0025)	(0.0099)	(0.0098)
Graduates	0.0405	0.0523**	0.0294	0.0442
	(0.0261)	(0.0256)	(0.0409)	(0.0421)
R&D	-0.5787**	-0.4454*	1.0823	1.787
	(0.2669)	(0.2258)	(1.1406)	(1.1115)
Population density	-0.0013	-0.0005	-0.2331*	-0.0898
	(0.0012)	(0.0012)	(0.129)	(0.0942)
constant	0.2117**	0.1608***	4.9389***	4.2138***
	(0.0831)	(0.0527)	(0.7873)	(0.6159)
N*T	927	927	927	927
N	103	103	103	103
Time effects	Yes	Yes	Yes	Yes
Provincial effects	No	No	Yes	Yes
R^2 within	0.61	0.61	0.70	0.71
Pesaran's CD test	No	No	8.522***	8.272***

Source: our elaborations. ISTAT and EUROSTAT data.

Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. The first two models are ordinary least squares estimates while the last two models are fixed-effect estimates. The Pesaran's CD test is run to verify the cross-sectional dependence in the fixed-effect models.

Table 5: Estimation results for all the Italian provinces (2SLS).

Dependent variable	2SLS GDP growth rate (5)	2SLS GDP growth rate (6)
ln $Y_{i,t-1}$	-0.3832***	-0.3880***
	(0.0267)	(0.0259)
Total immigration	0.0007**	
	(0.0003)	
Selective immigration		0.0231***
		(0.0075)
Manufacturing employment	0.3568***	0.2713**
	(0.1141)	(0.1237)
Agricultural employment	-0.0799	-0.0532
	(0.1292)	(0.1416)
Openness	0.0019	0.0013
	(0.0099)	(0.0095)
Graduates	0.0303	0.0711
	(0.0402)	(0.0439)
R&D	0.8076	2.2842**
	(1.1467)	(1.1069)
Population density	-0.3536**	-0.1475
	(0.1587)	(0.0925)
N*T	927	927
N	103	103
Time effects	Yes	Yes
Provincial effects	Yes	Yes
R^2 within	0.70	0.69
Under-identification test (*p-value*)	39.654 (*0.000*)	8.058 (*0.004*)
KP F-statistics	55.171	69.036

Source: our elaborations. ISTAT and EUROSTAT data.

Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. All models are fixed-effect two-stage least squares estimates where both total and selective international immigrations are treated as endogenous variables and instrumented with the external instruments obtained from equation (3) and (4). The control variables are assumed to be exogenous.

Table 6: Summary statistics Centre-North and South.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Centre-North					
Annual GDP *per capita* growth rate	603	0.007	0.046	-0.212	0.132
Log of GDP *per capita*	603	10.218	0.155	9.863	10.832
Total immigration	603	72.400	25.652	18.765	141.981
Selective immigration	603	3.286	2.400	0.547	16.893
Manufacturing employment	603	0.221	0.073	0.064	0.397
Agricultural employment	603	0.034	0.021	0.003	0.105
Openness	603	0.469	0.208	0.060	1.620
Graduates	603	0.183	0.044	0.085	0.350
Private R&D	603	0.013	0.004	0.003	0.021
Population density	603	257.354	271.619	37.275	1926.043
South					
Annual GDP *per capita* growth rate	324	0.009	0.042	-0.107	0.114
Log of GDP *per capita*	324	9.774	0.137	9.465	10.135
Total immigration	324	22.402	13.232	5.073	77.817
Selective immigration	324	1.232	0.570	0.330	3.971
Manufacturing employment	324	0.132	0.048	0.059	0.299
Agricultural employment	324	0.094	0.043	0.017	0.202
Openness	324	0.243	0.383	0.011	3.043
Graduates	324	0.156	0.044	0.053	0.291
Private R&D	324	0.008	0.002	0.004	0.012
Population density	324	223.574	409.055	40.464	2603.165

Source: our elaborations. ISTAT and EUROSTAT data.

Table 7: Estimation results separating the Centre-North from the South (2SLS).

	2SLS	2SLS	2SLS	2SLS
Sample of Italian provinces	Centre-North	Centre-North	South	South
	(7)	(8)	(9)	(10)
ln $Y_{i,t-1}$	-0.3848***	-0.3929***	-0.4029***	-0.4056***
	(0.0402)	(0.0339)	(0.0456)	(0.0465)
Total immigration	0.0009		0.0021**	
	(0.0006)		(0.001)	
Selective immigration		0.0179***		-0.0235
		(0.006)		(0.0186)
Manufacturing employment	0.3328**	0.2844**	0.2166	0.3119
	(0.1432)	(0.1379)	(0.2602)	(0.248)
Agricultural employment	-0.1631	-0.0215	-0.1703	-0.1229
	(0.3142)	(0.3401)	(0.1517)	(0.1471)
Openness	-0.006	-0.0019	0.0171	0.018
	(0.0165)	(0.0144)	(0.0147)	(0.0154)
Graduates	0.0565	0.0810*	0.0309	0.0525
	(0.0447)	(0.0491)	(0.088)	(0.0883)
R&D	2.7204**	3.5506***	2.6967	-4.1703
	(1.3212)	(1.2766)	(3.8594)	(3.1431)
Population density	-0.4403**	-0.2127*	0.0334	0.1735
	(0.2086)	(0.1141)	(0.2418)	(0.2509)
N*T	603	603	324	324
N	67	67	36	36
Time effects	Yes	Yes	Yes	Yes
Provincial effects	Yes	Yes	Yes	Yes
R^2 within	0.74	0.73	0.64	0.67
Under-identification test (*p-value*)	17.097 (*0.000)*	7.228 (*0.007*)	9.090 (*0.003*)	1.082 (*0.298*)
KP F-statistics	20.128	70.283	37.154	19.464

Source: our elaborations. ISTAT and EUROSTAT data.

Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. All models are fixed-effect two-stage least squares estimates where both total and selective international immigrations are treated as endogenous variables and instrumented with the external instruments obtained from equation (3) and (4). The control variables are assumed to be exogenous.

Table 8: Spatial Fixed-Effects estimation results (SAM, SEM, and SARAR models).

	Sp. Lag Model		Sp. Err. Model		Sp. Autoreg. Err. Model	
	FE-2SLS		FE-2SLS		FE-2SLS	
Dependent variable:	(11)	(12)	(13)	(14)	(15)	(16)
GDP growth rate						
ln $Y_{i,t-1}$	-0.3834***	-0.3876***	-0.3906***	-0.3927***	-0.3847***	-0.3904***
	(0.0282)	(0.0283)	(0.0275)	(0.028)	(0.0281)	(0.0281)
Rho	-0.1204	-0.0606			-0.2373	-0.1364
	(0.1289)	(0.1231)			(0.1575)	(0.1286)
Lambda			0.1705***	0.1620***	0.4298***	0.4113***
			(0.0431)	(0.0433)	(0.0788)	(0.0824)
Total immigration	0.0008***		0.0006**		0.0008***	
	(0.0003)		(0.0002)		(0.0003)	
Selective immigration		0.0223***		0.0219***		0.0218***
		(0.0051)		(0.005)		(0.0053)
Manuf. employment	0.3381***	0.2671**	0.4046***	0.3163***	0.3946***	0.3157**
	(0.1211)	(0.124)	(0.1176)	(0.1209)	(0.1201)	(0.1239)
Agric. employment	-0.0806	-0.048	-0.0876	-0.0585	-0.0817	-0.0498
	(0.1572)	(0.1566)	(0.1523)	(0.1541)	(0.151)	(0.1537)
Openness	0.0016	0.0014	0.0017	0.0002	0.0016	-0.0001
	(0.0101)	(0.0101)	(0.0098)	(0.01)	(0.0097)	(0.0099)
Graduates	0.0256	0.0669	0.0367	0.0717	0.0311	0.0674
	(0.0468)	(0.0473)	(0.0449)	(0.0465)	(0.0448)	(0.0462)
R&D	0.7675	2.3076*	0.7082	2.0781*	0.6102	2.0997*
	(1.1811)	(1.1803)	(1.2207)	(1.2004)	(1.2612)	(1.2314)
Population density	-0.4041***	-0.1377	-0.3472**	-0.1515*	-0.3952***	-0.1423*
	(0.1446)	(0.0842)	(0.1389)	(0.0855)	(0.1411)	(0.0863)
N*T	927	927	927	927	927	927
N	103	103	103	103	103	103
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Provincial effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: our elaborations. ISTAT and EUROSTAT data.

Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. All models are spatial fixed-effect estimation by implementing a GM estimation of panel data models with spatially correlated errors components. The total and selective international immigrations are treated as endogenous variables and instrumented with the external instruments obtained from equation (3) and (4). The control variables are assumed to be exogenous.

Appendix A

Table A1: Countries' ranking by different dimensions of institutional quality.

Voice and accountability		Political stability		Government effectiveness		Regulatory quality		Rule of law		Control of corruption	
Norway	1.61	Finland	1.48	Denmark	2.19	Denmark	1.83	Finland	1.95	Denmark	2.40
Denmark	1.60	Luxembourg	1.40	Finland	2.16	New Zealand	1.79	Denmark	1.94	New Zealand	2.32
Luxembourg	1.59	Iceland	1.31	Switzerland	1.97	Netherlands	1.74	Norway	1.94	Finland	2.31
Sweden	1.58	New Zealand	1.27	Sweden	1.97	Australia	1.73	Sweden	1.91	Sweden	2.21
Switzerland	1.58	Norway	1.27	Norway	1.91	Finland	1.73	New Zealand	1.87	Iceland	2.12
Netherlands	1.55	Switzerland	1.27	Canada	1.81	UK	1.72	Austria	1.86	Netherlands	2.09
Finland	1.55	Sweden	1.22	Netherlands	1.81	Luxembourg	1.72	Switzerland	1.82	Switzerland	2.08
New Zealand	1.55	Austria	1.20	New Zealand	1.78	Ireland	1.68	Iceland	1.81	Norway	2.05
Iceland	1.47	Ireland	1.11	Australia	1.76	Sweden	1.66	Luxembourg	1.81	Australia	2.01
Canada	1.44	Denmark	1.05	Iceland	1.76	Canada	1.65	Netherlands	1.80	Canada	1.97
Australia	1.43	Canada	1.00	Austria	1.75	Switzerland	1.60	Canada	1.77	Luxembourg	1.96
Austria	1.40	Netherlands	0.97	Luxembourg	1.71	Austria	1.54	Australia	1.76	Germany	1.79
Ireland	1.40	Australia	0.93	UK	1.65	Germany	1.54	Ireland	1.70	Austria	1.76
Germany	1.38	Germany	0.86	Belgium	1.64	US	1.49	UK	1.70	UK	1.73
UK	1.37	Belgium	0.81	US	1.58	Norway	1.44	Germany	1.69	Ireland	1.62
Belgium	1.36	France	0.53	Germany	1.57	Belgium	1.32	US	1.59	Belgium	1.44
France	1.29	Italy	0.46	France	1.53	Iceland	1.30	France	1.47	France	1.44
US	1.17	UK	0.37	Ireland	1.51	France	1.23	Belgium	1.35	US	1.42
Spain	1.14	United States	0.36	Spain	1.08	Spain	1.18	Spain	1.15	Spain	1.17
Italy	1.03	Spain	-0.2	Italy	0.41	Italy	0.92	Italy	0.46	Italy	0.27

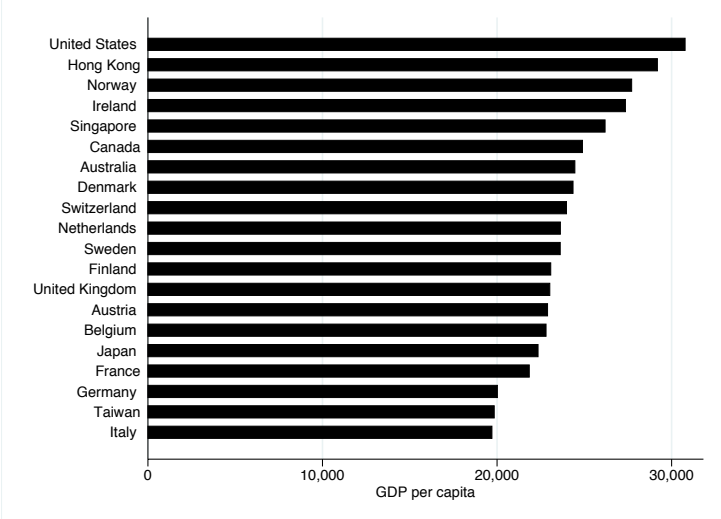

Figure A1: Countries' ranking by GDP *per capita*.

Table A2: Description of the variables

Variable	Definition	Source
GDP growth	Annual GDP *per capita* growth rate.	EUROSTAT
Log of GDP *per capita*	Logarithm of the level of GDP *per capita* at the beginning period.	EUROSTAT
Total immigration	Measures the share of foreign-born immigrants from all available countries in total population per thousand inhabitants.	ISTAT Statistics of Foreign-Born Residents
Selective immigration	Represents the share of foreign-born immigrants from countries with a higher development level ("frontier countries") in total population per thousand inhabitants.	ISTAT Statistics of Foreign-Born Residents
Openness	The degree of openness is measure as the share of import and export over GDP of Italian provinces.	ISTAT Development Policy Statistics
Private R&D	R&D expenditure from the business sector as a percentage of provincial GDP. Data are at NUTS-2 level.	ISTAT Development Policy Statistics
Agricultural employment	Share of employment in agriculture as a percentage of total employment.	ISTAT Development Policy Statistics
Manufacturing employment	Share of employment in manufacturing as a percentage of total employment.	ISTAT Development Policy Statistics
Graduates	Number of graduates as a percentage of provincial population.	ISTAT Development Policy Statistics
Population density	Population per square kilometre.	ISTAT Development Policy Statistics