UNIVERSITÀ POLITECNICA DELLE MARCHE
Dipartimento di Scienze Economiche e Sociali

MIGRATION AND THE STRUCTURE OF MANUFACTURING PRODUCTION. A VIEW FROM ITALIAN PROVINCES

Elizabeth J. Casabianca, Alessia Lo Turco, Daniela Maggioni

QUADERNI DI RICERCA n. 448*
ISSN: 2279-9575

November 2020

(*) La numerazione progressiva continua dalla serie denominata “Quaderni di ricerca — Dipartimento di economia”

Collana curata da Massimo Tamberi

ISSN: 2279-9575

Abstract

What is the impact of immigration on the product mix of the receiving economy? To answer this question we exploit variation in the presence of immigrants across Italian provinces within the period 2003-2011. We find that immigration changes the manufacturing output composition of Italian provinces in favour of less capital intensive products, without affecting the total amount of manufacturing production. This result is based on a 2SLS strategy resting on the settlement of immigrants in the pre-sample period and is in line with the predictions of standard trade models concerning the role of factor growth on product specialisation. More specifically, immigrants sustain and deepen Italy's revealed comparative advantages in labour intensive goods. We thus add to the existing studies finding within-industry adjustments of factor usage in production rather than between-industry output adjustments in response to immigration flows. When searching for the underlying mechanisms driving our result, we discover that a larger share of immigrants promotes the local reshoring of labour intensive productions and fosters the creation of new firms in labour intensive industries.

JEL Class.: F22; J61
Keywords: Immigration, Local production structure, Capital intensity

Indirizzo: Elizabeth J. Casabianca - Prometeia, Piazza Trento e Trieste 3, 40137 Bologna, Italy. Email: elizabeth.casabianca@prometeia.com.
Alessia Lo Turco - Università Politecnica delle Marche Piazzale Martelli 8, 60121 Ancona, Italy. Email: a.loturco@univpm.it.
Daniela Maggioni - Università Cattolica del Sacro Cuore, argo A. Gemelli, 1, 20123 Milano. Email: daniela.maggioni@unicatt.it

Migration and the Structure of Manufacturing Production.A View from Italian Provinces [†]

Elizabeth J. Casabianca, Alessia Lo Turco, Daniela Maggioni

1 Introduction

Immigration is a wide and complex phenomenon. In the EU alone, 4.7 million people immigrated in one of the member countries during 2015, and more than half of them were citizens of non-member countries (Eurostat, 2017). This large inflow of migrants, mainly from developing countries, has deep consequences from an economic, social and geo-political perspective. On the one hand, it raises doubts on the capacity of the receiving country to absorb migrants. Public opinion often reflects concerns that migrants take away jobs from native workers and are a burden on the welfare systems of developed countries. On the other hand, migrants are one of the major contributors to population growth especially in richer economies, which are facing both aging populations and declining birth rates. On top of all this, foreigners constitute an important labour input for the host economy and could significantly shape firms' decisions over their production processes and product mix. From an economic standpoint, the literature has mainly focused on analysing the effects of immigration on the labour market of the receiving country. Meanwhile, relatively less evidence exists on the impact of immigration on its production structure.

In line with the Rybczynski theorem, a large inflow of migrants, especially low-skilled ones, should promote manufacturing of labour intensive goods, while contracting production of capital-intensive goods. At the intensive margin, the availability of immigrants could push firms to reshuffle resources across production processes characterised by different levels of factor intensity. Also, migration could affect the extensive margin of production at firm and product level. On the one hand, it could reshape market entry incentives and support the creation of new firms in less capital intensive industries (Olney, 2013). On the other hand, it could push firms to bring back home those production stages that had been previously offshored to low labour cost locations (Olney and Pozzoli, 2020).

With this paper we deepen and extend the understanding of migrants' role in affecting the manufacturing structure of the host economy, while shedding light on some of the channels at work. To this end, we exploit relevant heterogeneity and variation in the stock of migrants and economic activity across Italian provinces over the 2003-2011 period.

Italy represents an interesting case study for a number of reasons. First, the country has experienced growing inflows of migrants during the period examined. In 2011 immigrants stood at around 7% of the country's population from 2.7% in 2002. Second, in the same year nearly 95% of these migrants were from less developed economies and were usually employed as low-skilled workers. Third, com-

[†] *Disclaimer: The data used in this work are from the Istat COE territorial trade database. All the elaborations have been conducted at the Laboratorio per l'Analisi dei Dati ELEmentari, Istat, and in compliance with the law on the protection of statistical confidentiality and personal data. The results and the views expressed in this paper are those of the authors, are their sole responsability and neither do they represent official statistics nor the views of the affiliated institutions. No sampling weights have been employed in the estimations.* *We are particularly grateful to Massimiliano Bratti, Cristina Cattaneo, Anna Maria Mayda, Guido Neidhofer and Gianluca Santoni for their useful comments and suggestions on previous versions of this work. We further thank all participants at the 2018 AIEL and ETSG conferences and the 2019 International Economic Seminar.*

pared to other advanced countries, Italy's economy is characterised by poor capital accumulation and its manufacturing traditionally bends towards low skilled labour intensive goods (De Benedictis, 2005; Larch, 2005). Moreover, as there are ongoing debates at national and international level on the benefits and costs of migration, exploring the contribution of migrants to the performance of Italy's manufacturing can provide important insights that will support the design of future policies.

For the purpose of our work, we merge information at province level for the period 2003-2011 on the stock of migrants, available from the Demographic Portal of ISTAT, with data on manufacturing exports by HS-4 digit product level, available from the ISTAT-COE database, which we use as proxy for production flows.[1] The structure of province exports is then combined with a product level indicator of capital intensity built by UNCTAD (Shirotori et al., 2010) to calculate a measure of capital intensity of Italian provinces' export baskets.

Our findings suggest that an increase in the number of migrants relative to population at province level translate into a reduction of the weighted average capital intensity of exports of that province. This result is confirmed when an instrumental variable (IV) strategy is adopted to account for the potential endogeneity of migration inflows. In particular, our IV relies on the distribution of residency permits released in 1994. We show that the OLS estimate is biased towards zero, in line with migrants' concentration in the wealthier and more capital intensive areas within Italy. Furthermore, when we differentiate immigrants according to their country of origin, we find that the baseline result is led by migrants from low and middle income economies.

Our results hold to a number of sensitivity checks, including the use of different IVs and the adoption of further second stage indicators measuring the skill intensity of goods (Shirotori et al., 2010), as well as their sophistication level (Hausmann et al., 2007). Other robustness we perform involve including further controls to our baseline specification and estimating alternative models.

The same evidence emerges when we move to a product-province level specification. We regress exports at province-product level on the interaction between province migrant share and product capital intensity, while controlling for time-varying specificities with province-year and product-year fixed effects. The sign of the coefficient associated to the interaction of interest is negative and statistically significant, both when using export values and quantities for its calculation. Rather than affecting the total level of manufacturing, low skilled migration tends to foster more the production of labour intensive goods compared to that of capital intensive goods.

When we explore the potential underlying mechanisms driving our results, we find that a larger pool of foreign workers promotes the local reshoring of less capital intensive productions and the creation of new firms in less capital intensive industries.

Our work falls in the growing literature on the impact of migration on the production structure of the receiving country. An increase in the availability of low-skilled migrant workers could affect production techniques within sectors and, ceteris paribus, cause a Rybczynski effect by reallocating resources toward low skill intensive sectors. In this respect, recent empirical contributions have investigated the within- and between industry impact of foreign labour. Evidence in favour of within-industry changes in the factor intensity of production techniques, rather than between-industry adjustments in output, has been found in Spain and Germany (Gonzales and Ortega, 2011, Dustmann and Glitz, 2015, respectively) consistently with findings for Israel and the US (Lewis, 2003; Gandal et al., 2004; Card and Lewis, 2007). Instead, a relevant role for between-industry adjustments has been recently found by Bratsberg et al. (2017) who investigate the impact of the increased migration flows deriving from the EU enlargement of 2004 and 2007 on sectoral growth and structural change in Norway. Their results,

[1] Production flows by province are available from the PRODCOM database. However, unlike exports that are recorded at plant level, production is recorded at firm level. Therefore, this source cannot be used for an empirical framework where identification relies on geographical variation as firms operating with plants in different provinces have an important weight in manufacturing production. In the robustness check we address potential pitfalls resulting from the use of exports instead of production flows.

instead, suggest that migration led to significant changes in relative wages across industries, thus enabling those sectors intensive in the use of occupations particularly affected by immigration to grow faster than others.

At firm level, Mitaritonna et al. (2011) have explored the impact of the local supply of immigrants on firms' outcomes in France. They find that an increase in the local presence of foreign born workers positively affect firms' total factor productivity, their capital stock, export and wages paid to native workers. On the contrary, Lewis (2011) shows that the immigration-induced increase in the supply of low-skilled workers in the US metropolitan areas significantly induces firms to adopt less machinery per unit of output. Similarly, Bettin et al. (2014) adopt a production theory approach and, for the case of the Italian manufacturing, find that an increase in the adoption of foreign labour may both favour the use of less skill intensive techniques and change the manufacturing industry mix in favour of low skill intensive sectors. For Italian provinces in the period 1995-2006, De Arcangelis et al. (2015) find that a doubling in the ratio of foreign-born residents to the province population induces a sizeable and significant increase in manufactures' value added with respect to services' value added. This highlights the fundamental role of the migrant labour force in maintaining and increasing manufacturing value added in Italy.

Our work is also close to the work examining the effects of immigration on innovation and comparative advantage (Bosetti et al., 2015; Bahar and Rapoport, 2017), which for the case of Italy delivers no significant evidence on the number of patents applications and firms self-reported innovation by firms (Bratti and Conti, 2017). Finally, with our focus on relocation we also contribute to the incipient literature on the role of immigrants in influencing firms' participation to global production networks and their offshoring strategies (Egger et al., 2019; Olney and Pozzoli, 2020).

Within these areas of research, we provide our contribution by exploring the changes brought by migrants to the composition of manufacturing with the goal of shedding light on the type of production fostered by their presence in the host economy. In particular, we extend the scope of previous work by using a detailed definition of the production structure at province level based on more than 1,200 products. Our approach adds to and extends the state of the art based on industry level studies which mostly support migration-led within-industry adjustments of factor usage in production and discard between-industry adjustments in the output mix. In this sense, the empirical framework we use uncovers results that lead us to suggest that the absence of relevant evidence on between-industry adjustments could either be context-specific or depend on the high aggregation of the data previously used. The industry level aggregation used by previous studies can hide changes in the product mix (Gonzales and Ortega, 2011; Lewis, 2003; Card and Lewis, 2007). The latter could occur at a finer disaggregation level, since, within industries goods are characterised by heterogenous factor requirements and goods with similar factor intensities can be manufactured by different industries (Schott, 2001; Lewis, 2013). By the same token, the firm level detail of some existing studies (Dustmann and Glitz, 2015) could hinder the identification of changes in the output mix due to migration as most firms within industries are multi-product and can produce goods belonging to different industries (Bernard et al., 2010). For these reasons, a product level detail can be considered more effective in delivering an answer on changes in the output mix caused by migration.

As a further contribution of our work, we bring additional evidence on the channels behind the migration-growth nexus, by shedding light on the relevant role played by reshoring strategies and new entrepreneurs' decisions.

The rest of the paper is structured as follows. The next section presents some anecdotal evidence on the role of immigrants in the production structure of Italian districts. Section 3 presents the data used, the empirical model applied and discusses some estimation issues. Section 4 presents the results, the robustness checks and a few extensions of the baseline model. Section 5 explores the mechanisms driving our results. Finally, Section 6 discusses the implications of our findings and concludes.

2 Italian manufacturing and migration: some anecdotal evidence

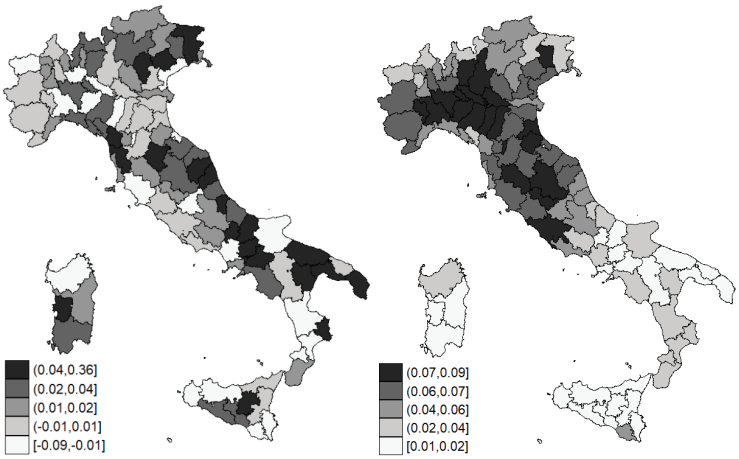
Our empirical application focuses on the Italian manufacturing sector. Italy represents an interesting case study for a number of reasons. First, immigration to the country rose dramatically over the period we analyse: from 2.7% in 2007 to 7.5% in 2011. Second, in 2011 95% of immigrants came from low and middle income countries and were mostly low skilled workers. The ISTAT labour force survey reports that in that year immigrants represented 14% of workers with no or primary education and only about 10% of the remaining workers. Also, about 84% of immigrants were employed as blue collars, as opposed to 51% of native workers. Immigrants' presence was higher in manufacturing (36% compared to 33% in other industries) and, in line with the evidence by Peri and Sparber (2009), within finely defined manufacturing sectors and occupation categories immigrants performed less interactive and especially more manual task intensive jobs.[2] Third, Italy's production structure concentrates mostly on labour intensive goods.

Moreover, Italy's manufacturing is characterised by several specific features, which are relevant for our study. One important aspect is the production of several high labour intensive products that entail a great deal of craftwork (the so-called *Made in Italy*) and are often produced within production clusters/districts spanning across one or more provinces. The use of traditional craft methods by expert artisans makes most of these consumer goods highly appreciated by domestic and foreign consumers alike. Another feature is that, although Italy's flagship products typically belong to labour intensive industries, there is some heterogeneity across goods belonging to the same industry as well as across their different components, which are the outcome of production stages with different labour intensity. Take for instance the footwear industry where the two main parts of a leather shoe, the upper and sole, are quite heterogeneous in terms of input intensity used for their production. The manufacture of uppers is highly labour-intensive: it consists of countless craft processes, which require expert manual workers to design, cut and stitch the many pieces that make up a single upper. The production of soles, instead, entails repetitive activities and, for this reason, is typically executed by means of specialised machinery and automated processes. The last, but not least important, feature of the industry under scrutiny is the role played by the recent flow of immigrant workforce in favouring the production of local labour intensive goods and components over our period of analysis. The latter point emerged based on the interview with the President of the footwear manufacturers of the Central Adriatic Confindustria. He indicated that the shoe industry, especially the upper producing segment, at the beginning of the 2000s faced several difficulties for two main reasons.[3] First, the shortage of labour supply to carry out manual/craft intensive tasks; and second, increased and unprecedented competitive pressure from low labour cost countries. As a result, several producers of uppers were either forced out of the market or pushed to offshore their production to low labour cost locations, in particular to the newly annexed EU countries. The main issue was, and still is, the high cost of manual labour in Italy compared to that in new EU members, which is exacerbated by the difficulty of finding local workers with the appropriate abilities to perform the manual tasks required by the production of uppers. In this framework, the increased presence of immigrants has started to represent an opportunity to fill the void left by native workers in the local supply of craft work. Immigrant workers have fostered the local production of shoes both as new labour force within domestic firms and as new entrepreneurs active in

[2] For the year 2011 we matched information on the task intensity of each 3-digit CP occupations, collected from the ICP database on the content of jobs in Italy developed by INAPP, with the labour force surveys available from ISTAT. On this data we run a regression of occupational interactive and manual task intensities on several individual and job characteristics as well as 4-digit industry and 2-digit occupation dummies. In all cases the dummy for foreign-born workers is statistically significant. Also, we run the Kolmogorov-Smirnov test on the equality of distribution of the residuals from the above regressions, with the exclusion of the foreign-born dummy from the specification, between immigrants and native workers and in all cases equality is rejected. Results are available upon request.

[3] The interview took place in June 2018 in Montegranaro a small town in the Marche region, home to one of the Italian shoe districts.

Figure 1: Changes in Capital Intensity (left) and Migration (right) across Italian Provinces (2003-2011)



the production of uppers. The story of the shoe industry can represent a archetypal example on how the immigrant workforce, representing in 2011 around 10% of workers in the Italian manufacturing, has supplemented the local labour supply and sustained the production of local labour intensive components and final goods which represent the most successful *Made in Italy* export products.[4] Figure 1 corroborates this anecdotal evidence by showing the positive association existing between the increase in the presence of migrants and the reduction of the weight of capital intensive goods' production across Italian provinces, especially those in the North and Center of the country.
All in all, we take this information as the starting point of our analysis and build our empirical analysis below accordingly.

[4]The story of the shoe industry is common to other sectors too. A toy producer, who used to purchase electronic components from China, has recently decided to bring back its production to Italy and create and exploit employment opportunities at home.

3 Empirical framework and identification strategy

3.1 Data

The Italian Statistical Institute (ISTAT) keeps record of the resident population at January 1 of each year and makes it available through the GeoDemo portal. We use this source to collect information on foreign residents by nationality at province level for each year between 2003 and 2011 included. The number of provinces, which correspond to the areas belonging to the third level of the NUTS classification (NUTS3), increased from 103 to 107 during our period of analysis. For data consistency, we maintain the 103 provinces initially identified throughout the years of our sample.[5]

To compute the capital intensity of Italian provinces, we use data from different sources. We start by collecting information on capital intensity at product level. In particular, we rely on the indicator developed by UNCTAD for products classified in HS1996 at the 6-digit level (Shirotori et al., 2010). The indicator mimics the calculation of the PRODY indicator put forth by Hausmann et al. (2007) and is based on the assumption that products' factor intensities reflect the factor endowment of the exporting countries. The capital intensity measure that we adopt is, then, calculated as follows:

$$K_g = log(\sum_c \frac{\frac{X_{cg}}{X_w}}{\sum_c \frac{X_{cg}}{X_w}} \times \frac{CapitalStock_c}{Workers_c})$$

where K_g is the capital intensity of good g and is equal to the log weighted average of the capital stock per worker of the countries exporting that good. The weight of each country c is equal to the country's weight in the world exports of good g in 1998 (reference year).

Going back to our anecdotal evidence, K_g for the production of soles (HS640620) is about 65000\$, while for the production of uppers (HS640610) is around 25000\$. For our purpose, we collapse the indicator at 4-digit level. In this case, we compare as an example the capital intensity of a safety headgear (HS6506), which is around 82000\$, to that of a knitted or crocheted headgear (HS6505), which is about 17000\$. Hence, it is evident that goods importantly vary in their capital intensity even within the same industry. Table B1 in Appendix B shows that within any 2-digit manufacturing industry there exists a high heterogeneity across HS 4-digit product categories in terms of their capital intensity.

Next, we collect export flows by province as a proxy for production levels from the ISTAT-COE database.[6] Export flows are recorded at NUTS3 level and classified in Common Nomenclature (CN) at the 8-digit level. Given the highly erratic nature of detailed territorial trade statistics, we choose to convert CN flows into the HS1996 classification at 4-digit level, which leaves us with more than 1,200 product codes. Nevertheless, in the robustness checks we will show that our baseline insights are corroborated when we replicate the analysis with 6-digit export flows.

Finally, we merge products' K_g with export flows by product and province and calculate the weighted average capital intensity of production at province level (K_p), which we use as our main dependent

[5]Data on the stock of migrants is also available for subsequent years. Nevertheless, in 2011 a major change occurred in the methodology for the calculation of the resident population. As reported by Albani and Simone (2015), since 1993 the data collection has been based on the "Indagine sulla Popolazione straniera", a yearly survey based on municipalities' registries. The first revision of the registry data took place at the time of the 2001 census, which produced new starting values of the foreign population. These were subsequently updated each year on the basis of the municipalities' registries. The data was further revised after the 2011 census, but this time the methodology used to update the foreign population was based on the use of the "Liste Anagrafiche Comunali" by means of recently introduced IT tools. Figures A1 and A2 in Appendix A describe these milestones. To avoid any inconsistency in the time series at province level, we consider 2010 as the last year of observation of the foreign population. Nevertheless, our results are confirmed when we run a robustness check using data up to 2013. Starting from this year, the Italian government only allowed the legal entry of mostly seasonal workers and a small share of legal workers. At the same time, starting in 2013 an increase in arrivals by boat of refugees also occurred (see Figure A3 in Appendix A). Consequently, more recent data on foreign residents could be an unreliable measure of the true presence of immigrants in the Italian provinces, especially for those areas more exposed to the arrival of refugees.

[6]This is a standard assumption in the literature on countries' specialisation (Hidalgo et al., 2007).

variable in the application below. For our purposes, we keep information on the manufacturing sector only.
We further select some variables from ISTAT and Eurostat at NUTS3 level (and, when not available, at NUTS2 level) that we use as baseline controls in our analysis.

3.2 Empirical model and estimation issues

To uncover the effect of immigration on the production structure of Italian provinces, we estimate the following empirical model:

$$K_{p,\,t} = \quad \alpha + \beta Migrants^{share}_{p,\,t-1} + \gamma X_{p,\,t-1} + \delta_p + \lambda_t + \epsilon_{pt} \tag{1}$$

where $K_{p,t}$ is the weighed average of capital intensity of province p at time t, $Migrants^{share}_{p,t-1}$ is the share of migrant residents in province p at time $t-1$, $X_{p,t-1}$ are a set of time-varying control variables, δ_p and λ_t are province and time fixed effects, respectively, and finally $\epsilon_{p,t}$ is the idiosyncratic error term.[7] In the estimation below, standard errors are clustered at NUTS3 level, unless otherwise specified. Table B3 in Appendix B reports descriptive statistics for the variables included in the baseline model.
The correct identification of the effect we are searching for is jeopardized by the potential endogeneity of immigration. More specifically, this issue stems from two forces pulling in opposite directions. On the one side, immigrants might reach provinces characterised by labour intensive productions where their labour endownment could easily match local labour demand. The omission of this unobserved effect may lead the OLS estimator to be downward biased. On the other side, immigrants might be attracted by provinces with capital intensive productions where wages are expected to be higher, the economic system may be more dynamic and offer better work opportunities. In this case, the OLS estimate would be biased upwards. All in all, the direction of the bias is uncertain and endogeneity, and especially reserve causality, can prevent the correct identification of the effect. To address this issue we implement an IV strategy. In particular, we rest on the use of the standard shift and share IV adopted by immigration studies (Altonji and Card, 1991; Card, 2001). Our baseline IV is built as follows:

$$IVperm^{94}_{pt} = \sum_{c=1}^{N} w^{1994}_{pc} * \frac{Migrants_{ct}}{Population^{1994}_{p}} \tag{2}$$

where w^{1994}_{pc} is the share of residency permits granted to migrants from country c in province p in 1994 on total permits released to immigrants from country c and $Migrants_{ct}$ is the number of immigrants from country c residing in Italy in year t. The presence of immigrants from country c in province p at time t is imputed according to the (pre-sample) 1994 distribution of permits to immigrants from country c across Italian provinces and is normalised over the total population of the province in the same year.[8]
Following Mitaritonna et al. (2011), we preliminary check the validity of our IV by controlling if its change between 2003 and 2011 is correlated with K_{pt} in 2002. Results of the corresponding regressions are in Table B2 in Appendix B and indicate a positive and non significant coefficient. Similar tests in Columns [2] and [3] of the Table are run by regressing the difference of the IV over the 2008-2011/2007-2011 sub-samples with the change in K_{pt} between 2003-2007/2003-2006. Results confirm that the two variables are unrelated.

[7] Baseline control variables include GDP, the share of manufacturing on total value added, the unemployment rate, the share of irregular workers and an indicator of export openness.

[8] In the robustness checks, we build alternative IVs using the distribution of permits in different pre-sample years, a different set of recipient countries other than Italy and a supply-driven measure of local migration obtained from an empirical model to assess the determinants of migration into Italian provinces.

4 Results

4.1 Baseline

Table 1 shows the baseline results of our model described in Equation (1). Column [1] reports the coefficient associated with our variable of interest from estimation of a pooled OLS. The estimate suggests a negative association between the share of immigrants in province p and the weighted average capital intensity of the goods produced by the corresponding province. This result is confirmed when province fixed effects are included in Column [2] and even when we cluster standard errors at NUTS2 level in Column [3]. The potential endogeneity of immigration is accounted for in Columns [4] and [5], where we report the second and first stage results, respectively, of the IV strategy described in Subsection 3.2. Column [4] reveals that OLS and FE estimates of the effect of immigrants on the local production structure are biased towards zero. This is in line with foreigners reaching the wealthier and more capital intensive production areas within Italy in search of better paid work opportunities. Standard first stage results, reported at the bottom of Column [5], reassure us that our instrument based on residency permits is a valid one. Finally, the validity of our instrument is confirmed when we relax the exclusion restriction, and we follow Conley et al. (2012) and implement the plausible exogenous estimation.[9]

Table 1: Baseline results

	[1]	[2]	[3]	[4]	[5]
	OLS	FE	FE cluster	2SLS-FE	
				Second	First
$Migrants^{share}_{p,\,t-1}$	-1.318*	-1.754***	-1.754***	-2.571**	
	[0.675]	[0.529]	[0.503]	[1.009]	
$IVperm^{94}$					0.352***
					[0.066]
Controls	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927
R^2	0.077	0.134	0.134		
# of NUTS3		103	103	103	103
Shea R^2					0.252
F-test					28.49

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.
All specifications include time and province fixed effects.
Notes: NUTS3 level GDP, share of manufacturing in value added, unemployment rate and export openness as well as the NUTS2 share of irregular workers are included in each specification and partialled out in the estimation. Robust standard errors in brackets are clustered by province with the exception of Column [3] where they are clustered by NUTS2 region.
Shea R^2 and F-test refer to the first stage Shea partial R-squared and F-statistic.

The estimated effect of Column [4] implies that an increase of one standard deviation in the presence of migrants within a province would reduce the capital intensity of local manufacturing by 0.042. As reported in the descriptive statistics in Table B3 in Appendix B, this effect corresponds to one third of the overall standard deviation of the capital intensity and 95% of its within standard deviation. More intuitively, the average increase in migration that we observe over our sample means that Italian firms produce less safety helmets (code HS6404) and more crocheted hats (HS6405) and/or more footwear with outer soles of rubber and uppers of textile material (HS6404) (see Figure A4 in Appendix A). Going back to our anecdote, our estimated effect means that on average it would take a 3 percentage point increase in migration to shift production from soles (HS640620) to uppers (HS640610) (see Figure A5

[9] For details see Appendix C.

in Appendix A).

4.2 Robustness

We perform a number of robustness checks to validate our results against potential pitfalls of our empirical analysis. This section summarises their main takeaways.

Alternative first and second stage variables The first part of our sensitivity analysis involves exploring the validity of our IV strategy by using different specifications of the instrumental variable to allocate the total stock of migrants across Italian provinces during our period of analysis. Columns [1]-[6] of Table 2 reports the corresponding estimates. We start by building alternative IVs using the distribution of residency permits in different pre-sample years. In Columns [1] and [2] we replace our baseline IV with one calculated using information on total permits granted on average between 1991 and 1994. Results confirm those previously found. In Columns [3] and [4] we instead exploit the distribution of permits in 1991. The baseline evidence is confirmed, despite the lower predictive power of this IV.[10] Last, we follow Ortega and Peri (2014) and Docquier et al. (2016) and, rather than using the imputed stock of migrants on the basis of past residence permits as instrument, we exploit it in a Poisson pseudo-maximum-likelihood regression of a gravity model predicting the provinces' stock of migrants by origin country. We get the predicted stock of migrants at province-country-year level from this model, but we exclude any province specific demand pull factor captured by the estimates of province-year dummies in order to isolate just the supply-driven component behind the migration stocks.[11] We sum these supply driven predicted stocks over all origin countries and normalise the total stock by provinces' population in 1994. In Columns [5]-[6] we show that our baseline evidence is robust to this additional IV. Overall, the alternative IVs all work in the same direction as our preferred one.

Finally, in Table B4 in Appendix B we corroborate our baseline finding by running a placebo experiment. We randomly attribute migration shares to Italian provinces and, as expected, the experiment leads to no effect at all.

Columns [7]-[10] of Table 2 present a set of robustness checks where alternative indicators replace the baseline dependent variable (K_p). At the outset, we consider the PRODY indicator put forth by Hausmann et al. (2007) and for which Columns [7] and [8] report the corresponding FE and 2SLS estimates, respectively. We confirm our baseline results and extend them by showing that immigration reduces province level production sophistication.[12]

Another second stage indicator we consider is the human capital index available from UNCTAD, which

[10] This result depends on the different countries of origin of migrants settled in Italy in 1991 compared to 1994. As the IV is based on the cluster of immigrants in enclaves, it works better when there is a good overlapping of nationalities throughout the years. Our main results still hold when we further calculate a set of IVs exploiting information on migration stocks to countries belonging to the EU12, rather than just to Italy. We also use different pre-sample, referred to year 1994, 1991 and to the average across 1991-1994, distributions of residency permits to calculate the IVs as above. This set of results are not shown for the sake of brevity but they are available upon request.

[11] The poisson model specification includes country-province and province-year dummies as well as origin country measures of GDP, unemployment rate, capital stock over GDP, secondary enrolment rate and export share. We tested several alternative specifications of the gravity model and in all cases our results hold.

[12] Worthy of note is that the use of alternative proxies for the incidence of migration led to substantially identical results. First, we calculated the migrant share in the province labour force rather than in the population. Second, we computed the share of foreign firms in total province firms and, finally we split the share of enterpreneurs and non-entrepeneurs immigrants in the local population. In all cases the evidence of a decline in the weighted avarage capital intensity of the local production is confirmed and our baseline effect is driven by the bulk of non-enterpreneur immigrants. This, however, does not completely rule out the role of immigrant firms which, indeed, is similar to our baseline effect and could be hindered by the higher variation of non-enterpreneur immigrants through time and across provinces.

is calculated by replacing the capital stock per worker in Equation (1) with the average years of schooling of the countries exporting good g. Columns [9] and [10] show the associated results from the FE and 2SLS model specifications, which further mimic previous evidence and reveal that immigration reduces the weight of skill intensive goods in province level production.
We thus provide further evidence that an increase in the stock of migrants reduces the sophistication and skill intensity of production within Italian provinces.

Alternative model specifications and measurements Another possible threat to our empirical analysis could emerge from an incorrect model specification.
To discard this possibility, we estimate Equation (1) over long differences. Table 3 presents the corresponding results. They show that our baseline findings are confirmed, although the estimated coefficients are slightly higher.
Also, we estimate a dynamic model by controlling for the lagged dependent variable and implementing a GMM estimator. Results are shown in Table 4 where OLS and fixed effects estimates of Columns [1] and [2] are compared to estimates obtained from a GMM estimator with transformation of the original model in first-differences in Column [3] and orthogonal deviations in Column [4]. In both cases, the coefficient associated with the lagged dependent variable lies between the OLS and FE estimates and the coefficient associated with the share of immigrants in a province is negative and significant. The long-run coefficient estimate of the effect of immigration, $\beta^{long\ run}$, has a magnitude that is comparable to the coefficient in the static specification, thus hinting at the minor role of dynamics in affecting the size of our main coefficient of interest.
Furthermore, our findings could be influenced by the use of exports as proxy for production to build our province level indicator, K_p. More specifically, our results could be driven by the widely documented migration effect on trade working through the information, network and preference channels (Rauch and Trinidade, 2002; White, 2007; Bettin and Turco, 2012; Bratti et al., 2014). To check that this is not the case, in Column [1] of Table 5 we exclude from the calculation of K_p export destinations that coincide with the top three countries of origin of migrants residing in that province. Results from this set of estimates assure us that our findings are not driven by the the information, network and preference channels.
In a similar vein, migrants could bend the production structure of the local market towards more labour intensive goods because of their consumption habits and preference for this type of products. We want to exclude the possibility that our baseline evidence captures a demand effect associated to migrants' consumption. For this reason, we estimate an empirical model where our province level indicator K_p does not include province level export flows of products defined as final consumer goods according to the BEC classification. The related estimates in Columns [2]-[3] of Table 5 allow us to confidently conclude that our main findings are not linked to migrants' higher demand of labour intensive products as the baseline evidence is driven by intermediate rather than consumption goods.
Table 5 shows one more set of robustness checks that we perform to deal with potential omitted variables at province level that could cause a spurious relation between migration and specialisation of the local production in less capital intensive products. In particular, we consider the significant North-South divide that characterises Italy. The Northern areas account for almost 55% of national GDP, while the South for just above 20%. These wide territorial differences may cause immigration to have a heterogeneous effect on the local production structure across the North, Center and South of the country. We control if this is the case by running two modified versions of our baseline specification. First, we include area-year dummies to our main model and second, we add a spatial lag to account for potential spatial autocorrelation in product specialisation. Our results on the effect of immigration on the local production structure are robust to these checks as well.[13] In Columns [8]-[11] we further

[13]We further extend the model to control for (i) local financial development; (ii) the share of population with tertiary education at NUTS2 level; (iii) brain drain and (iv) the capital intensity of province level imports. To perform these robustness

show that our result holds when we extend the sample period and when we exclude the crisis years from the estimation.
As an additional check, we replicate our baseline findings on a province level capital intensity measure based on the HS 6-digit, rather than 4-digit, export flows and our baseline insights are corroborated (Table B5 in Appendix B).
Also, we estimate an empirical model at province-product level both on export values and quantities. To this end, we replace our left hand side variable with the log of export value/quantity of product g from province p. Our right hand side variable of interest becomes the interaction between the product level measure of capital intensity, K_g, and the province level share of immigrants. A negative sign of the associated coefficient indicates that immigration causes a reshuffling of production from high to low capital intensive goods. The corresponding estimates are shown in Columns [1] to [5] of Table B6 in Appendix B and confirm that immigrants foster exports of less capital intensive goods, whether measured as export value or quantity. The same results hold in Columns [6]-[10] when we rest on the more disaggregated HS 6-digit level for export values and quantities. As indicated at the bottom of the table, the model includes all the set of relevant product-year, province-year and product-province fixed effects. Results of Columns [1] and, most importantly, [2] confirm that immigration produces a shift of resources in favour of low capital intensive manufacturing.
Furthermore, in order to check that our product-level approach is actually the most suitable at detecting the effect of migration on the output mix, we use data from the NBER industry database to compute the capital intensity for US industries at the 2- and 3-digit level. We use this measure to calculate the weighted average capital intensity of Italian provinces that we use as alternative left hand side variable in our empirical model. Results in Table B7 in Appendix B show that a higher level of aggregation in our empirical setting delivers a null effect of migration on the output mix.
Finally, we further dig into our baseline results to uncover the driving forces behind them. In particular, foreigners originate from countries at different stages of development and they could heterogeneously affect the production mix that we have documented. Migrants from developed economies, who are presumably high-skilled individuals, could exert a positive effect on the capital intensity of the local manufacture. Thus, the negative impact we observe could be entirely due to low-skilled migrants coming from developing countries. We test this hypothesis in Table 6 where we split our indicator of immigration into two measures depending on whether migrants' origin is a high- or low-income economy, $Migrants^{share}_{High}$ and $Migrants^{share}_{Low}$ respectively. Columns [1] and [2] show that our baseline results are exclusively driven by immigration from low-income countries. Coefficients associated with immigrants coming from high-income countries are positive albeit not significant, possibly due to the smaller presence in Italy of this group of foreigners relative to those coming from developing regions.

checks, we collect information on the number of banking branches at province level available from the Bank of Italy and kindly provided by Alberto Zazzaro. Information on the share of the population with tertiary education at NUTS2 level are from ISTAT. By exploiting ISTAT records of municipalities' registries on province-level immigrant and emigrant education levels we build a measure of brain drain. Results suggest that none of these potential determinants of the capital intensity of production at province level affects the role of immigration. Finally, we alternatively drop provinces with high/low immigration in 2002 and the baseline evidence is not affected. All this set of estimates is not shown for the sake of brevity and are available upon request.

Table 2: Alternative First and Second Stage Variables

	Alternative IVs						**Alternative second stage indicators**			
	Permits 1991-1994		**Permits 1991**		**Predicted IV**		**Prody**		**Skill Intensity**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
			2SLS				FE	2SLS-FE	FE	2SLS-FE
	second	first	second	first	second	first				
$Migrants^{share}_{p,\ t-1}$	-2.683**		-2.798*		-2.556***		-1.980***	-3.897**	-0.372**	-0.669**
	[1.119]		[1.430]		[0.955]		[0.600]	[1.558]	[0.167]	[0.310]
$IVperm_{9194}$		0.319***								
		[0.067]								
$IVperm_{91}$				0.153***						
				[0.051]						
$\hat{IVperm}^{Poisson}_{94}$						0.003***				
						[0.001]				
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Nr. Obs.	927	927	927	927	927	927	927	927	927	927
R^2	0.122		0.118		0.125		0.073	0.033	0.121	0.112
# of NUTS3	103	103	103	103	103	103	103	103	103	103
Shea R^2	0.218		0.0885		0.116			0.252		0.252
F-test	22.68		9.23		23.68			28.49		28.49

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
All specifications include time and province fixed effects. Fixed effects results for specifications of Columns [1]-[6] are not shown for the sake of brevity and are available upon request.

Table 3: Alternative model: long differences $\Delta K_{2011-2003}$

	OLS	2SLS	
		Second	First
	[1]	[2]	[3]
$\Delta Migrants^{share}_{p,2010-2002}$	-2.758***	-3.377***	
	[0.830]	[1.097]	
$\Delta IVperm_{94}$			0.340***
			[0.077]
Controls	yes	yes	yes
Nr. obs.	103	103	103
R^2	0.266		
Shea R^2			0.247
F-test			19.66

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets. .

Table 4: Dynamic Model

	[1]	[2]	[3]	[4]
	OLS	FE	GMM	
			First Difference	Orthogonal
$K_{p,t-1}$	0.953***	0.633***	0.523***	0.695***
	[0.017]	[0.093]	[0.119]	[0.091]
$Migrants^{share}_{p,t-1}$	-0.228***	-0.804***	-1.308***	-0.800**
	[0.069]	[0.278]	[0.471]	[0.379]
$\beta^{long\ run} = \frac{\beta}{1-\gamma_{K_{p\ t-1}}}$	-4.801**	-2.191***	-2.742***	-2.624***
	[2.258]	[0.678]	[0.807]	[0.929]
Controls	yes	yes	yes	yes
Nr. obs.	927	927	824	927
R^2	0.923	0.434		
# of NUTS3		103	103	103
Hansen			84.11	98.71
Hansen P-value			0.08	0.17
Hansen DF			67	86
AR(1)			-2.442	-1.504
AR(1) P-value			0.01	0.13
AR(2)			1.914	1.791
AR(2) P-value			0.06	0.07

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
All specifications include time and province fixed effects.

Table 5: Further Robustness Checks - 2SLS

	Exclusion of Top 3 Migration Origins	**Intermediate Goods**	**Final Goods**	**Area-Year Dummies**		**Spatial Lag**		**Extending to 2013**		**Excluding 2008-2009**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
	second	second	second	second	first	second	first	second	first	second	first
$Migrants_{p,t-1}^{share}$	-2.694**	-3.369**	-1.247	-3.838*		-2.384**					
	[1.051]	[1.464]	[1.110]	[2.133]		[1.093]		-1.912*		-2.488***	
								[1.024]		[0.960]	
$K_{p,t}^{Contiguous}$						0.142	-0.052***				
						[0.104]	[0.011]				
$IVperm^{94}$					0.198***		0.328***		0.348***		0.353***
					[0.072]		[0.060]		[0.070]		[0.067]
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927	927	927	1,133	1,133	721	721
R-squared	0.128	0.081	0.098	0.111		0.136		0.114		0.155	
# of NUTS3	103	103	103	103	103	103	103	103	103	103	103
Shea R^2	0.252	0.252	0.252	0.094		0.24		0.232		0.255	
F-test	28.49	28.49	28.49	7.499		29.65		24.55		28.05	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
All specifications include time and province fixed effects. Fixed effects estimates are not shown for the sake of brevity and are available upon request.

Table 6: Split by migrants' country of origin

		[1]	[2]	[3]
	FE	2SLS-FE		
		Second	First	
			$Migrants^{share}_{High}$	$Migrants^{share}_{Low}$
$Migrants^{share}_{High}$	9.506	9.546		
	[6.986]	[18.053]		
$Migrants^{share}_{Low}$	-1.835***	-2.442**		
	[0.543]	[1.101]		
$IVperm_{94\ High}$			0.419***	-0.764
			[0.129]	[1.393]
$IVperm_{94\ Low}$			0.000	0.0364***
			[0.003]	[0.064]
Controls	yes	yes	yes	yes
Nr. obs.		927	927	927
R^2		0.035		
# of NUTS3		103	103	103
Shea R^2_{High}			0.2	
F-test$_{High}$			7.44	
Shea R^2_{Low}				0.224
F-test$_{Low}$				15.95
Cragg Donald			85.895	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
All specifications include time and province fixed effects.

4.3 Extensions: migration and the structure of province specialisation

We now extend our empirical analysis to consider the role played by immigrants on (i) total exports at province level; (ii) the distribution of the capital intensity of products and (iii) the emergence of comparative advantages in new products. In Column [1] of Table 7 we find that immigration does not significantly affect total exports at province level. To further shed light on this finding, we split provincial exports above and below the median (Columns [2]-[3]) and by tercile (Columns [4]-[6]) of the capital intensity. We implement a 3SLS estimator and, despite the absence of any effect on total province exports, we show that immigrants increase the export of less capital intensive goods and contract the exports of the high capital intensive ones. When looking at terciles we find that this overall picture is mainly driven by the reshuffling of resources between intermediate and low capital intensive goods, while the total production of the high capital intensive goods is not affected.[14]

Table 7: Total Province Exports

	2 SLS	**3SLS**				
	Total Exports	**median**		**terciles**		
		Above	**Below**	**First**	**Second**	**Third**
	[1]	[2]	[3]	[4]	[5]	[6]
$Migrants_{p,t-1}^{share}$	-0.818	-5.942***	7.513***	7.673**	-9.271***	-3.192
	[4.279]	[2.059]	[2.645]	[3.429]	[2.521]	[2.903]
Controls	yes	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927	927
R-squared	0.544	0.989	0.982	0.975	0.983	0.982
# of NUTS3	103	103	103	103	103	103

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
All specifications include time and province fixed effects. Fixed effects estimates are not shown for the sake of brevity and are available upon request.

On the contrary, from Table 8 immigration does not affect the distribution of the capital intensity of the goods produced by provinces. We find no effect on the mean, the minimum, the first quartile, the median, the last quartile and the maximum of the capital intensity of the products exported by a province. This finding corroborates the view that migration heterogeneously affects the quantity produced of existing goods in favour of the less capital intensive ones, while it does not heterogeneously affect the introduction of goods produced within specific capital intensity quartiles. In this direction, we find that immigration helps fostering the extant local specialisation in labour intensive goods, while it does not play any role for the development of comparative advantages in new products, regardless of their capital intensity. Resting on the product-province sample, we build a measure of revealed comparative advantage (RCA) according to the symmetric version of the Balassa index (Balassa, 1965). Furthermore, we build a dummy taking value 1 if the province gains a revealed comparative advantage in product g, i.e. when the symmetric index moves from less or equal to 0 to a number higher than 0.02, compared to either one or two years before, and 0 otherwise. In Column [1]-[3] of Table 9 we find that the presence of migrants at province level strengthens RCAs disproportionately more for labour intensive goods than for the capital intensive ones[15] Meanwhile, when we focus on the acquisition of new

[14]This evidence is confirmed when we look at quartiles and quintiles of the province level distribution of goods' capital intensity.

[15]The effect of immigration on Italy's production structure that we uncover could actually operate especially in district areas. As a matter of fact, industrial districts constitute an important share of Italian manufacturing: in 2011 they absorbed more than a third of the total manufacturing labour force (ISTAT, 2015). To gain a better understanding of this issue, we split our sample into two subgroups based on the presence of districts in the province, namely district and non-district areas, and estimates reveal that our main evidence is actually driven by district areas. Results are available upon request.

RCAs in Columns [4]-[9], immigrants do not play any significant role for the probability to acquire new specialisations, regardless of the goods' capital intensity.[16]

Table 8: Province Level Distribution of Goods' Capital Intensity - 2SLS

	Mean	**Minimum**	**25th Percentile**	**Median**	**75th Percentile**	**Maximum**
	[1]	[2]	[3]	[4]	[5]	[6]
$Migrants^{share}_{p,t-1}$	-0.086	2.998	0.072	-0.228	-0.246	-0.036
	[0.236]	[2.601]	[0.729]	[0.322]	[0.170]	[0.418]
Controls	yes	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927	927
R^2	0.046	0.039	0.064	0.046	0.008	0.021
# of NUTS3	103	103	103	103	103	103

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
All specifications include time and province fixed effects. Fixed effects results are not shown for the sake of brevity and are available upon request.

Table 9: Revealed Comparative Advantage of Provinces

	RCA			**New RCA wrt t-1**			**New RCA wrt t-1/t-2**		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	FE	2SLS-FE		FE	2SLS-FE		FE	2SLS-FE	
		second	first		second	first		second	first
$K_g * Migrants^{share}$	-0.280***	-0.356***		-0.049	-0.141*		-0.007	-0.085	
	[0.081]	[0.138]		[0.046]	[0.079]		[0.055]	[0.094]	
$K_g * IVperm_{94}$			0.492***			0.483***			0.459***
			[0.006]			[0.006]			[0.006]
Nr. Obs.	927,927	927,927	927,927	728,798	728,798	728,798	621,788	621,788	621,788
R^2	0.834	0		0.31	0		0.304	0	
Fixed Effects									
NUTS3*year	yes	yes	yes	yes	yes	yes	yes	yes	yes
HS4*year	yes	yes	yes	yes	yes	yes	yes	yes	yes
NUTS3*HS4	yes	yes	yes	yes	yes	yes	yes	yes	yes
Shea R^2		0.372			0.379			0.368	
F-test		6726			6212			6143	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
Notes: K_g: capital intensity of HS 4-digit product g

[16] In this direction we find that immigrants do neither significantly foster the export of goods not previously exported nor the ceasing of already exported goods at province level, regardless of the products' capital intensity. Meanwhile, immigrants foster the export of more labour intensive goods among the added and continuing products, provided that goods are added or still produced. Results are not shown for the sake of brevity and are available upon request.

5 Migration and the local output mix: dissecting the channels

So far we have provided robust evidence of the negative nexus existing between the presence of migrants in the province and the weighted average capital intensity of local production. Why does a higher share of immigrants contribute to lower the weight of capital intensive goods in the local production structure? In this section we explore two potential mechanisms underpinning our results.

A first potential explanation is that immigrants might foster the relocation of production in the original province after being offshored to low labour cost locations. This substitutability between offshoring and migration has been confirmed in recent evidence at firm level for Denmark (Olney and Pozzoli, 2020). We test this hypothesis by estimating a model where the left hand side variable is the weight of imported goods relative to manufacturing value added at province level, while the right hand side variable of interest is the interaction between province migrant share and product capital intensity. For our purpose, we only consider goods that are produced in the pre-sample year, namely in 2002. Estimates are presented in Table 10. The positive coefficient associated with the interaction between province migrant share and product capital intensity suggests that immigration has fostered the import of more capital intensive goods relative to labour intensive ones. We take this result as evidence of the role of migrants in promoting the relocation of labour intensive goods back to Italy.

Another line of reasoning is related to the role played by immigrants in shaping entrepreneurs' decisions to start new businesses, particularly for the production of labour intensive goods. The presence of immigrants may change the entrepreneurs' incentives and may heterogeneously affect the profitability of new economic activities. To assess if this mechanism is at work, we collect data on firm entry for manufacturing sectors from the Union of the Chambers of Commerce (Unioncamere). Firms are classified into sectors according to the ATECO at the finely defined 4-digit level for a total of more than 250 manufacturing industries. We use this information to build the average capital intensity at province level for newly established firms $K_{p\,t}^{Firms}$, which we plug in Equation (1) as our left hand side variable. Results of Table 11 disclose that a higher share of migrants in the local population enhances the labour intensity of the newly established local businesses. As the ATECO classification underwent changes in 2002 and 2007, we replicate the estimates of Table 11 after a harmonisation procedure which delivers around 103 harmonised industry aggregates. Table B8 of Appendix B shows the corresponding results that confirm the above findings, despite of the higher industry aggregation level. It is worth highlighting that the higher industry aggregation level delivers smaller coefficients in absolute terms and a lower significance level. This evidence can support the importance of the aggregation level of the empirical analysis to inspect output mix effects.

Finally, similar insights emerge when we consider the number of new firms created in sector s and province p and regress it against the interaction between province migrant share and product capital intensity. As displayed by Table B9 in Appendix B the coefficient associated with the interaction term of interest is negative. This indicates that the increasing presence of foreigners encourages the creation of new firms in labour intensive sectors rather than in capital intensive ones.

Table 10: Dependent Variable: $(Imports/VA)_{gpt}$; Sample: goods produced in 2002

	Migrants		
	FE	2SLS-FE	
		Second	First
$K_g * Migrants^{share}$	0.001	0.003**	
	[0.001]	[0.001]	
$K_g * IVperm_{94}$			0.348***
			[0.007]
Nr. obs.	502,740	502,740	502,740
R^2	0.847		
Shea R^2		0.228	
F-test		2525	
Fixed Effects			
NUTS3*year	yes	yes	yes
HS4*year	yes	yes	yes
NUTS3*HS4	yes	yes	yes

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
K_g: capital intensity of HS 4-digit product g.

Table 11: Dependent Variable: $K_{p\,t}^{New\_Firms}$

	[1]	[2]	[3]	[4]	[5]	[6]
	FE		**2SLS-FE**			
			Second	First	Second	First
$Migrants^{share}$	-1.313***	-1.692***	-1.887***		-2.517***	
	[0.365]	[0.395]	[0.618]		[0.763]	
$K_{p\,t-1}^{Firms}$		0.512**			0.525***	0.033
		[0.198]			[0.201]	[0.036]
$IVperm_{94}$				0.328***		0.335***
				[0.060]		[0.062]
Controls	yes	yes	yes	yes	yes	yes
Nr. obs.	824	721	824	824	721	721
R^2	0.491	0.5	0.487		0.493	
# NUTS3	103	103	103	103	103	103
Shea-R^2			0.249		0.251	
F-test			29.803		29.567	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
Notes: time and province fixed effects are included in each specifications. The variable $K_{p\,t-1}^{Firms}$ in Columns [2], [5] and [6] measures the average capital intensity of existing firms.

6 Conclusions

We provide robust evidence of the impact of immigration on the product mix of the receiving country. Overall, our approach goes beyond most existing studies supporting within changes in the factor intensity of production techniques due to increased migration inflows. By using a detailed measure of the production structure at province level, we show that the absence of evidence supporting between industry adjustments in the output mix could be context specific or due to the high aggregation of the data used.

More specifically, we find that immigration increases the weight of labour intensive goods in Italian provinces' manufacturing production. This result is in line with the effects of standard trade models concerning the role of factor growth on product specialisation. Our findings suggest, in fact, that as a receiver of low skilled migrants, Italy has further consolidated its long lasting tradition in labour intensive manufacturing. Further investigation of this result reveals that it is driven by immigrants' role in promoting the relocation of previously offshored labour intensive production at home. Moreover, we also discover that a larger share of foreigners encourages the creation of new firms in labour intensive industries rather than in capital intensive ones.

In this day and age when there are ongoing discussions on the benefits and costs of migration, the results of migrants spurring the production of low capital/less sophisticated intensive goods may be controversial and casts doubts about their contribution to sustained long run growth. According to Hausmann et al. (2007) product specialisation matters for growth perspectives and more sophisticated products display a higher growth potential. Producing more sophisticated goods requires a wider pool of capabilities, relationship-specific investments, intangible assets, knowledge and a larger set of inputs (Nunn, 2007; Levchenko, 2007). Our findings could feed the perception that foreign workers may represents a burden, more than an opportunity, for the host economy, given the low growth enhancing potential of labour intensive industries. On the contrary, our work suggests that immigrants from low labour cost countries represent a backbone of manufacturing in countries, like Italy, whose specialisation bends in favour of more traditional, manual task intensive goods. Immigrants foster the expansion and maintenance of manufacturing activities in local districts and help deepening comparative advantage in labour intensive goods by reshoring productions and spurring the formation of new firms. Therefore, policy actions should be devoted to further expand the participation of immigrants into manufacturing productions to sustain and strengthen the production of the more labour intensive *Made-in-Italy* goods. Our results, in fact, suggest that immigrants help preserving the *know-how* of manual craftwork at the heart of Italy's comparative advantage. Nonetheless, this target should be balanced with the need to support territories in diversifying into more sophisticated productions.

References

ALBANI, M. AND M. SIMONE (2015): "Gli stranieri residenti per genere e cittadinanza: la stima per comune negli anni successivi al censimento," *RIVISTA DI STATISTICA UFFICIALE*, 3, 71–102.

ALTONJI, J. G. AND D. CARD (1991): *The Effects of Immigration on the Labor Market Outcome of Less-skilled Natives*, University of Chicago Press, chap. Immigration, Trade, and the Labor Market, 201–234.

BAHAR, D. AND H. RAPOPORT (2017): "Migration, knowledge diffusion and the comparative advantage of nations," *The Economic Journal*, Forthcoming.

BALASSA, B. (1965): "Trade Liberalisation and Revealed Comparative Advantage," *Journal of Financial Economics*, 33, 99–123.

BERNARD, A., S. REDDING, AND P. SCHOTT (2010): "Multiple-product Firms and product switching," *American Economic Review*, 100, 70–97.

BETTIN, G. AND A. L. TURCO (2012): "A Cross-Country View on South-North Migration and Trade: Dissecting the Channels," *Emerging Markets Finance and Trade*, 48, 4–29.

BETTIN, G., A. L. TURCO, AND D. MAGGIONI (2014): "A firm level perspective on migration: the role of extra EU workers in Italian manufacturing," *Journal of Productivity Analysis*, 42, 305–325.

BOSETTI, V., C. CATTANEO, AND E. VERDOLINI (2015): "Migration of skilled workers and innovation: A European perspective," *Journal of International Economics*, 96, 311–322.

BRATSBERG, B., A. MOXNES, R. ODDBJORN, AND K. H. ULLVEIT-MOE (2017): "Opening the floodgates: Immigration and Structural Change," Working paper.

BRATTI, M. AND C. CONTI (2017): "The effect of immigration on innovation in Italy," *Regional studies*.

BRATTI, M., L. DE BENEDICTIS, AND G. SANTONI (2014): "On the pro-trade effects of immigrants," *Review of World Economics*, 3, 557–594.

CARD, D. (2001): "Immigration inflows, native outflows, and the local labour market impacts of higher immigration," *Journal of Labour Economics*, 19, 22–64.

CARD, D. AND E. G. LEWIS (2007): *The diffusion of Mexican immigrants during the 1990s: Explanations and Impacts*, University of Chicago Press, chap. 6.

CONLEY, T. G., C. B. HANSEN, AND P. E. ROSSI (2012): "Plausibly Exogenous," *The Review of Economics and Statistics*, 94, 260–272.

DE ARCANGELIS, G., E. DI PORTO, AND G. SANTONI (2015): "Migration, Labour Tasks and Production structure," *Regional Science and Urban Economics*, 53, 156–169.

DE BENEDICTIS, L. (2005): "Three decades of Italian comparative advantage," *World Economy*.

DOCQUIER, F., E. LODIGIANI, H. RAPOPORT, AND M. SCHIFF (2016): "Emigration and democracy," *Journal of Development Economics*, 120, 209–223.

DUSTMANN, C. AND A. GLITZ (2015): "How do industries and firms respond to changes in local labour supply," *Journal of Labour Economics*, 33, 711–750.

EGGER, P. H., K. ERHARDT, AND A. LASSMANN (2019): "Immigration and firms' integration in international production networks," *European Economic Review*, 111, 1 – 34.

EUROSTAT (2017): "Eurostat Statistical Database on Migration and Migrant population," Online database.

GANDAL, N., G. H. HANSON, AND M. J. SLAUGHTER (2004): "Technology, trade, and adjustment to immigration in Israel," *European Economic Review*, 48, 403–428.

GONZALES, L. AND F. ORTEGA (2011): "How do very open economies adjust to large immigration flows?" *Labour Economics*, 18, 57–70.

HAUSMANN, R., J. HWANG, AND D. RODRIK (2007): "What you export matters," *Journal of Economic Growth*, 12, 1–25.

HIDALGO, C. A., B. KLINGER, A.-L. BARABÁSI, AND R. HAUSMANN (2007): "The product space conditions the development of nations," *Science*, 317, 482–487.

ISTAT (2015): "I distretti industriali 2011," Tech. rep., ISTAT.

LARCH, M. (2005): "Stuck in a rut? Italy's weak export performance and unfavourable product specialization," *ECFIN Country Focus*, 2, 1–6.

LEVCHENKO, A. A. (2007): "Institutional Quality and International Trade," *The Review of Economic Studies*, 74, 791–819.

LEWIS, E. G. (2003): "Local, Open Economies within the U.S.: How Do Industries Respond to Immigration?" FRB Working Paper 04-01, Federel Reserve Bank of Philadelphia.

——— (2011): "Immigration, skill mix and capital-skill complementarity," *The Quarterly Journal of Economics*, 126, 1029–1069.

——— (2013): "Immigration and production technology," *Annual Review of Economics*, 51, 165–191.

MITARITONNA, C., G. OREFICE, AND G. PERI (2011): "Immigration and Firms' Outcomes: Evidence from France," *European Economic Review*, 96, 62–82.

NUNN, N. (2007): "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade," *The Quarterly Journal of Economics*, 122, 569–600.

OLNEY, W. (2013): "Immigration and firm expansion," *Regional Science*, 53, 142–157.

OLNEY, W. W. AND D. POZZOLI (2020): "The Impact of Immigration on Firm-Level Offshoring," *The Review of Economics and Statistics*.

ORTEGA, F. AND G. PERI (2014): "Openness and income: The roles of trade and migration," *Journal of International Economics*, 92, 231–251.

PERI, G. AND C. SPARBER (2009): "Task specialization, immigration and wages," *American Economic Journal: Applied Economics*, 1, 135–169.

RAUCH, J. AND V. TRINIDADE (2002): "Ethnic Chinese Networks in international Trade," *The Review of Economics and Statistics*, 84, 116–130.

SCHOTT, P. (2001): "Across-product versus within product specialization in International Trade," *Journal of Labour Economics*, 19, 22–64.

SHIROTORI, M., B. TUMURCHUDUR, AND O. CADOT (2010): "Revealed Factor Intensity Indices at the Product Level," UNCTAD Blue Series Papers 44, United Nations Conference on Trade and Development.

WHITE, R. (2007): "Immigrant-trade links, transplanted home bias and network effects," *Applied Economics*, 39, 839–852.

A Additional Figures

Figure A1: Timeline of foreign residents' records

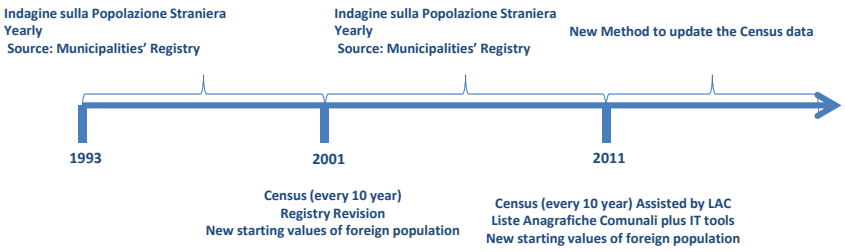
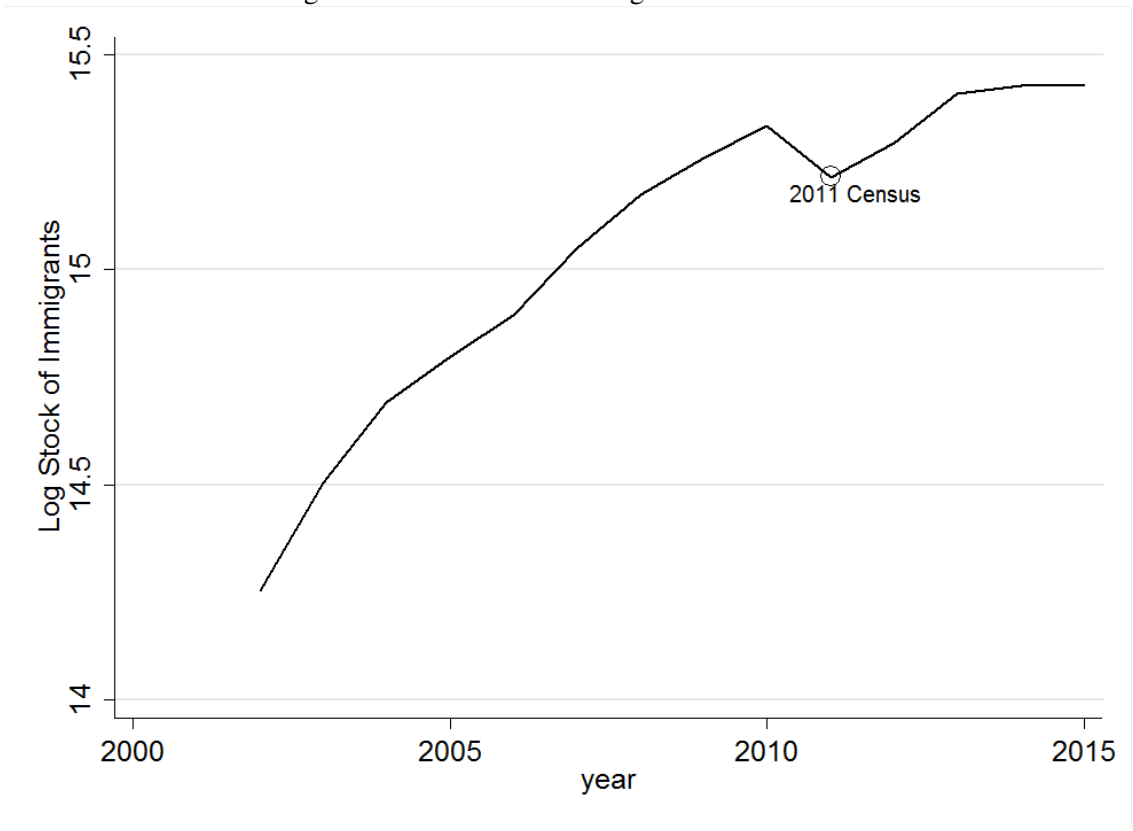
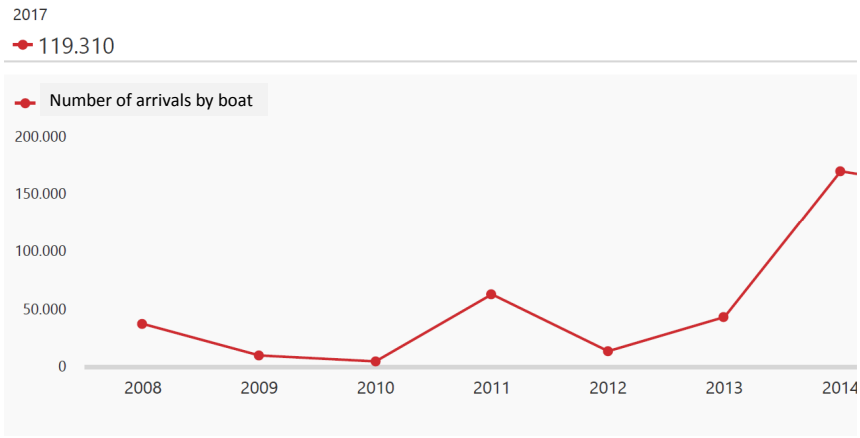


Figure A2: Evolution of immigration: 2000-2015



Source: Istat, GeoDemo portal. Own Calculations.

Figure A3: Number of arrivals by boat: 2008-2014



Source: Openpolis on data from Ministry of Internal Affairs and ISMU. $https://www.openpolis.it/numeri/gli-sbarchi-italia-negli-ultimi-10-anni/$

Figure A4: From capital intensive to labour intensive products

Figure A5: From soles to uppers

B Additional Tables

Table B1: Minimum and Maximum of the Capital Intensity of Products by 2 digit Industry

2 digit NACE Rev. 2 Industry	Capital Intensity	
	Minimum	Maximum
Food	3907	132023
Beverages	12933	61299
Textile	2542	114219
Apparel	6487	66794
Footwear	3907	68703
Wood	5091	103175
Paper	22499	136319
Chemicals	4108	146314
Pharmaceutical	23854	124627
Plastics	23020	99654
Non Met. Mineral Products	5185	121098
Metals	7464	142303
Metal Products	6423	125633
Computer	23503	105930
El. Equip.	18004	121098
Machinery	12508	153467
Motor vehicles	5578	83081
Other Transport eq.	3565	148906
Furniture	44687	56094
Manufacturing, nec	2055	113943

Table B2: Testing the Validity of the IV

	$\Delta IVperm^{94}_{p\ 2011/2003}$	$\Delta IVperm^{94}_{p\ 2011/2008}$	$\Delta IVperm^{94}_{p\ 2011/2007}$
	[1]	[2]	[3]
$K_{p,\ 2002}$	0.019		
	[0.019]		
$\Delta K_p^{2007/2003}$		-0.019	
		[0.012]	
$\Delta K_p^{2006/2003}$			-0.035
			[0.022]
Nr. Obs.	103	103	103
R^2	0.011	0.016	0.016

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.

Table B3: Descriptive Statistics

		Mean	Std. Dev.	Observations
K_p	overall	11.370	0.138	N = 927
	between		0.131	n = 103
	within		0.045	T = 9
$Migrants_p^{share}$	overall	0.049	0.031	N = 927
	between		0.026	n = 103
	within		0.017	T = 9
GDP_p	overall	9.185	0.797	N = 927
	between		0.798	n = 103
	within		0.066	T = 9
$gva\_manuf_p^{share}$	overall	0.169	0.080	N = 927
	between		0.079	n = 103
	within		0.0122	T = 9
$unempl_p$	overall	7.752	4.507	N = 927
	between		4.315	n = 103
	within		1.360	T = 9
$irreg\_lab_p$	overall	12.689	4.801	N = 927
	between		4.750	n = 103
	within		0.858	T = 9
exp_open_p	overall	0.200	0.144	N = 927
	between		0.139	n = 103
	within		0.042	T = 9

Table B4: Placebo Test

	[1] OLS	[2] FE	[3] FE cluster	[4] 2SLS-FE	[5]
				Second	First
$Migrants_{p,\,t-1}^{share}$	-0.232	-0.22	-0.22	0.092	
	[0.456]	[0.417]	[0.354]	[0.920]	
$IVperm^{94}$					0.513***
					[0.071]
Controls	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927
R^2	0.056	0.09	0.09	0.087	
# of NUTS3		103	103	103	103
Shea R^2					0.381
F-test					51.46

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Notes: NUTS3 level GDP, share of manufacturing in value added, unemployment rate and export openness as well as the NUTS2 share of irregular workers are included in each specification and partialled out in the estimation.

Table B5: Baseline results - HS 6 digit export flows

	[1] OLS	[2] FE	[3] FE cluster	[4] 2SLS-FE	[5]
				Second	First
$Migrants^{share}_{p,\,t-1}$	-0.89	-2.143**	-2.143***	-4.429**	
	[0.667]	[0.863]	[0.726]	[1.829]	
$IVperm^{94}$					0.352***
					[0.066]
Controls	yes	yes	yes	yes	yes
Nr. obs.	927	927	927	927	927
R^2	0.047	0.051	0.051	0.012	
# of NUTS3		103	103	103	103
Shea R^2				0.252	
F-test				28.49	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. All specifications include time and province fixed effects. Robust standard errors in brackets are clustered by province with the exception of Column [3] where they are clustered by NUTS2 region.

Table B6: Alternative model: province-product level evidence

	HS 4 digit					HS 6 digit				
	Value		Quantity			Value		Quantity		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	FE	IV-FE	FE	2SLS-FE		FE	IV-FE	FE	2SLS-FE	
		second		second	first		second		second	first
$K_g * Migrants^{share}$	-2.622***	-3.469**	-2.995***	-5.639***		-2.049***	-3.080***	-2.552***	-4.032***	
	[0.884]	[1.734]	[0.996]	[2.023]		[0.456]	[1.032]	[0.510]	[1.170]	
$K_g * IVperm_{94}$					0.358***					0.297***
					[0.007]					[0.004]
Nr. Obs.	505,520	505,520	505,218	505,218	505,218	1,396,202	1,396,202	1,395,237	1,395,237	1,395,237
R^2	0.853	0	0.845	0		0.81	0	0.813	0	
Fixed Effects										
NUTS3*year	yes	yes	yes	yes	yes	yes	yes			
HS4*year	yes	yes	yes	yes	yes	yes	yes			
NUTS3*HS4	yes	yes	yes	yes	yes	yes	yes			
Shea R^2		0.237		0.237			0.187		0.186	
F-test		2995		2991			6337		6343	

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
K_g: capital intensity of HS 4-digit product g

Table B7: Province output mix based on NBER industry-level indicators of capital intensity

	2 digit		**3 digit**	
	[1] FE	[2] 2SLS-FE	[3] FE	[4] 2SLS-FE
$Migrants^{share}_{p,\,t-1}$	-0.556	0.538	-0.819	-0.626
	[1.457]	[2.086]	[1.047]	[1.370]
Controls	yes	yes	yes	yes
Nr Obs.	927	927	927	927
R^2	0.12	0.941	0.15	0.965
Shea R^2		0.252		0.252
F-test		25.27		25.27

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
All specifications include time and province fixed effects.

Table B8: Dependent Variable: $K^{New\_Firms}_{p\,t}$ - Harmonised Classification

	FE		**2SLS-FE**			
			Second	First	Second	First
	[1]	[2]	[3]	[4]	[5]	[6]
$Migrants^{share}$	-0.519**	-0.524**	-1.040***		-0.935**	
	[0.213]	[0.249]	[0.362]		[0.415]	
$K^{Firms}_{p\,t-1}$		0.355**			0.341**	0.033
		[0.170]			[0.162]	[0.066]
$IVperm_{94}$				0.352***		0.332***
				[0.067]		[0.061]
Controls	yes	yes	yes	yes	yes	yes
Nr. obs.	927	824	927	927	824	824
# of NUTS3	103	103	103	103	103	103
R^2	0.105	0.108	0.09		0.101	
Shea R^2				0.255		0.249
F-test				27.606		29.723

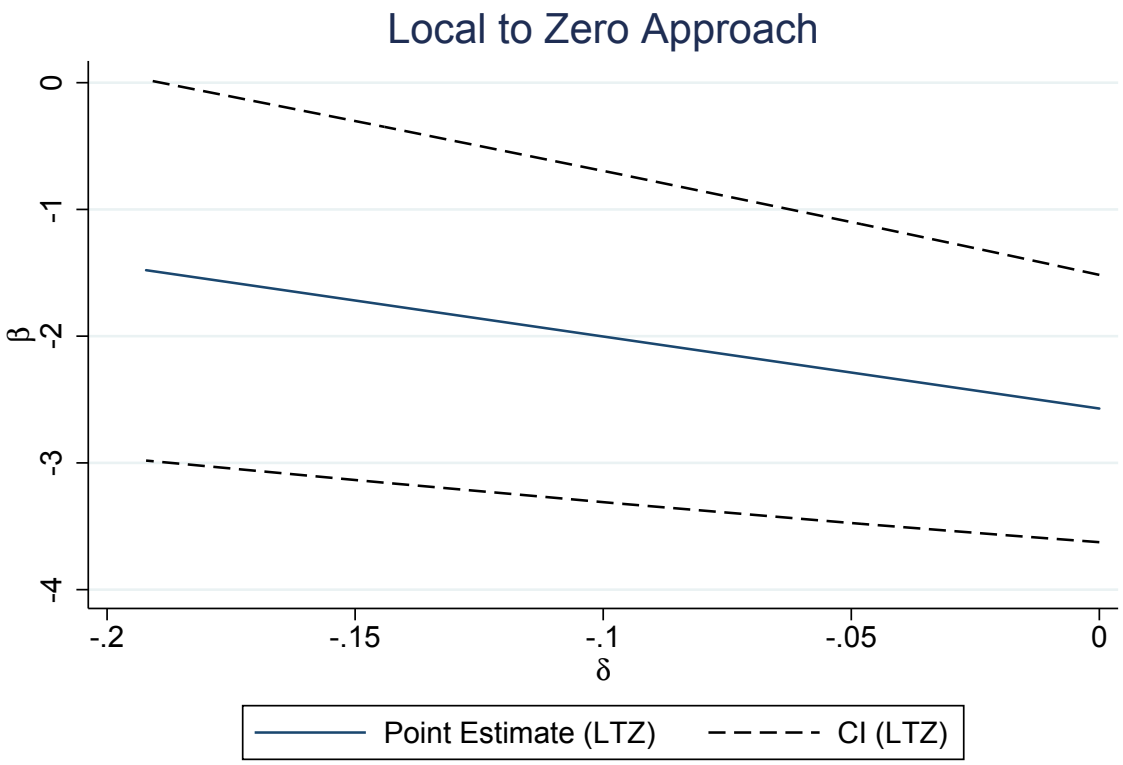
* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets are clustered by province.
Notes: time and province fixed effects are included in all the specifications. The variable $K^{Firms}_{p\,t-1}$ in the specifications of Columns [2], [5] and [6] measures the average capital intensity of existing firms.

Table B9: Dependent Variable: $N_{ps\ t}^{New\_Firms}$ - 2SLS

	[1]	[2]	[3]	[4]
	FE		2SLS-FE	
$K_s * Migrants^{share}$	-3.121***	-2.312**	-3.473**	-3.229*
	[0.761]	[1.126]	[0.979]	[1.210]
$N_{ps\ t-1}^{active}$		-0.223***		-0.223***
		[0.007]		[0.007]
Observations	170,053	127,514	170,053	127,514
Fixed Effects				
NUTS3*year	yes	yes	yes	yes
Nace-4d*year	yes	yes	yes	yes
NUTS3*Nace-4d	yes	yes	yes	yes
Shea-R^2			0.368	0.343
F-test			3066	2828

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level. Robust standard errors in brackets.
K_s: capital intensity of NACE 4-digit industry s.
Specification of Column [2] includes the number of firms active in the province in year t-1, $N_{ps\ t-1}$.

Figure C1: Relaxing IV exogeneity



Methodology described in Conley et al. (2012)

C Plausibly exogenous estimation

We run a regression where we include our preferred IV among the right hand side variables of model 1 and we get an estimate of the corresponding γ coefficient equal to -0.384 with a standard error of 0.345. Then, we apply the local to zero method by assuming that γ is normally distributed with mean $\mu = 0$ and variance δ^2, with $\delta = \frac{\gamma}{2}$. The corresponding point estimate and 95% confidence interval of our β coefficient associated to our variable of interest under different hypotheses on the relaxation of the IV exogeneity is available in Figure C1. The figure shows that the estimated coefficient associated with the variable of interest is always negative and quite different from zero.