Does Emigration Shape Local Specialization? Evidence from Italy

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Abstract

This study examines the impact of emigration on local specialization. We focus on the significant rise in emigration rates among the working-age population from Italian provinces following the 2008–2009 economic crisis. Using panel data at the province and province-product level for 2006–2012, we show that emigration reduces exports of high human capital-intensive and high-quality products. These findings are robust to an instrumental variable strategy and reflect the high-skill profile of emigrants from Italian provinces. Our results suggest that high-skilled emigration can reshape local production structures, limiting the capacity to sustain skill-intensive production.

Keywords: Emigration, human capital, Italy, local specialization, product structure.

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1 Introduction

Migration is a central issue in both academic and political debates. As of 2020, approximately 4% of the global population lived outside their country of origin (United Nations Department of Economic and Social Affairs, 2020), with around two-thirds of international migrants classified as labour migrants (International Organization for Migration (IOM), 2019). Within this broader phenomenon, the migration of high-skilled individuals - those holding tertiary education degrees (International Labor Organization (ILO), 2023) - has attracted significant attention from economists and policymakers, owing to their disproportionately high mobility and the complex social and economic implications of their migration entails for both origin and destination countries (International Labor Organization (ILO), 2023). Individuals with higher levels of education, cognitive ability, and adaptability, indeed, are more likely to migrate, as these attributes facilitate adjustment to new environments (Bütikofer and Peri, 2021; Organisation for Economic Co operation and Development (OECD), 2020).

While the economic impact of high-skilled emigration has long been a pressing concern for low- and middle-income countries, in recent decades it is increasingly becoming a structural challenge for high-income economies as well. In particular, Southern European countries have faced persistent and large-scale outflows of highly skilled individuals, especially toward Central and Northern Europe. These migration patterns have been further intensified by the European Union's policy of free movement and the lingering effects of the 2008-2009 global financial crisis (Schivardi and Schmitz, 2020).

Although a substantial body of research has investigated the economic effects of immigration on receiving countries, much less is known about the consequences of high-skilled emigration for countries of origin, particularly in the context of advanced economies.[1]

This study seeks to fill this gap by exploring how emigration shapes the economic development trajectories of high-income origin countries. Specifically, it examines the implications for

[1]This is especially relevant given that many origin countries experience a proportionally greater loss in their labour force than the relative gain observed in destination countries through immigration (Mishra, 2014).

production structures and patterns of local specialization, assessing whether the outflow of skilled individuals affects the capacity of origin regions to sustain skill-intensive and high-quality export production.

This research question is particularly important for understanding how people's mobility - and the knowledge they carry - can influence long-term development patterns. While the literature on regional development has extensively investigated the role of local capabilities, knowledge externalities, and technological relatedness in driving innovation and structural change, only recently has migration been recognised as a critical vector of extra-regional knowledge (Diodato et al., 2021; Morrison, 2023). Migrants can facilitate knowledge diffusion and innovation by mitigating local limits in cognitive diversity and strengthening regional resilience (Boschma, 2005a; Martin and Sunley, 2006). However, the reverse process must also be considered: all else being equal, the emigration of high-skilled individuals may reduce the local capability space, potentially constraining innovation capacity and altering the path of local economic development. In this sense, the movement of skilled people represents not only an opportunity for knowledge diffusion but also a possible threat to the long-term competitiveness of regions that experience consistent high-skilled outflows.

To delve into this issue, we focus on Italy, which has experienced a marked increase in emigration flows. In the aftermath of the financial crisis, these flows nearly tripled between 2010 and 2020, with a substantial share of high-skilled and highly educated individuals leaving the country (see Figures A.1-A.3 in Appendix).[2] While emigration affected all age and education groups, Table A.1 in Appendix highlights that it was particularly pronounced among young, highly educated Italian citizens aged 25-39, followed by those aged 40-65. Given the pivotal role of the high-skilled labor force in shaping local specialization, analyzing the effects of their emigration can provide valuable insights into the long-run growth prospects of sending economies.

To examine these dynamics, we use data from the Italian National Institute of Statistics (ISTAT)

[2]For detailed data on the Italian resident population (aged 15–64) and emigrants (aged 25–64) by educational attainment from 2002 to 2012, see Tintori and Romei, 2017.

on manufacturing export flows disaggregated by product and province, which we link to the product-level human capital intensity index from the United Nations Conference on Trade and Development (UNCTAD) (Shirotori et al., 2010). Based on this data we can construct a measure of the human capital intensity of each province's export basket. We then combine this indicator with province-level migration data from ISTAT's Anagrafe registry, which records registrations and cancellations of residents, to measure the share of the stock of working-age Italian emigrants at the province level.

Our empirical strategy unfolds in two steps. First, we analyze the relationship between changes in provincial emigration rates and shifts in local specialization by estimating a differences model that analyzes the nexus between pre- and post-crisis variations in the share of high human capital-intensive/high-quality exports and changes in emigration. Second, we extend the analysis to the province-product level, assessing whether the impact of emigration varies across products with different levels of human capital intensity and quality.

Identifying the causal effect of emigration on local economic outcomes faces several challenges. These include reverse causality, as weaker economic performance may lead to increased emigration, measurement errors in emigration statistics due to delayed or incomplete reporting, and omitted variable bias resulting from unobserved factors that influence both emigration and trade outcomes. To address these issues, we adopt an instrumental variable (IV) approach following Anelli et al. (2023), utilising an economic-weighted, network-based instrument that captures the past presence of emigrant communities from each province in major destination countries.

Our findings show that increased emigration of Italian individuals aged 25-65 is associated with a decline in the provincial share of exports represented by high human capital-intensive and high-quality products. The IV strategy highlights that ordinary least squares (OLS) fixed effects (FEs) estimates tend to be downward biased. The results are robust to alternative model specifications and hold across a range of robustness checks based on two-stage least squares (2SLS) regressions.

Similar results emerge when the analysis is conducted at the province-product level: within provinces, emigration particularly reduces exports of products that are both skill-intensive and of

high quality. These findings are robust across alternative specifications, sample restrictions, and the inclusion of province-year and product-year FEs.

The remainder of the paper is structured as follows. Section 2 reviews the related literature. Section 3 describes the data sources, measurement strategies, and presents preliminary evidence. Section 4 outlines the empirical framework, presents the instrumental variable identification strategy and discusses its validity. Section 5 presents the main findings and robustness checks. Section 6 concludes.

2 Emigration and Local Development

Our study relates to broader debates in regional development on the role of local capabilities in shaping structural transformation. A rich literature has shown that the composition and quality of local knowledge - often embedded in institutions, networks, and routines - play a central role in driving innovation and growth (Arrow, 1962; Romer, 1986; Grossman and Helpman, 1993). Knowledge spillovers are geographically bounded (Jaffe et al., 1993), as, despite technological advances, tacit knowledge remains deeply embedded in local contexts and is essential to either sustaining or hampering competitive advantage (Gertler, 2003; Howells, 2012). Further contributions have stressed that learning by interacting (Lundvall and Johnson, 1994) and cognitive proximity (Boschma, 2005b; Baptista and Swann, 1998) enhance the absorption and use of local knowledge. In other words, other forms of proximity - relational, organizational, institutional, technological and cognitive - complete the geographical one (Boschma, 2005b; Boschma and Iammarino, 2009; Boschma et al., 2012, 2013; Turco and Maggioni, 2016, 2019). Within this framework, migration - as multinationals and international firm networks (Turco and Maggioni, 2016, 2019; Cortinovis et al., 2020; Ascani et al., 2020) - has emerged as a key mechanism of extra-regional knowledge diffusion. Scholars have recently emphasized that migration introduces variation into regional knowledge bases (Morrison, 2008; Breschi and Lenzi, 2015). Migrants may act as knowledge carriers and brokers, facilitating tacit knowledge transfer and triggering both path-dependent re-

inforcement and path-breaking diversification (Saxenian, 2005; Morrison, 2023). Whereas most of the literature has focused on the positive effects of immigration, our study adopts a reverse yet complementary lens. We investigate how high-skilled emigration undermines the development potential of origin regions by reducing their cognitive diversity and capability space. If productivity depends on complementarities among highly skilled individuals, the departure of even a subset of them may disrupt local production systems and weaken the basis for future specialization.

Historically, the literature on high-skilled emigration has primarily focused on the "brain drain" from less to more prosperous countries, a phenomenon thoroughly studied and intensely debated since the 1950s.[3] Early contributions emphasized the negative consequences of human capital loss for developing countries of origin (Beine et al., 2008; Docquier et al., 2007; Mishra, 2007). Over time, the focus has expanded to include the impacts of emigration in high-income origins, with studies documenting its influence on wages (Elsner, 2022, 2013), entrepreneurship, and total factor productivity (Anelli et al., 2023; Giesing and Laurentsyeva, 2018). Contrasting these negative effects, a parallel literature highlights the potential benefits of "brain circulation."[4] These include remittances (Di Giovanni et al., 2015; Bollard et al., 2011), return migration of experienced professionals (Choudhury, 2016; Jonkers and Cruz-Castro, 2013; Baruffaldi and Landoni, 2012), and knowledge spillovers through diaspora networks (D'Ambrosio et al., 2019; Miguelez, 2018; Breschi et al., 2017). Such spillovers can foster innovation and facilitate foreign direct investment (Javorcik et al., 2011; Docquier and Lodigiani, 2010), ultimately benefiting origin economies (Andersson et al., 2022; Fackler et al., 2020; Agrawal et al., 2011). Nevertheless, most empirical studies in this area have concentrated on low- and middle-income countries. Much less is known about the effects of high-skilled emigration from advanced economies, particularly in terms of their production structures and specialization patterns. This study addresses that gap by focusing on Italy, a high-income country that has experienced persistent outflows of educated workers, especially after

[3] For a survey on brain drain from the 1950s to the early 2000s, see Giannoccolo, 2009

[4] As per European Commission (2005), "brain circulation" refers to the phenomenon where a country of origin benefits from return migration or diaspora networks when skilled professionals acquire knowledge and expertise abroad and invest or stimulate investment in their home countries.

the 2008–2009 financial crisis. Despite the magnitude of this phenomenon, empirical evidence on its economic consequences remains limited. Recent studies provide initial insights. Anelli et al. (2023) show that the emigration of highly educated and skilled young Italians leads to a decline in firm creation and entrepreneurship, reducing local employment and the share of qualified workers. Dicarlo (2022) find that outflows from Italy to Switzerland caused sector-specific productivity losses and, in some instances, firm closures.[5] These findings suggest that skilled emigration may exacerbate both economic and institutional vulnerabilities in origin regions. However, no existing study directly examines how such outflows affect export composition or specialization in skill-intensive sectors. Our research contributes to this debate by offering new province- and product-level evidence for Italy, revealing how high-skilled emigration can erode the capacity to sustain complex and high-quality exports.

Empirically, we show that high-skilled emigration from Italian provinces is associated with a reduction in exports of complex, skill-intensive, and high-quality products. This suggests that emigration can shift production structures, weaken innovation capacity, and limit regions' ability to engage in high-value trade. In this respect, our work complements literature on the impact of migration on the local production structure and on the trade–migration nexus. Concerning the first stream of literature, Casabianca et al. (2022) find that the increase in the availability of low-skilled immigrants in Italian provinces between 2002 and 2011 led to a shift in manufacturing output toward low capital-intensive products. Bettin et al. (2014) similarly show that immigrant labour lowers the skill ratio and fosters the expansion of low-skill intensive sectors. In this work, instead, we look at the effect of emigration on the local production structure. Concerning the literature on trade-migration nexus, while extensive work highlights how immigrant networks reduce trade costs and promote exports from origin to destination countries (D'Ambrosio and Montresor, 2022; Ehrhart et al., 2014; Parsons, 2011; Felbermayr et al., 2010; Rauch and Trindade, 2002; Head and Ries, 1998; Gould, 1994), fewer studies examine how the loss of skilled workers affects production

[5]Meanwhile, Anelli and Peri (2017) explore political outcomes, linking emigration to lower political participation and a diminished representation of young, educated, and female officials.

and trade in sending regions (Brambilla et al., 2019; Brambilla and Porto, 2016; Serti et al., 2010; Verhoogen, 2008). By highlighting these dynamics in the Italian context, our study brings new insights to the debate on migration and local development and offers broader implications for understanding how knowledge embedded in people shapes the economic trajectories of places.

3 Data and Measurement Issues

Data Sources

Our analysis relies on a range of data sources provided by ISTAT, enabling us to measure emigration flows from Italian provinces and assess patterns of local specialization.

Emigration Migration data are obtained from ISTAT's Population Registry (Anagrafe), which offers extensive territorial coverage over an extended time span. The dataset includes all registrations and cancellations of resident populations by origin municipality and the municipality or country of destination.

Local Specialization To measure provincial specialization, we use manufacturing export flows disaggregated at the 4-digit Harmonized System (HS) product level and the NUTS3 region (the third level of the NUTS classification) level, obtained from the ISTAT COE dataset.[6] The use of exports as a proxy for countries' specialization is broadly accepted in the literature (Hidalgo et al., 2007).[7]

[6] Although the raw data are available at the 8-digit level of the Combined Nomenclature (CN), we convert them to the 4-digit Harmonized System (HS) classification. This choice is motivated by the unpredictable nature of detailed territorial trade statistics and the annual revisions to the CN classification, which can hinder consistency over time.

[7] While information on production flows at the province level is available from the PRODCOM database, it is important to note that these data are recorded at the firm level, unlike export data, which are collected at the plant level. Consequently, relying on production data may lead to biased estimates of geographical specialization, especially in contexts where multi-plant firms operate across several provinces.

Further Data All control variables used in our analysis are sourced from ISTAT. These include the share of immigrants aged 15 to 65, the logarithm of the total population of Italians in the same age group, the gross registration rate in the business register and financing risks,[8] and the logarithm of value added per capita.

Data on the total population of Italians (both male and female) in the labor force aged 25 to 65 at the province level, which we also use to construct the IV, are likewize obtained from ISTAT.

Additionally, data on the gross domestic product (GDP) in current U.S. dollars for destination countries over time are sourced from the World Bank Indicators (WDI) database, which we also use in the construction of the IV.

Province Definition The number of provinces corresponding to NUTS3 changed multiple times during our study period. To ensure data consistency and integrity, we base our analysis on the 104 provinces defined at the beginning of the sample period, ensuring a reliable and comparable dataset throughout.

Measurement Issues

Emigration Rates We use annual emigration flows from Italian provinces for the period 1995 to 2019 to calculate, for each province, the share of the stock of Italian emigrants relative to the total population of Italians as follows:

$$Emigration_{p,t}^{share} = \frac{\sum_{l=t_0}^{t} flow\ of\ emigrants_{p,t}}{Population_{p,t}} * 1000 \tag{1}$$

where, $t_0 = 1995$ and we implicitly assume that differences in emigration stocks across provinces were negligible at the starting point. Although this assumption may not hold perfectly, our empirical models rely on estimating differenced equations. Therefore, heterogeneous initial conditions across

[8]Defined as the percentage of registered non-agricultural businesses out of total registered companies in the previous year, and the financing decay rate. Source: ISTAT elaborations on province-level indicators for development policies: (Italian National Institute of Statistics (ISTAT), 2001).

provinces will not bias our results, as we isolate the effect of the overall emigration flow observed between any two time periods.

To ensure the accuracy of our analysis, we focus exclusively on individuals aged 25 to 65, who generally have completed tertiary education. This group represents the core working-age population - typically at the peak of their productive capacity and most likely to emigrate.

When calculating the share of the stock of Italian emigrants aged 25–65 at the province level, as outlined in Equation 1, we divide the stock of Italian emigrants in that age group since 1995 by the total population of Italians in the same age range since 2002, and then multiply the result by 1,000.[9]

Product Level Indicators In order to reflect the human capital content of production, we exploit the Revealed Human Capital Intensity (RHCI) index developed by UNCTAD (Shirotori et al., 2010) for each 4-digit HS product g, $RHCI_g$.[10] This index is calculated as a trade-weighted average of the human capital stock of countries exporting the given product.[11]

We also rely on a measure of product quality, which is derived from export data We follow the approach adopted by Khandelwal et al. (2013), and estimate the following equation:

$$lnQuantity_{pg,t} + \sigma_{pg} * lnPrice_{pg,t} = \mu_g + \gamma_t + \epsilon_{pg,t} \tag{2}$$

[9]We also normalized this measure using the total population of Italians aged 25–65 in 2006; however, this adjustment does not significantly affect our estimation results.

[10]The RHCI index, originally available at the HS 6-digit level, is averaged at the HS 4-digit level by averaging the corresponding values.

[11]Shirotori et al. (2010) use a slightly modified version of the Revealed Comparative Advantage (RCA) index originally proposed by Balassa (1965) as weights to calculate the RHCI index: $RHCI_g = \sum_i \frac{X_g^i/X^i}{\sum_i X_g^i/X^i} * h^i$ where, X_g^i denotes the exports of product g by country i, X^i is the total exports of country i and h^i represents the average years of schooling completed by individuals in country i. The numerator measures the share of country i's exports of product g relative to its total exports, while the denominator sums these shares across all countries for product g. This ratio indicates whether a country's export share for a specific product is above or below the global average. This modified RCA index, following the methodology proposed by Hausmann et al. (2007), improves the analysis by incorporating scale effects rather than relying solely on raw export weights, thereby providing a more precize assessment of comparative trade advantages.

where, $lnQuantity_{pg,t}$ denotes the logarithm of total export quantity of a 4-digit product g produced by province p at time t, and $lnPrice_{pg,t}$ is the corresponding logarithm of the export price (unit value). σ_{pg} is the median elasticity of substitution at province p level, based on the 2-digit NACE Rev. 2 to which product g belongs. μ_g and γ_t are product and time FEs, respectively. After estimating Equation 2, we take the regression residuals as a measure of the log quality of product g exported by province p at time t, $lnQuality_{pg,t}$.

Local Specialization To build a measure of local specialization of Italian provinces, we combine data on manufacturing exports at the HS 4-digit product level for each province with the product-level measure of human capital intensity described above, $RHCI_g$.

We then calculate the human capital intensity (HCI) of Italian provinces' export baskets, focusing on the period from 2006 to 2019, as follows.

$$Exp\_share_{p,t}^{HHCI} = \frac{\sum_{g=1}^{G} exports_{pg,t} * RHCI_g^{high}}{\sum_{g=1}^{G} exports_{pg,t}} \tag{3}$$

where $\sum_{g=1}^{G} exports_{pg,t}$ is the total export value of product g produced by province p at time t, while $RHCI_g^{high}$ is a binary variable that takes the value of one for products that are high-skill intensive, specifically those whose $RHCI_g$ value ranks above the median or in the upper quartile of the distribution of products exported by Italian provinces. $Exp\_Share_{p,t}^{HHCI}$, then, represents the share of exports of high human capital-intensive products for province p at time t, thereby reflecting the degree of concentration in these types of products.

We, further, refine the above measure in order to focus on the provincial specialization in both high human capital-intensive and high-quality products:

$$Exp\_share_{p,t}^{\substack{HHCI \\ HQuality}} = \frac{\sum_{g=1}^{G} exports_{pg,t} * RHCI_g^{high} * Quality_{pg,t}^{high}}{\sum_{g=1}^{G} exports_{pg,t}} \tag{4}$$

where, $RHCI_g^{high}$ is a binary variable that takes the value of one for products that are high-skill intensive, specifically those whose $RHCI_g$ value ranks in the upper quartile of the distribution

of products exported by Italian provinces. $Quality_{pg,t}^{high}$ is a binary variable equal to one if the relative quality of product g produced by province p at time t exceeds the median of the distribution of relative quality across all province-product combinations at time t, compared to the national average.[12]

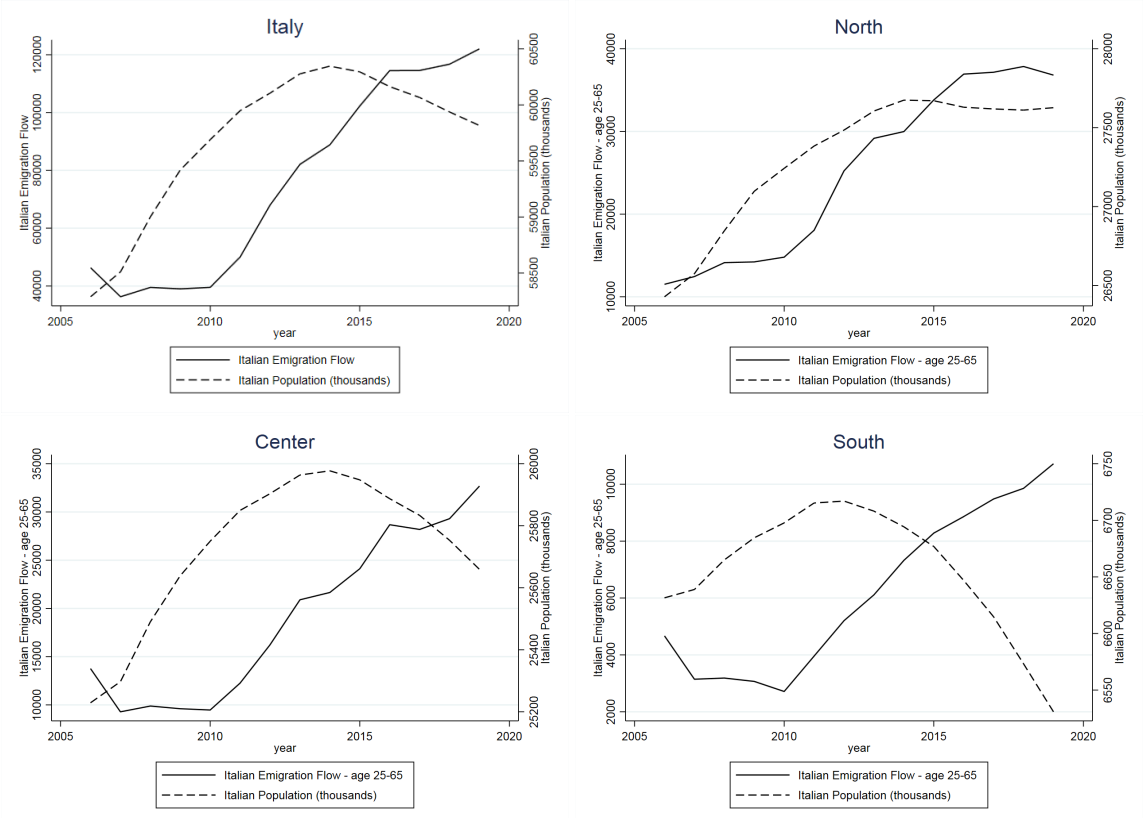
Preliminary Evidence

To illustrate the relationship between emigration and population dynamics, we present a series of plots that capture both national trends in Italy and regional differences among the North, Center, and South, shedding light on the extent and nature of territorial disparities.

Figure 1 displays emigration flows of Italian citizens alongside trends in the total Italian population across all age groups, offering a national-level overview for the period 2006-2019. The first panel shows a marked and steady increase in emigration starting around 2010, a pattern observable across all age groups and coinciding with a gradual decline in the overall Italian population. When focusing on macro-regions, notable differences emerge: while emigration of working-age individuals exhibits an upward trajectory across the North, Center, and South, population loss - both in relative and absolute terms - is substantially more pronounced in the Center and South, indicating deeper structural demographic imbalances in these regions.

[12] As an alternative, we also consider products whose relative quality, compared to the national average, is in the top quartile of the distribution, but the group was too small for estimations.

Figure 1: Annual Emigration Flows and Trends in the Total Population of Italians.



Notes: This figure illustrates the relationship between increased emigration flows and the decline in the total population of Italians from 2006 to 2012. The solid line shows the annual emigration flows of Italians (of all age groups in the first panel and of working age (25-65) in the following panels), while the dashed line shows the trend of the total population of Italians across all age groups (in thousands).

Source: Demographic Portal of ISTAT Anagrafe.

Figure A.4 in Appendix reproduces the trends specifically for the working-age population, depicting emigration flows and the total population of Italians aged 25 to 65.

The observed patterns reveal a strong negative link between emigration and population levels within this age group over the period 2006–2019. Compared to the aggregate trends shown in Figure 1, the trajectories in Figure A.4 are notably steeper, highlighting the significant impact of emigration on the working-age population. This trend is particularly pronounced in the post-crisis years and provides clear evidence that the emigration of these individuals is a key driver of both brain drain and population decline in Italy.

Turning to the research question addressed in this study, we examine the relationship between

changes in emigration rates among the Italian labor force and the export performance of high human capital-intensive products across Italy's macro-regions - North, Center, and South - over the period 2006–2012, a time span that records the sharp increase in emigration dynamics from before/after the 2008–2009 global financial crisis. Figure A.5 in Appendix focuses on the total change in the share of exports of high human capital-intensive products, while Figure A.6 considers those products that are both high in human capital intensity and characterized by high quality. Both figures reveal a negative relationship, suggesting that provinces with higher emigration rates among working-age individuals tend to experience weaker growth or even declines in these categories of exports. Relevant regional heterogeneity also emerges: the Center and South exhibit the steepest negative trends, pointing to a stronger adverse effect of emigration on export performance. Conversely, the North shows a more stable relationship, potentially reflecting greater economic resilience.

These findings underscore how the outflow of skilled human capital can undermine export competitiveness, particularly in sectors characterized by high human capital-intensity and product quality. Moreover, they highlight the asymmetric regional consequences of emigration in Italy, with economically weaker areas being disproportionately affected.

4 Empirical Strategy

To explore the impact of emigration on local specialization in the aftermath of the global financial crisis, we first focus solely on province-level variation. We consider the period from 2006 to 2012, encompassing the years immediately preceding and following the global economic downturn, during which Italy experienced a significant surge in emigration flows. Such sudden and pronounced changes in migration dynamics may have led to a loss of skilled human capital, thereby impacting local productive specialization. We then estimate the following empirical model:

$$Y^{share}_{p,t/t-4} = \beta Emigration^{share}_{p,t/t-4} + \gamma Controls_{p,t/t-4} + \epsilon_{p,t/t-4} \tag{5}$$

where, $Y^{share}_{p,t/t-4}$ represents the change in the local specialization outcome of province p - as defined by Equations 3 and 4 - between time $t-4$ and t. $Emigration^{share}_{p,t/t-4}$ measures the change between time $t-4$ and t in the share of the stock of Italian emigrants aged 25 to 65 from province p in total local population (as measured by Equation 1). It reflects the total flow of emigrants at times t, $t-1$, $t-2$, $t-3$ and $t-4$, normalized by the population. $Controls_{p,t/t-4}$ denotes the change between time $t-4$ and t in a set of time-varying province level control variables such as the share of immigrants aged 15 to 65, the logarithm of the total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, and the logarithm of value added per capita. The model also includes NUTS1-year FEs to account for heterogeneous macro-region dynamics in the evolution of export specialization. $\epsilon_{p,t/t-4}$ is the error term, and standard errors are clustered at the province level.

It is worth stressing that, by taking four-year differences of the outcomes, main regressors, and controls we can account for the unobserved time-invariant factors at the province level. This approach allows us to analyze three different waves of data, both before and after the crisis: 2006/2010, 2007/2011 and 2008/2012.

To examine more closely the effect of emigration on local specialization in Italian provinces, we expand our analysis from the province level to a more detailed province-product level by estimating the following empirical model:

$$\begin{aligned} Y_{pg,t/t-4} = {} & \beta Emigration^{share}_{p,t/t-4} + \omega Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} \\ & + \theta Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4} \\ & + \zeta Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4} * RHCI^{high}_{g} \\ & + \gamma Controls_{pg,t/t-4} + \mu_{g,t} + \epsilon_{pg,t/t-4} \end{aligned} \tag{6}$$

where, $Y_{pg,t/t-4}$ is the log-change of province p's export value/quantity of good g between time $t-4$ and t and $Emigration^{share}_{p,t}$ is defined as above. $RHCI^{high}_{g}$ is a time-invariant product-specific binary variable that takes the value of one for products that are high-skill intensive, specifically

those whose RHCI value ranks in the upper quartile of the distribution of products exported by Italian provinces. $Quality^{high}_{pg,t/t-4}$ is the change between $t-4$ and t in a binary variable that takes the value of one for products exported by province p at time t if their relative quality - compared to the national average - exceeds the median of the distribution of relative quality in all combinations of province-products at time t. These are products for which the province is a national quality leader. $Controls_{pg,t/t-4}$ is the change between time $t-4$ and t in a set of time-varying province level control variables, as previously defined, plus relative export quality $Quality^{high}_{pg,t/t-4}$. $\mu_{g,t}$ are product-year FEs which absorb any observable and unobservable product level time-varying factors that may affect manufacturing production structure. $\epsilon_{pg,t/t-4}$ is the error term, and standard errors are clustered at the province-product level. Again, it is worth highlighting that by taking four-year differences of the outcomes, main regressors and controls we remove time-invariant province-product specific unobservables and focus the analysis on three different waves of data, both before and after the crisis: 2006/2010, 2007/2011 and 2008/2012.

The IV Approach

In order to identify the effect and take into account endogeneity issues, we implement an IV strategy. If emigration flows were randomly distributed across provinces, the OLS estimate of Equation 5 would capture the causal effect of emigration on exports. However, the OLS estimates may be biased due to the complex interplay between emigration and local economic and social conditions (Anelli et al., 2023). For example, provinces with more dynamic economic activity may have stronger links to foreign markets, which can simultaneously foster higher emigration and export performance, potentially biasing the OLS estimates upward and masking the true negative effect. On the other hand, if emigration is more likely when local labor demand weakens and economic activity slows, this would generate a negative correlation between emigration and trade, resulting in a downward bias.

The IV strategy is meant to address these complex influences and to solve for omitted variables

bias and measurement errors[13] affecting OLS results. More specifically, we exploit variation in migration flows driven by pre-existing migrant networks, while adjusting for destination-country economic pull factors. The rationale for this IV is that Italian provinces tend to maintain ties with specific foreign countries through long-standing emigrant communities. These networks facilitate information exchange, access to job opportunities, and other support mechanisms that link individuals in the provinces to the diaspora abroad. Such connections tend to be stronger when the destination countries are economically attractive, thereby reinforcing migration flows independently of local economic conditions in the sending provinces.

We use the stock of Italians in the labor force aged 25-65, obtained by summing up the flow of emigrants from 1995 to 2002 who were still resident of foreign countries in 2002, as a proxy for pre-existing migrant networks. This measure is then adjusted by the GDP growth rate of each destination country during the treatment period. Summing these adjusted values across all destination countries yields an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. The instrument for the share of emigrants of province p at time t is then constructed as follows:

$$IV_{p,t} = \sum_{d} Network_{pd,t=2002} \times G_{d,t} \tag{7}$$

where, $Network_{pd,t=2002}$ is the stock of Italians in the labor force from province p who are residents in country d in 2002, normalized by the total population of Italians aged 25 to 65 in provinces in 2002. It captures the size of the historical emigrant community from province p to country d, which may influence the likelihood of subsequent emigration flows from p to d. $G_{d,t}$ denotes the GDP growth rate of country d during the treatment period.

Finally, we derive the four-year difference of this measure, which constitutes the instrument in our analysis.

[13]Measurement error may arise due to delays and inaccuracies in the registration of temporary migrants. However, it is important to note that such errors are likely to be considerably smaller when assessing the pre-existing networks of Italians abroad.

Our main identification assumption is that the influence of pre-existing diaspora networks - adjusted by the GDP growth rate of destination countries from 2006 to 2012 - is uncorrelated with unobserved province-specific factors that may affect export performance over the same period. To assess the validity of our IV, we test whether changes in the instrument between 2006 and 2012 are predictive of our outcome variables four periods earlier. Specifically, we regress the share of exports of high human capital-intensive and high-quality products on the four-year difference of the instrument, lagged accordingly. Results, reported in Table A.2 in Appendix, show positive but statistically insignificant coefficients, indicating no relationship between the instrument and past export outcomes. This supports the validity of our identification strategy.

To validate the strength and relevance of our instrument, we then consider first-stage regressions at both the province and province-product levels. In Table A.3-A.5 in Appendix, we present the first-stage results, where we predict the four-year difference of the share of the stock of Italian emigrants aged 25 to 65 with the four-year difference of our IV. In the regression we control for the four-year differences of the controls described above as well as NUTS1-year FEs.

The coefficient on the IV has the expected sign and a plausible magnitude. It is statistically significant at the 1% level, indicating a strong and meaningful association with the endogenous variable. This provides support for the relevance of the instrument.

In sum, the first-stage results suggest that the IV is suitable for isolating the exogenous variation in the endogenous variable.

5 Results

To examine the impact of high-skilled emigration on the local specialization of Italian provinces, we adopt two complementary approaches: an aggregate analysis at the province level and a more granular analysis at the province-product level. As described above, we estimate models in four-year differences over the period 2006-2012 to capture medium-run dynamics before and after the global financial crisis.

Province Level Evidence

Table 1 presents the baseline results of the province level model, as described in Equation 5. It displays both OLS and 2SLS estimates regarding the effect of emigration on the local specificalization of provinces in high human capital-intensive and high-quality products. Columns (1), (3) and (5) report the coefficients associated with our main variables of interest based on the OLS estimations. Across all specifications, estimates suggest a negative relationship between the variables under analysis. In Columns (2), (4), and (6) we instead show estimates obtained from the IV strategy, explained in Section 4 to address potential endogeneity of emigration. When instrumenting emigration, the magnitude of the coefficients increases, and statistical significance improves. This reveals that OLS results are downward biased.

The estimated effects suggest that an increase in the share of Italian emigrants aged 25 to 65 from a given province is associated with a reduction in the share of exports consisting of high human capital-intensive products in that province. This decline is observed among both the above-median and upper quartiles of the distribution of these products exported by Italian provinces. Additionally, Column (6) shows a reduction in the share of products that are characterized by both a high human capital-intensity and a high quality.

Table A.7 in Appendix shows that demonstrate that our baseline evidence remain consistent when the model is re-estimated after winsorizing the upper 0.5% or 1% tails of the outcome variables to reduce the impact of extreme outliers.

Table 1: Baseline Results.

	(1)	(2)	(3)	(4)	(5)	(6)
			$Exp\_Share^{HHCI}_{p,t/t-4}$		$Exp\_share^{\substack{HHCI \\ HQuality}}_{p,t/t-4}$	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
$Emigration^{share}_{p,t/t-4}$	-0.010	-0.043*	-0.011*	-0.019**	-0.003	-0.010*
	(0.006)	(0.024)	(0.006)	(0.009)	(0.003)	(0.005)
N	312	312	312	312	312	312
Cragg-Donald Wald F		71.19		71.19		71.19
Kleibergen-Paap rk Wald F		19.85		19.85		19.85
Kleibergen-Paap rk LM		9 724		9 724		9 724
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table presents estimates from the OLS and 2SLS regressions of Eq. 5. All estimates are based on the period 2006-2012. N=312 (3 periods x 104 provinces). The dependent variables are expressed as four-year differences. In Columns (1) and (2), the dependent variable is the share of exports of high human capital-intensive products that fall above the median of the distribution. In Columns (3) and (4), it is the same share but contributed by the upper quartile of the distribution. In Columns (5) and (6), the dependent variable is the share of exports of high human capital-intensive and high-quality products falling above the median of their respective distribution. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the logarithm of value added per capita as well as NUTS1-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Province-Product Level Evidence

Furthermore, we estimate our empirical model at the province-product level as expressed in Equation 6 for both export values and quantities.

We first estimate our model using OLS.[14] To examine heterogeneity in the effect of emigration on exports across products, we include both the four-year difference of the share of Italian emigrants aged 25 to 65 and its interaction with product-level binary indicators. $RHCI_g^{high}$, $Quality_{pg,t/t-4}^{high}$, and $RHCI_g^{high} * Quality_{pg,t/t-4}^{high}$ defined in Section 3. Our main variable of interest is $Emigration_{p,t/t-4}^{share} * RHCI_g^{high} * Quality_{pg,t/t-4}^{high}$, as we aim to analyze how changes in emigrant share specifically affect sectors that are both high human capital-intensive and high-quality and to test whether emigration dynamics have a differential impact on such industries compared to others.

Table 2 reports the results for both the value and quantity of exports and also tests for a triple interaction term that combine emigration rates with binary variables for high human capital-intensive and high-quality products. In Columns (1)-(4) and (6)-(9) coefficients associated with our main variable of interest are based on the OLS estimations, while in Columns (5) and (10) we adopt the IV strategy, explained in Section 4 to address potential endogeneity of emigration. The negative coefficients indicate that the emigration of a high-skilled labor force leads to a reduction in exports of products that are both human capital-intensive and high-quality, whether measured by value or quantity. This evidence remains consistent even when we further restrict our sample by excluding province-product pairs with fewer than three observations through time and mantain the balanced panel of province-product pairs. This exclusion helps prevent bias in the regression that could arise from small, under-represented province-product pairs and to highlight whether results differ for those product varieties (product-province combinations) that are continuously exported over the sample period. The estimated results in Table 3 convey a similar and complementary evidence to that presented in Table 2. Emigration can undermine the local specialization of sending economies and hinder their long-run growth prospects.

[14]The baseline estimation excludes outliers at the product-province level, identified as observations below the 5th and above the 95th percentiles of the dependent variables' distribution.

To further validate our results, we run the province-product level model using different samples and specifications, with standard errors clustered at the province or the province-product level. Tables A.8 and A.9 in Appendix presents the estimates from the 2SLS regressions. The results remain consistent with our baseline specifications.

Lastly, we estimate our model controlling for both province-year and product-year FEs. Tables A.10 and A.11 in Appendix shows the corresponding results, that show no big differences compared to those previously presented, further confirming the reliability of our main model.

Overall, our results provide robust evidence that emigration alters the composition of local exports. Specifically, there is a significant shift away from high human capital-intensive and high-quality production sectors. These findings are consistent across various aggregation levels, robustness checks, and instrumented models.

Table 2: Baseline Results at the Province-Product Level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$lnExport^{Value}_{pg,t/t-4}$					$lnExport^{Quantity}_{pg,t/t-4}$				
	OLS				2SLS	OLS				2SLS
$Emigration^{share}_{p,t/t-4}$	0.013	0.021	0.008	0.015	-0.001	0.001	0.007	0.000	0.005	-0.000
	(0.014)	(0.014)	(0.012)	(0.012)	(0.022)	(0.013)	(0.013)	(0.013)	(0.013)	(0.026)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$		-0.035***		-0.026***	0.007		-0.024**		-0.022**	-0.014
		(0.010)		(0.009)	(0.027)		(0.010)		(0.010)	(0.033)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$			-0.023*	-0.017	0.004			-0.002	0.016	-0.030
			(0.012)	(0.013)	(0.035)			(0.013)	(0.014)	(0.041)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$				-0.023**	-0.019*				-0.069***	-0.070***
				(0.010)	(0.011)				(0.013)	(0.014)
N	59046	59046	59046	59406	59046	59046	59046	59046	59406	59046
Cragg-Donald Wald F					2141					2141
Kleibergen-Paap rk Wald F					2857					2857
Kleibergen-Paap rk LM					13.75					13.75
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table presents estimates from both the OLS and 2SLS regressions of Eq. 6, using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution. The coefficients from OLS are shown in Columns (1)-(4) and (6)-(9), while those from IV are in Columns (5) and (10). All estimates are based on the period 2006-2012. N=59046. The dependent variables are expressed as four-year differences. In Columns (1)-(5) the dependent variable is the logarithm of the value of exports, while in Columns (6)-(10), it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Baseline Results at the Province-Product Level Using Further Restricted Sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$lnExport^{Value}_{pg,t/t-4}$					$lnExport^{Quantity}_{pg,t/t-4}$				
	OLS				2SLS	OLS				2SLS
$Emigration^{share}_{p,t/t-4}$	0.012	0.022*	0.008	0.015	0.013	0.001	0.008	-0.000	0.006	0.013
	(0.012)	(0.012)	(0.010)	(0.010)	(0.019)	(0.011)	(0.012)	(0.011)	(0.011)	(0.021)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$		-0.040***		-0.032***	-0.006		-0.030**		-0.028**	-0.025
		(0.013)		(0.012)	(0.025)		(0.013)		(0.013)	(0.027)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$			-0.024**	-0.019	0.004			-0.009	0.008	-0.006
			(0.012)	(0.012)	(0.031)			(0.011)	(0.013)	(0.035)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$				-0.022**	-0.027**				-0.064***	-0.072***
				(0.010)	(0.011)				(0.013)	(0.015)
N	53061	53061	53061	53061	53061	53061	53061	53061	53061	53061
Cragg-Donald Wald F					2156					2156
Kleibergen-Paap rk Wald F					2982					2982
Kleibergen-Paap rk LM					14					14
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table presents estimates from both the OLS and 2SLS regressions of Eq. 6, using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution - and is further restricted by excluding province-product pairs with fewer than three observations through time. The coefficients from OLS are shown in Columns (1)-(4) and (6)-(9), while those from IV are in Columns (5) and (10). All estimates are based on the period 2006-2012. N=53061. The dependent variables are expressed as four-year differences. In Columns (1)-(5) the dependent variable is the logarithm of the value of exports, while in Columns (6)-(10), it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Concluding Remarks

This study provides new empirical evidence on the relationship between emigration and local export specialization in Italy in the aftermath of the 2008 financial crisis. Using granular data at the province and province–product level, we show that, *ceteris paribus*, rising emigration rates among the working-age population have significantly reduced the share of exports of high human capital-intensive and high-quality products. Our instrumental variable strategy corroborates these results, mitigating concerns about endogeneity and reverse causality.

Our findings contribute to a relatively recent and still under-explored strand of research examining how migration and the mobility of people shape regional development and diversification trajectories (Morrison, 2023). In particular, we revisit the costs of the so-called "brain drain" by showing that skilled outmigration can directly erode a region's productive capabilities, shifting output composition toward less skill-intensive products and weakening local competitiveness in global trade. The long-term implications of these dynamics for regional development, export performance, and economic complexity may be substantial. Future research should expand this line of inquiry by providing comparative evidence across other regional contexts and national settings. Further work is also needed to assess whether current emigration patterns from Italy and other advanced EU regions might eventually generate "brain circulation" effects, for instance through return migration or diaspora engagement.

Our results underscore the need for policy interventions aimed at preserving and expanding local stocks of knowledge and productive capabilities. To this end, policymakers should prioritize strategies that retain and attract talent - such as investing in innovation ecosystems, enhancing labor market opportunities for the highly educated, and designing targeted return migration programs. These tools are critical not only for counteracting population decline, but also for safeguarding the ability to produce high-value products and for reinforcing regional economic resilience.

Bibliography

Agrawal, A., Kapur, D., McHale, J., and Oettl, A. (2011). Brain drain or brain bank? the impact of skilled emigration on poor-country innovation. *Journal of Urban Economics*, 69(1):43–55.

Andersson, D., Karadja, M., and Prawitz, E. (2022). Mass migration and technological change. *Journal of the European Economic Association*, 20(5):1859–1896.

Anelli, M., Basso, G., Ippedico, G., and Peri, G. (2023). Emigration and entrepreneurial drain. *American Economic Journal: Applied Economics*, 15(2):218–252.

Anelli, M. and Peri, G. (2017). Does emigration delay political change? evidence from italy during the great recession. *Economic Policy*, 32(91):551–596.

Arrow, K. (1962). The economic implications of learning by doing. *Review of Economic Studies*, 29:155–173.

Ascani, A., Balland, P.-A., and Morrison, A. (2020). Heterogeneous foreign direct investment and local innovation in Italian Provinces. *Structural Change and Economic Dynamics*, 53(C):388–401.

Balassa, B. (1965). Trade liberalisation and "revealed" comparative advantage 1. *The manchester school*, 33(2):99–123.

Baptista, R. and Swann, P. (1998). Do firms in clusters innovate more? *Research Policy*, 27:525–540.

Baruffaldi, S. H. and Landoni, P. (2012). Return mobility and scientific productivity of researchers working abroad: The role of home country linkages. *Research policy*, 41(9):1655–1665.

Beine, M., Docquier, F., and Rapoport, H. (2008). Brain drain and human capital formation in developing countries: winners and losers. *The Economic Journal*, 118(528):631–652.

Bettin, G., Lo Turco, A., and Maggioni, D. (2014). A firm level perspective on migration: the role of extra-eu workers in italian manufacturing. *Journal of Productivity Analysis*, 42:305–325.

Bollard, A., McKenzie, D., Morten, M., and Rapoport, H. (2011). Remittances and the brain drain revisited: The microdata show that more educated migrants remit more. *The World Bank Economic Review*, 25(1):132–156.

Boschma, R. (2005a). Proximity and innovation: a critical assessment. *Regional Studies*, 39:61–74.

Boschma, R. (2005b). Proximity and innovation: A critical assessment. *Regional Studies*, 39(1):61–74.

Boschma, R. and Iammarino, S. (2009). Related varieties, trade linkages,and regional growth in italy. *Economic Geography*, 85(3):289–311.

Boschma, R., Minondo, A., and Navarro, M. (2012). Related variety and regional growth in spain. *Papers in Regional Science*, 91(1):241–256.

Boschma, R., Minondo, A., and Navarro, M. (2013). The emergence of new industries at the regional level in spain: A proximity approach based on product relatedness. *Economic Geography*, 89(1):29–51.

Brambilla, I., Lederman, D., and Porto, G. (2019). Exporting firms and the demand for skilled tasks. *Canadian Journal of Economics/Revue canadienne d'économique*, 52(2):763–783.

Brambilla, I. and Porto, G. G. (2016). High-income export destinations, quality and wages. *Journal of International Economics*, 98:21–35.

Breschi, S. and Lenzi, C. (2015). The role of external linkages and gatekeepers for the renewal and expansion of us cities' knowledge base, 1990–2004. *Regional Studies*, 49(5):782–797.

Breschi, S., Lissoni, F., and Miguelez, E. (2017). Foreign-origin inventors in the usa: testing for diaspora and brain gain effects. *Journal of Economic Geography*, 17(5):1009–1038.

Bütikofer, A. and Peri, G. (2021). How cognitive ability and personality traits affect geographic mobility. *Journal of Labor Economics*, 39(2):559–595.

Casabianca, E. J., Lo Turco, A., and Maggioni, D. (2022). Do migrants affect the local product mix? an analysis of the effects and underlying mechanisms. *Journal of Economic Geography*, 22(4):755–777.

Centro Studi Confindustria (2017). Le sfide della politica economica. https://www.bollettinoadapt.it/wp-content/uploads/2017/09/ScenariEconomici_settembre_2017.pdf.

Choudhury, P. (2016). Return migration and geography of innovation in mnes: a natural experiment of knowledge production by local workers reporting to return migrants. *Journal of Economic Geography*, 16(3):585–610.

Cortinovis, N., Crescenzi, R., and van Oort, F. (2020). Multinational enterprises, industrial relatedness and employment in european regions. *Journal of Economic Geography*, 20(5):1165–1205.

Di Giovanni, J., Levchenko, A. A., and Ortega, F. (2015). A global view of cross-border migration. *Journal of the European Economic Association*, 13(1):168–202.

Dicarlo, E. (2022). How do firms adjust to a negative labor supply shock? evidence form migration outflows. *Bank of Italy Temi di Discussione (Working Paper) No 1361*.

Diodato, D., Morrison, A., and Petralia, S. (2021). Migration and invention in the age of mass migration. *Journal of Economic Geography*, 22(2):477–498.

Docquier, F. and Lodigiani, E. (2010). Skilled migration and business networks. *Open Economies Review*, 21:565–588.

Docquier, F., Lohest, O., and Marfouk, A. (2007). Brain drain in developing countries. *The World Bank Economic Review*, 21(2):193–218.

D'Ambrosio, A. and Montresor, S. (2022). The pro-export effect of subnational migration networks: new evidence from spanish provinces. *Review of World Economics*, 158(1):53–107.

D'Ambrosio, A., Montresor, S., Parrilli, M. D., and Quatraro, F. (2019). Migration, communities on the move and international innovation networks: an empirical analysis of spanish regions. *Regional Studies*, 53(1):6–16.

Ehrhart, H., Le Goff, M., Rocher, E., and Singh, R. J. (2014). Does migration foster exports? evidence from africa. *Evidence from Africa (January 1, 2014). World Bank Policy Research Working Paper*, (6739).

Elsner, B. (2013). Emigration and wages: The eu enlargement experiment. *Journal of International Economics*, 91(1):154–163.

Elsner, B. (2022). Does emigration increase the wages of non-emigrants in sending countries. *IZA World of Labor*.

European Commission (2005). Migration and development: Some concrete orientations. `https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0390:FIN:EN:PDF`.

Fackler, T. A., Giesing, Y., and Laurentsyeva, N. (2020). Knowledge remittances: Does emigration foster innovation? *Research policy*, 49(9):103863.

Felbermayr, G. J., Jung, B., and Toubal, F. (2010). Ethnic networks, information, and international trade: Revisiting the evidence. *Annals of Economics and Statistics/Annales d'Économie et de Statistique*, pages 41–70.

Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, 3(1):75–99.

Giannoccolo, P. (2009). The brain drain: A survey of the literature. *Università degli Studi di Milano-Bicocca, Department of Statistics, Working Paper*, 0(2006-03):02.

Giesing, Y. and Laurentsyeva, N. (2018). Firms left behind: Emigration and firm productivity. *CESifo Working Paper, No. 6815, Center for Economic Studies and ifo Institute (CESifo), Munich*.

Globerman, S. and Shapiro, D. (2008). The international mobility of highly educated workers among oecd countries. *Transnational Corporations*, 17(1):1.

Gould, D. M. (1994). Immigrant links to the home country: empirical implications for us bilateral trade flows. *The Review of Economics and Statistics*, pages 302–316.

Grossman, G. M. and Helpman, E. (1993). *Innovation and Growth in the Global Economy*, volume 1 of *MIT Press Books*. The MIT Press.

Hausmann, R., Hwang, J., and Rodrik, D. (2007). What you export matters. *Journal of economic growth*, 12:1–25.

Head, K. and Ries, J. (1998). Immigration and trade creation: econometric evidence from canada. *Canadian journal of economics*, pages 47–62.

Hidalgo, C. A., Klinger, B., Barabási, A.-L., and Hausmann, R. (2007). The product space conditions the development of nations. *Science*, 317(5837):482–487.

Howells, J. (2012). The geography of knowledge: never so close but never so apart. *Journal of Economic Geography*, 12:1003–1020.

International Labor Organization (ILO) (2023). Glossary of skills and labour migration. `https://www.ilo.org/global/topics/labour-migration/WCMS_830770/lang--en/index.htm`.

International Organization for Migration (IOM) (2019). World migration report 2020. `https://publications.iom.int/system/files/pdf/wmr_2020.pdf`.

Italian National Institute of Statistics (ISTAT) (2001). Indicatori territoriali per le politiche di sviluppo. `https://www.istat.it/sistema-informativo-6/banca-dati-territoriale-per-le-politiche-di-sviluppo/`.

Jaffe, A. B., Trajtenberg, M., and Henderson, R. (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *The Quarterly Journal of Economics*, 108(3):577–98.

Javorcik, B. S., Özden, Ç., Spatareanu, M., and Neagu, C. (2011). Migrant networks and foreign direct investment. *Journal of development economics*, 94(2):231–241.

Jonkers, K. and Cruz-Castro, L. (2013). Research upon return: The effect of international mobility on scientific ties, production and impact. *Research Policy*, 42(8):1366–1377.

Khandelwal, A. K., Schott, P. K., and Wei, S.-J. (2013). Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters. *American Economic Review*, 103(6):2169–2195.

Lundvall, B. and Johnson, B. (1994). The learning economy. *Journal of Industry Studies*, 1:23–42.

Martin, R. and Sunley, P. (2006). Path dependence and regional economic evolution. *Journal of Economic Geography*, 6.

Miguelez, E. (2018). Inventor diasporas and the internationalization of technology. *The World Bank Economic Review*, 32(1):41–63.

Mishra, P. (2007). Emigration and wages in source countries: Evidence from mexico. *Journal of development economics*, 82(1):180–199.

Mishra, P. (2014). Emigration and wages in source countries: A survey of the empirical literature. *International Handbook on Migration and Economic Development, Cheltenham: Edward Elgar*, pages 241–266.

Morrison, A. (2008). Gatekeepers of knowledge within industrial districts: Who they are, how they interact. *Regional Studies*, 42(6):817–835.

Morrison, A. (2023). Towards an evolutionary economic geography research agenda to study migration and innovation. *Cambridge Journal of Regions, Economy and Society*, 16(3):529–542.

Organisation for Economic Co operation and Development (OECD) (2020). Glossary of skills and labour migration. https://one.oecd.org/document/DELSA/ELSA/WD/SEM(2020)4/En/pdf.

Parsons, C. (2011). Do Migrants Really Foster Trade? The Trade-Migration Nexus, a Panel Approach 1960-2000. Technical report.

Rag.Rodella, L. (2021). Rientro dei cervelli in italia: le agevolazioni fiscali. https://www.fiscoetasse.com/approfondimenti/14372-rientro-dei-cervelli-in-italia-le-agevolazioni-fiscali.html#paragrafo4. [Accessed 2-Jun-2023].

Rauch, J. E. and Trindade, V. (2002). Ethnic chinese networks in international trade. *Review of Economics and Statistics*, 84(1):116–130.

Romer, P. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5):1002–1037.

Saxenian, A. (2005). From brain drain to brain circulation: Transnational communities and regional upgrading in india and china. *Studies in comparative international development*, 40:35–61.

Schivardi, F. and Schmitz, T. (2020). The it revolution and southern europe's two lost decades. *Journal of the European Economic Association*, 18(5):2441–2486.

Serti, F., Tomasi, C., and Zanfei, A. (2010). Who trades with whom? exploring the links between firms' international activities, skills, and wages. *Review of International Economics*, 18(5):951–971.

Shirotori, M., Tumurchudur, B., Cadot, O., et al. (2010). *Revealed factor intensity indices at the product level*, volume 44. Citeseer.

Tintori, G. and Romei, V. (2017). Emigration from italy after the crisis: The shortcomings of the brain drain narrative. *South-North migration of EU citizens in times of crisis*, pages 49–64.

Turco, A. L. and Maggioni, D. (2016). On firms' product space evolution: the role of firm and local product relatedness. *Journal of Economic Geography*, 16(5):975–1006.

Turco, A. L. and Maggioni, D. (2019). Local discoveries and technological relatedness: the role of MNEs, imports and domestic capabilities. *Journal of Economic Geography*, 19(5):1077–1098.

United Nations Department of Economic and Social Affairs, P. D. (2020). International Migration 2020 Highlights (st/esa/ser.a/452). https://www.un.org/development/desa/pd/news/international-migration-2020.

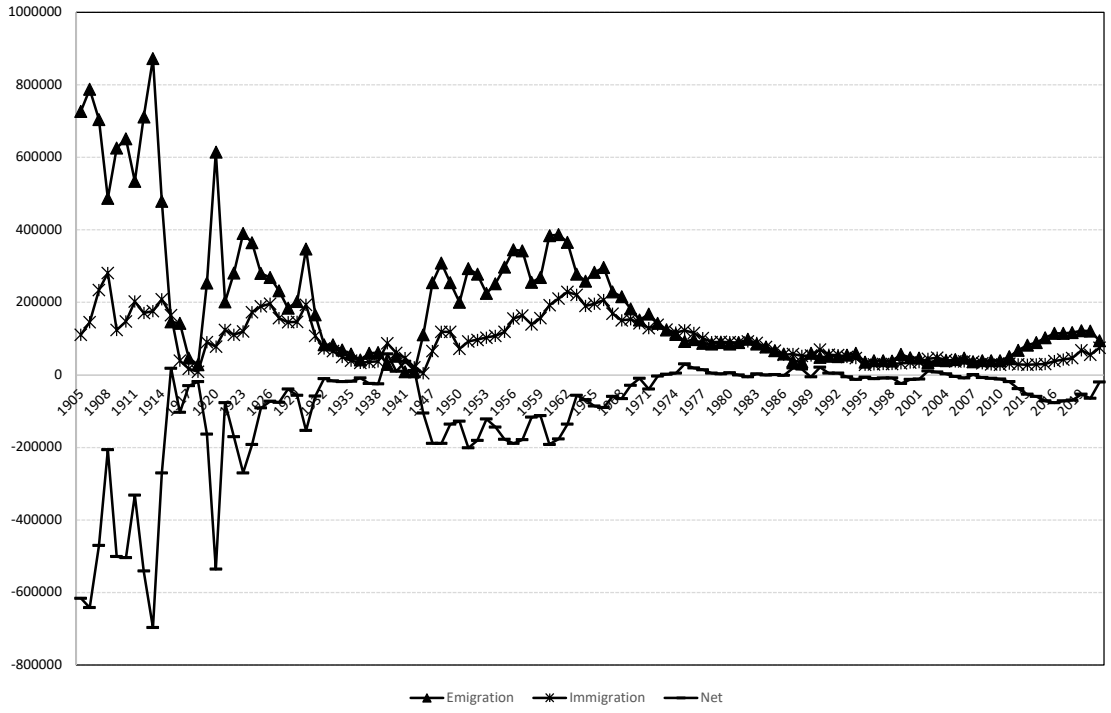
Verhoogen, E. A. (2008). Trade, quality upgrading, and wage inequality in the mexican manufacturing sector. *The Quarterly Journal of Economics*, 123(2):489–530.

Appendix

A.1 On Emigration Trends in Italy

According to official statistics, Italy has been a country of emigration since its unification in 1861, with millions of Italians moving to America and other parts of Europe due to economic and political reasons. Over the years, various financial and historical factors have shaped the emigration patterns from Italy. Since the 1960s, emigration has declined, coinciding with an economic boom often referred to as the "Italian Economic Miracle." However, following the financial crises of 2008 and 2011, emigration has regained strength due to rising unemployment rates and ongoing economic challenges.

Figure A.1: Migration Flows of Italians in 1905-2021 (Absolute Values in Thousands).



Notes: This figure illustrates the migration flows of Italians from 1905 to 2021, expressed in absolute values (in thousands). The data is categorized into emigration, immigration, and the net migration balance.

Source: ISTAT.

Overall, since World War II, over 10.4 million Italians emigrated from Italy, with only 6.6 million returning. This pattern reflects the enduring nature of emigration in Italy's history and its significant impact on the Italian diaspora around the world.

Today, this historical backdrop sets the stage for understanding Italy's contemporary challenges and opportunities related to brain drain and diaspora engagement, which are shaping the country's economic, social, and political landscape.

Although the large-scale waves of Italian emigration have diminished (A.1), Italy continues to witness substantial emigration (A.2), especially among its younger citizens (A.3) in the aftermath of the financial crisis of 2008-2010.[15] While emigration affected all age and education groups, Table A.1 shows that it was especially prevalent among young and highly educated Italian citizens (aged 25–39), followed by the group of 40-65-old individuals.

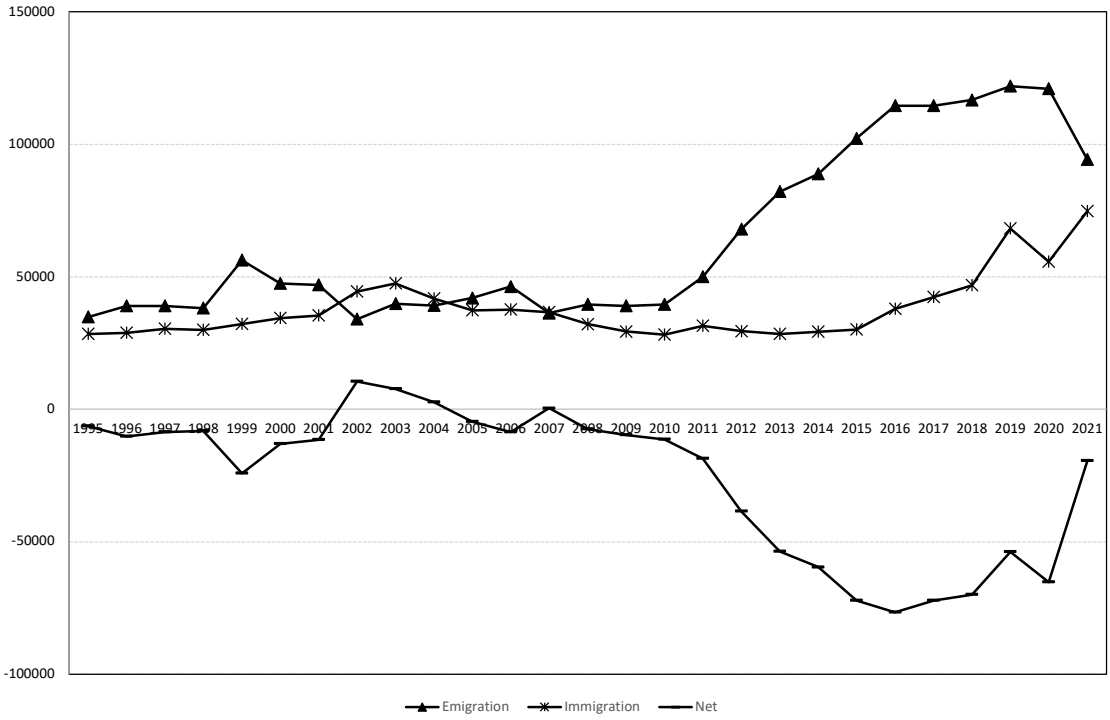
Emigration from Italy, particularly among educated and highly skilled individuals, reflects a complex interplay of factors. While "pull" factors such as career opportunities, the potential for personal and professional growth, and a higher quality of life in the destination country often motivate high-skilled individuals to migrate, it is essential not to underestimate the role of "push" factors stemming mainly from challenges in the Italian labor market, particularly in regions with adverse conditions (Globerman and Shapiro, 2008).

Between 2011 and 2021, more than one million residents expatriated from Italy,[16] with around a quarter of them holding degrees, indicating that a significant portion of Italy's highly educated population is relocating abroad (see Figure A.3, and Table A.1).

[15]For the details on the Italian resident population (aged 15-64) and emigrants (aged 25-64) by educational attainment between 2002 and 2013, refer to Tintori and Romei, 2017. The authors state that the percentage of graduates among emigrants over 25 years increased from 11.9% in 2002 to 30.6% in 2013.

[16]The primary destinations for Italian emigrants are Western European countries, which aligns with the ease of travel facilitated by the Schengen area for European Union citizens. In 2021, around 23,000 Italian emigrants chose the United Kingdom as their preferred destination. Germany was the second most popular country, with 14,000 emigrants, followed by France with 11,000, Switzerland with 9,000, and Spain with 6,000. The United States and Australia were the primary non-European destinations, with 4,000 and 2,000 emigrants, respectively. These trends have remained consistent over the past decade, suggesting that Italians seek opportunities in countries with strong economies and diverse prospects.

Figure A.2: Migration flows of Italians in 1995-2021 (Absolute Values in Thousands).

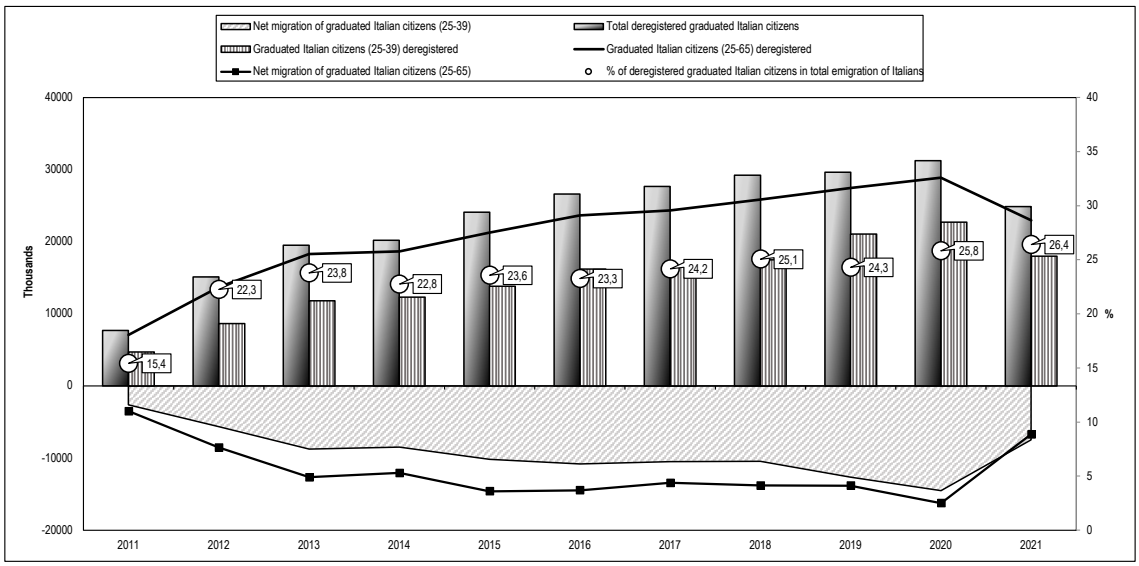


Notes: This figure illustrates the migration flows of Italians from 1995 to 2021, expressed in absolute values (in thousands). The data is categorized into emigration, immigration, and the net migration balance.
Source: ISTAT.

Within this group of emigrants, one-third fell within the age range of 25 to 39, and of those, roughly one-third had a degree before leaving Italy. This age group is typically in the early stages of their careers, and their decision to emigrate suggests that Italy may be losing individuals who could significantly contribute to its workforce and economy in the long term.

Most importantly, recent Italian emigration, which is characterized by a brain drain, is not offset by returning migrants. Figure A.3 shows that Italy's net migration of high-skilled individuals is increasingly negative.

Figure A.3: Graduated Italian Citizens Deregistered from Italian Residence due to Transfer of Residence Abroad by Age Groups 25-65 and 25-39 in 2011-2021.



Notes: This figure illustrates the trends in the deregistration of graduated Italian citizens from Italian residences due to their relocation abroad for two age groups, 25–39 and 25–65, during 2011–2021. It includes data on the total number of deregistered graduated Italian citizens, and the number of deregistered graduated Italian citizens within the 25-39 and 25-65 age groups. Additionally, the figure presents net migration for these groups and the percentage of deregistered graduates in the total emigration of Italians.

Source: ISTAT.

Table A.1: Graduated Italian Citizens Deregistered from Italian Residence due to Transfer of Residence Abroad by Age Groups in 2011-2021 (Absolute Values in Thousands).

	0-24	**25-39**	**40-64**	**65+**
2011	252	4720	2360	389
2012	603	8640	5086	801
2013	441	11815	6462	803
2014	677	12332	6326	886
2015	1505	13836	7421	1328
2016	1956	16200	7446	1032
2017	2112	16611	7742	1213
2018	2166	17482	8375	1223
2019	1344	21053	6424	820
2020	1594	22703	6189	746
2021	1312	17997	4985	595

Notes: The table presents the number of graduated Italian citizens who deregistered from Italian residences due to their transfer of residence abroad, categorized by age groups (0–24, 25–39, 40–64, and 65+) from 2011 to 2021. Values are reported in absolute numbers (in thousands). The 25–39 age group consistently represents the largest share of emigrants during the observed period, followed by the group of 40-65-old individuals.
Source: ISTAT.

While the movement and circulation of high-skilled individuals can facilitate the exchange of technology and knowledge, a major challenge for countries facing emigration is whether they can successfully re-attract and retain this talent. If there are no significant return migration flows or inflows of high-skilled foreigners, brain drain could trigger a detrimental cycle, leading to low growth potential and difficulties in accumulating the essential human capital, which is, in turn, a key factor of production alongside physical capital and technology.

Therefore, the emigration of educated individuals presents considerable challenges for Italy, as it signifies a loss of human capital that could have contributed to the nation's development and innovation.

In summary, the brain drain phenomenon in Italy reflects a complex interplay of historical trends, economic cycles, and personal aspirations. It underscores the need for strategies that both retain talent and attract it back,[17] balancing educational investments[18] with opportunities for professional growth and innovation. This challenge is critical for ensuring that the nation fully benefits from its investment in human capital.[19]

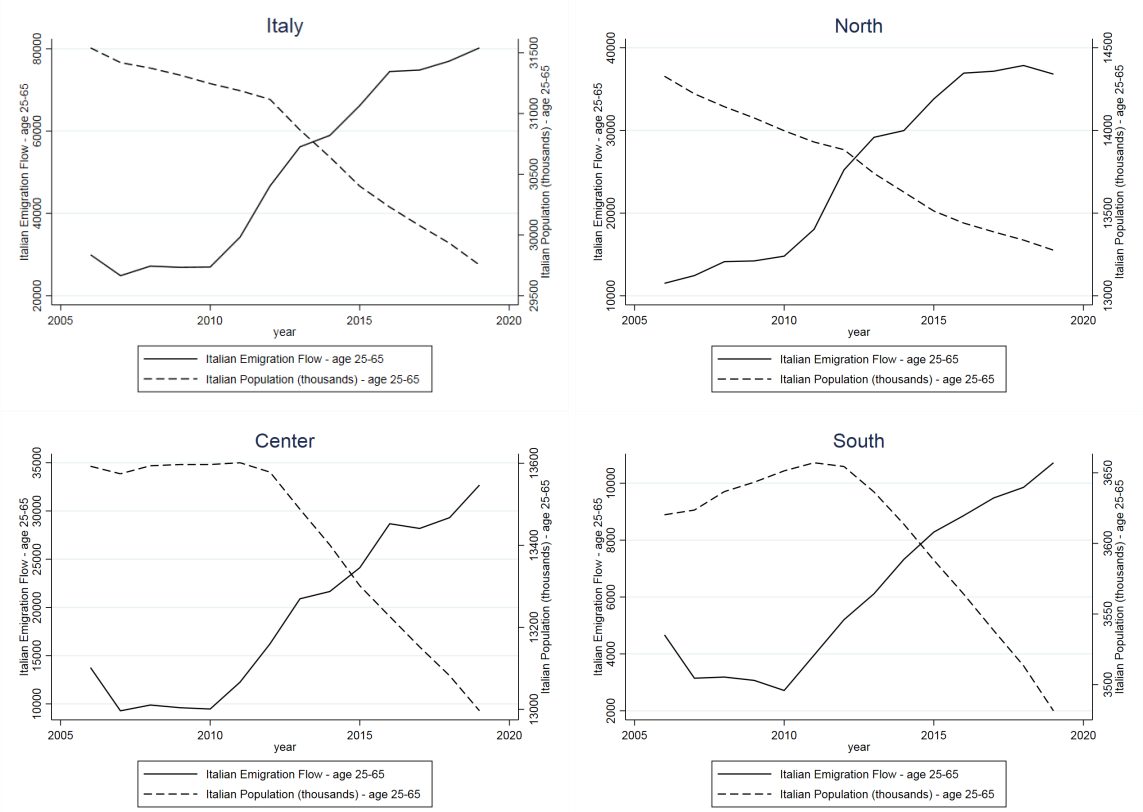
[17]To counteract the adverse trend of brain drain, Italy made significant efforts in 2010 and 2015 by introducing preferential tax schemes for inbound workers. These schemes provided substantial income tax reductions to eligible high-skilled returnees and immigrants with EU citizenship born on or after 1969. Furthermore, in 2019, a new preferential tax scheme was introduced, expanding its availability to a broader range of migrants, irrespective of their age or level of education (Rag.Rodella, 2021).

[18]According to estimates from the Centro Studi Confindustria (2017), Italian households spend approximately 165,000 euros per child on care and education from birth until the age of 25. the emigration of young Italians between 2008 and 2015 has resulted in a loss of private human capital investment equivalent to 42.8 billion euros.

[19]Italy, like other European countries with a public education system and modest tuition fees, invests in educating its citizens, which results in a high-skilled workforce. However, it seems that Italy struggles to retain these skilled individuals and fully reap the benefits of their education and expertise.

A.2 Emigration and Population of Italians Aged 25-65

Figure A.4: Annual Emigration Flows and Trends in the Total Population of Italians Aged 25-65.

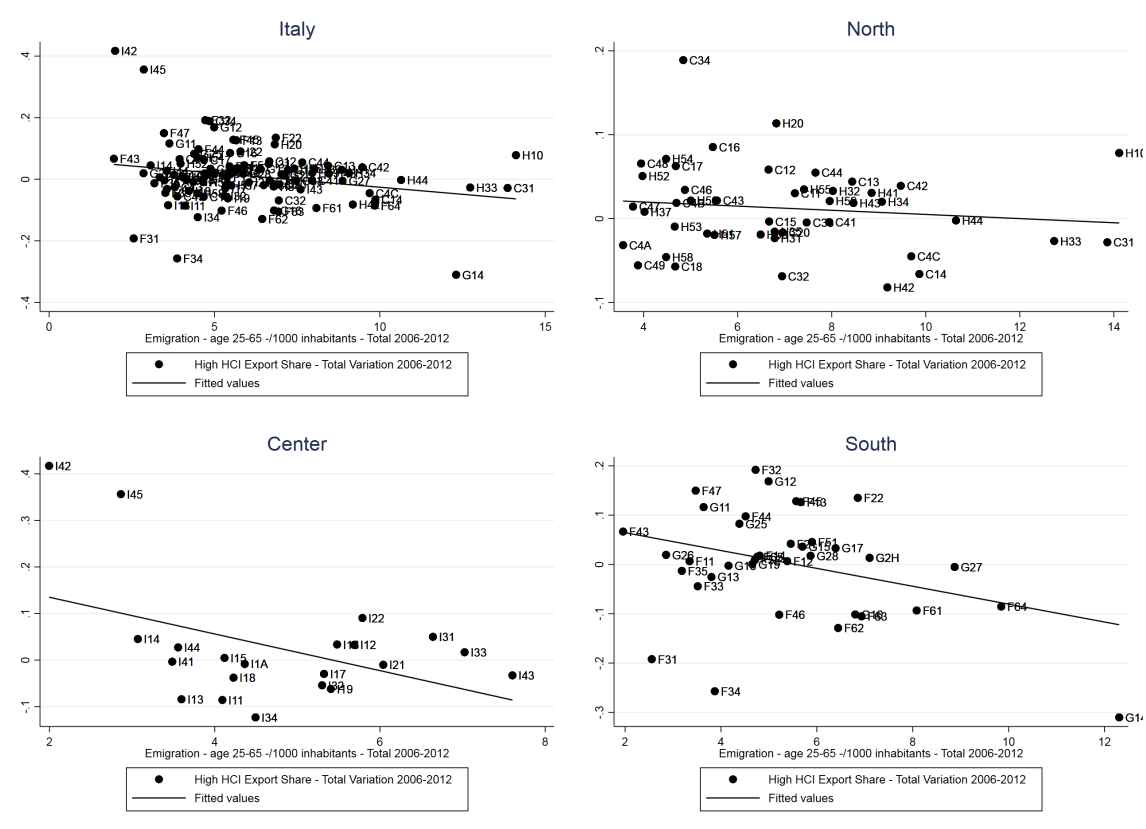


Notes: This figure illustrates the relationship between increased emigration flows and the decline in the working-age population of Italians from 2006 to 2012. The solid line shows the annual emigration flows of Italians aged 25 to 65, while the dashed line shows the trend of the Italian population for individuals aged 25–65 (in thousands).

Source: Demographic Portal of ISTAT Anagrafe.

A.3 Emigration of Italians Aged 25-65 and Export Performance

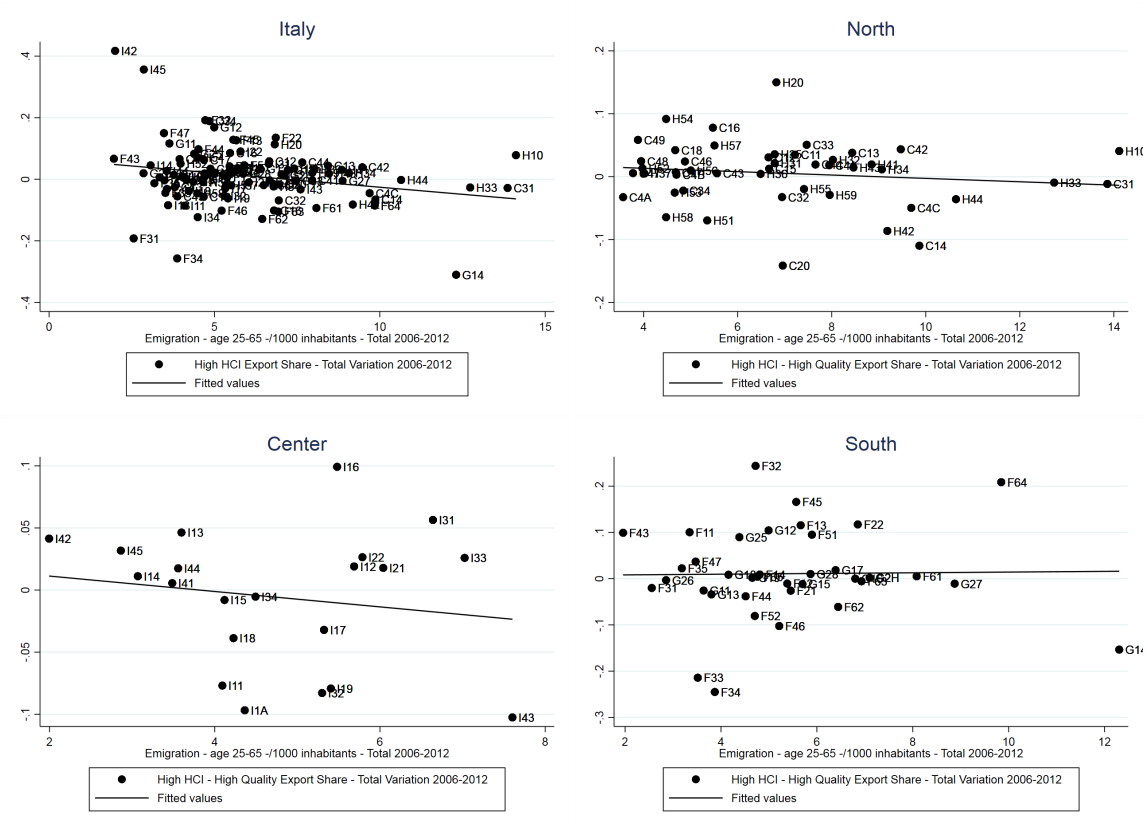
Figure A.5: Annual Emigration Flows of Italians Aged 25-65 and the Share of Exports for High Human Capital-Intensive Products.



Notes: This figure illustrates the correlation between emigration flows and export performance. The scatter plots, labelled with their respective provinces, are accompanied by a fitted line that captures the trend between the total change in emigration rates for Italians aged 25–65, normalized per 1,000 inhabitants, and the change in the share of export for high human capital-intensive products across Italian provinces from 2006 to 2012.

Source: Demographic Portal of ISTAT Anagrafe and ISTAT database on manufacturing exports (external and internal flows).

Figure A.6: Annual Emigration Flows of Italians Aged 25-65 and the Share of Exports for High Human Capital-Intensive and High-Quality Products.



Notes: This figure illustrates the correlation between emigration flows and export performance. The scatter plots, labelled with their respective provinces, are accompanied by a fitted line that captures the trend between the total change in emigration rates for Italians aged 25–65, normalized per 1,000 inhabitants, and the change in the share of exports for high human capital-intensive and high-quality products across Italian provinces from 2006 to 2012.

Source: Demographic Portal of ISTAT Anagrafe and ISTAT database on manufacturing exports (external and internal flows).

A.4 Testing the Validity of the IV

Table A.2: IV Validity.

	(1)	(2)	(3)
	$L4.Exp\_Share^{HHCI}_{p,t/t-4}$		$L4.Exp\_share^{\substack{HHCI \\ HQuality}}_{p,t}$
$IV^{share}_{p,t/t-4}$	0.173	0.141	0.114
	(0.157)	(0.114)	(0.149)
N	312	312	312
Controls	Yes	Yes	Yes

Note: The table presents IV validity test estimates from the OLS. All estimates are based on the period 2006-2012. N=312 (3 periods x 104 provinces). The dependent variables are lagged by four periods. In Column (1) the dependent variable is the share of exports of high human capital-intensive products that fall above the median of the distribution. In Column (2), it is the same share but restricted to products in the upper quartile. In Column (3), it is the share of high and high-quality products that are above the median of their respective distribution. The independent variable is the four-year difference of our IV, which is an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of the total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the logarithm of value added per capita as well as NUTS1-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.5 First Stage Regressions

Table A.3: First Stage Regression at the Province Level.

	(1) $Emigration^{share}_{p,t/t-4}$
$IV^{share}_{p,t/t-4}$	7.521
	(1.688)***
N	312
Controls	Yes

Note: The table presents estimates from the OLS. The dependent variable the four-year difference of the stock of Italian emigrants aged 25 to 65. The independent variable is the four-year difference of our IV, which is an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the logarithm of value added per capita as well as NUTS1-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: First Stage Regressions at the Province-Product Level.

	(1) $Emigration^{share}_{p,t/t-4}$	(2) $Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	(3) $Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	(4) $Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$
$IV^{share}_{p,t/t-4}$	11.320***	0.340***	0.118	0.107*
	(0.199)	(0.042)	(0.092)	(0.061)
$IV^{share}_{p,t/t-4} * RHCI^{high}_{g}$	1.534***	11.574***	-0.252	-0.266
	(0.429)	(0.473)	(0.184)	(0.416)
$IV^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	0.499*	-0.025	9.800***	-5.445***
	(0.276)	(0.090)	(0.415)	(0.349)
$IV^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.748**	-0.468	1.781***	38.904***
	(0.371)	(0.426)	(0.600)	(1.022)
N	64695	64695	64695	64695
Controls	Yes	Yes	Yes	Yes

Note: The table presents estimates from the OLS of Eq. 6, using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution. The dependent variable the four-year difference of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The independent variable is the four-year difference of our IV, which is an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: First Stage Regressions at the Province-Product Level Using Further Restricted Sample.

	(1) $Emigration^{share}_{p,t/t-4}$	(2) $Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	(3) $Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	(4) $Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$
${}_4IV^{share}_{p}$	12.232***	0.254***	0.240**	0.013
	(0.247)	(0.051)	(0.112)	(0.061)
${}_4IV^{share}_{p} * RHCI^{high}_{g}$	2.063***	13.517***	-0.327	-0.076
	(0.560)	(0.644)	(0.213)	(0.381)
${}_4IV^{share}_{p} * Quality^{high}_{pg,t/t-4}$	0.821**	-0.038	10.936***	-5.183***
	(0.327)	(0.103)	(0.518)	(0.351)
${}_4IV^{share}_{p} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.832**	-0.394	2.748***	42.602***
	(0.410)	(0.481)	(0.692)	(1.011)
N	59406	59406	59406	59406
Controls	Yes	Yes	Yes	Yes

Note: The table presents estimates from the OLS of Eq. 6, using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution - and is further restricted by excluding province-product pairs with fewer than three observations through time. The dependent variable the four-year difference of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The independent variable is the four-year difference of our IV, which is an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.6 Descriptive Statistics

Table A.6: Summary statistics.

	(1)	(2)	(3)	(4)	(5)	(6)
	2006-2019 period			2006-2012 period		
	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
$Emigration^{share}_{p,t/t-4}$	1040	7.105458	3.691854	312	3.837782	1.749953
$Exp\_Share^{HHCI_{50p}}_{p,t/t-4}$	1040	.0129709	.0976147	312	-.0113154	.1017459
$Exp\_Share^{HHCI_{75p}}_{p,t/t-4}$	1040	.0166554	.0786664	312	.0075522	.0800591
$Immigrants\_Share^{15-65_{age}}_{p,t/t-4}$	936	.0129322	.0105686	312	.0210245	.0103036
$lnTotPop\_Italians^{15-65_{age}}_{p,t/t-4}$	936	-.0098239	.0209087	312	.0083789	.0170603
$FirmReg\_Rate^{Gross}_{p,t/t-4}$	1040	-18.29059	49.94606	312	-7.672628	26.00978
$Financing\ risks_{p,t/t-4}$	932	.676761	2.605587	312	1.445123	1.706103
$lnValue\ Added^{per\ capite}_{p,t/t-4}$	1040	.0220809	.0573805	312	-.0169916	.0536928

Note: The table presents the descriptive statistics for the full sample from 2006 to 2019 in the first three columns, and for the restricted sample from 2006 to 2012 in the last three columns. It comprises dependent and independent variables, along with all additional controls used in the estimations. the number of observations in Column (1) and (4), the mean in Column (2) and (5), and the standard deviation Column (3) and (6).

A.7 Robustness Checks

Table A.7: Robustness of Baseline Results at the Province Level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			$Exp\_Share^{HHCI}_{p,t/t-4}$					$Exp\_share^{\substack{HHCI \\ HQuality}}_{p,t}$	
	W	W05	W05b	W	W05	W05b	W	W05	W05b
$Emigration^{share}_{p,t/t-4}$	-0.039*	-0.035*	-0.043*	-0.017*	-0.016*	-0.019**	-0.009*	-0.009*	-0.010*
	(0.021)	(0.020)	(0.024)	(0.009)	(0.008)	(0.009)	(0.005)	(0.005)	(0.005)
N	312	312	312	312	312	312	312	312	312
Cragg-Donald Wald F	71.19	71.19	71.19	71.19	71.19	71.19	71.19	71.19	71.19
Kleibergen-Paap rk Wald F	19.85	19.85	19.85	19.85	19.85	19.85	19.85	19.85	19.85
Kleibergen-Paap rk LM	9 724	9 724	9 724	9 724	9724	9724	9724	9724	9724
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table presents estimates from the 2SLS regressions of Eq. 5, using different specifications that winsorize the upper 0.5% or 1% tails of the outcome variables. *W* refers to winsorization at the 1% and 99% percentiles; *W05* applies winsorization at the 0.5% and 99.5% percentiles; while *W05b* uses symmetric winsorization at the same percentiles, replacing extreme values with corresponding cutoff values. All estimates are based on the period 2006-2012. N=312 (3 periods x 104 provinces). The dependent variables are expressed as four-year differences. In Columns (1)-(3), the dependent variable is the share of exports of high human capital-intensive products that fall above the median of the distribution. In Columns (4)-(6), it is the same share, but for products in the upper quartile of the distribution. In Columns (7)–(9), the dependent variable is the share of exports of high human capital-intensive and high-quality products, and that fall above the median of their respective distribution. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the logarithm of value added per capita as well as NUTS1-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.8: Robustness of Baseline Results at the Province-Product Level with Standard Errors Clustered at the Province Level.

	(1)	(2)	(3)	(4)
	Full Sample		Full Sample - Restricted	
	Value	Quantity	Value	Quantity
$Emigration^{share}_{p,t/t-4}$	-0.001	-0.001	0.011	0.010
	(0.021)	(0.022)	(0.021)	(0.022)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	0.024	0.011	-0.007	-0.012
	(0.027)	(0.032)	(0.022)	(0.027)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	-0.001	-0.061	0.001	-0.032
	(0.042)	(0.059)	(0.040)	(0.053)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.023*	-0.074***	-0.031***	-0.077***
	(0.013)	(0.017)	(0.012)	(0.016)
N	64695	64695	59406	59406
Cragg-Donald Wald F	2289	2289	2361	2361
Kleibergen-Paap rk Wald F	2868	2868	2938	2938
Kleibergen-Paap rk LM	13.79	13.79	13.94	13.94
Product-Year FEs	Yes	Yes	Yes	Yes

Note: The table presents estimates from 2SLS regressions of Eq. 6, using different specifications. In Columns (1) and (2), we estimate the model using the full sample, while in Columns (3) and (4) we further restrict the full sample by excluding province-product pairs with fewer than three observations through time. All estimates are based on the period 2006-2012. The dependent variables are expressed as four-year differences. In odd-numbered columns, the dependent variable is the logarithm of the value of exports, while in even-numbered columns, it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.9: Robustness of Baseline Results at the Province-Product Level with Standard Errors Clustered at the Province-Product Level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sample without Outliers		Sample without Outliers - Restricted		Full Sample		Full Sample - Restricted	
	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity
$Emigration^{share}_{p,t/t-4}$	-0.001	-0.000	0.013	0.013	-0.001	-0.001	0.011	0.010
	(0.015)	(0.017)	(0.013)	(0.016)	(0.015)	(0.018)	(0.014)	(0.017)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	0.007	-0.014	-0.006	-0.025	0.024	0.011	-0.007	-0.012
	(0.026)	(0.031)	(0.023)	(0.029)	(0.027)	(0.032)	(0.024)	(0.030)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	0.004	-0.030	0.004	-0.006	-0.001	-0.061*	0.001	-0.032
	(0.026)	(0.033)	(0.025)	(0.031)	(0.029)	(0.036)	(0.027)	(0.034)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.019	-0.070***	-0.027**	-0.072***	-0.023*	-0.074***	-0.031***	-0.077***
	(0.012)	(0.014)	(0.011)	(0.014)	(0.013)	(0.015)	(0.012)	(0.015)
N	59046	59046	53061	53061	64695	64695	59406	59406
Cragg-Donald Wald F	2141	2141	2156	2156	2289	2289	2361	2361
Kleibergen-Paap rk Wald F	151.3	151.3	115.8	115.8	168.1	168.1	132.8	132.8
Kleibergen-Paap rk LM	688.7	688.7	618.3	618.3	736.6	736.6	676.4	676.4
Product-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table presents estimates from 2SLS regressions of Eq. 6, using different samples and specifications. In Columns (1) and (2) we conduct regression analyzes using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution, while in Columns (3) and (4) we further restrict the sample by excluding province-product pairs with fewer than three observations through time. In Columns (5) and (6) we use the full sample, while in Columns (7) and (8) we further restrict the full sample by excluding province-product pairs with fewer than three observations through time. All estimates are based on the period 2006-2012. The dependent variables are expressed as four-year differences. In odd-numbered columns, the dependent variable is the logarithm of the value of exports, while in even-numbered columns, it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as product-year FEs. All Standard errors are in parentheses clustered at the province-product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: Further Robustness Checks at the Province-Product Level with Province-Year and Product-Year FEs and with Standard Errors Clustered at the Province Level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sample without Outliers		Sample without Outliers - Restricted		Full Sample		Full Sample - Restricted	
	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	0.017	-0.003	0.005	-0.014	0.026	0.013	-0.002	-0.008
	(0.026)	(0.032)	(0.025)	(0.027)	(0.025)	(0.030)	(0.021)	(0.025)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	-0.002	-0.036	0.005	-0.005	-0.006	-0.066	0.003	-0.030
	(0.035)	(0.041)	(0.031)	(0.034)	(0.042)	(0.059)	(0.040)	(0.053)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.016	-0.066***	-0.025**	-0.070***	-0.020	-0.071***	-0.030**	-0.075***
	(0.011)	(0.014)	(0.011)	(0.014)	(0.013)	(0.016)	(0.012)	(0.016)
N	59046	59046	53061	53061	64695	64695	59406	59406
Cragg-Donald Wald F	2873	2873	2908	2908	3055	3055	3147	3147
Kleibergen-Paap rk Wald F	3 787	3 787	3 917	3 917	3 811	3 811	3 875	3 875
Kleibergen-Paap rk LM	13.68	13.68	13.79	13.79	13.75	13.75	13.86	13.86
Province-Year and Product-Year FEs	Yes	Yes	Yes	Yes				

Note: The table presents estimates from 2SLS regressions of Eq. 6, using different samples and specifications. In Columns (1) and (2) we conduct regression analyzes using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution, while in Columns (3) and (4) we further restrict the sample by excluding province-product pairs with fewer than three observations through time. In Columns (5) and (6) we use the full sample, while in Columns (7) and (8) we further restrict the full sample by excluding province-product pairs with fewer than three observations through time. All estimates are based on the period 2006-2012. The dependent variables are expressed as four-year differences. In odd-numbered columns, the dependent variable is the logarithm of the value of exports, while in even-numbered columns, it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as province-year and product-year FEs. All Standard errors are in parentheses clustered at the province level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: Further Robustness Checks at the Province-Product Level with Province-Year and Product-Year FEs and with Standard Errors Clustered at the Province-Product Level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cluster Province-Product							
	Sample without Outliers		Sample without Outliers - Restricted		Full Sample		Full Sample - Restricted	
	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g}$	0.017	-0.003	0.005	-0.014	0.026	0.013	-0.002	-0.008
	(0.026)	(0.031)	(0.023)	(0.029)	(0.026)	(0.032)	(0.024)	(0.029)
$Emigration^{share}_{p,t/t-4} * Quality^{high}_{pg,t/t-4}$	-0.002	-0.036	0.005	-0.005	-0.006	-0.066*	0.003	-0.030
	(0.026)	(0.033)	(0.024)	(0.031)	(0.029)	(0.037)	(0.027)	(0.034)
$Emigration^{share}_{p,t/t-4} * RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$	-0.016	-0.066***	-0.025**	-0.070***	-0.020	-0.071***	-0.030**	-0.075***
	(0.012)	(0.014)	(0.011)	(0.014)	(0.013)	(0.015)	(0.012)	(0.015)
N	59046	59046	53061	53061	64695	64695	59406	59406
Cragg-Donald Wald F	2858	2858	2891	2891	3040	3040	3130	3130
Kleibergen-Paap rk Wald F	199.7	199.7	148.9	148.9	223.5	223.5	173.7	173.7
Kleibergen-Paap rk LM	685.8	685.8	611	611	737.2	737.2	678.1	678.1
Province-Year and Product-Year FEs	Yes	Yes	Yes	Yes				

Note: The table presents estimates from 2SLS regressions of Eq. 6, using different samples and specifications. In Columns (1) and (2) we conduct regression analyzes using a sample that excludes outliers - specifically, observations below the 5th percentile and above the 95th percentiles of the dependent variables' distribution, while in Columns (3) and (4) we further restrict the sample by excluding province-product pairs with fewer than three observations through time. In Columns (5) and (6) we use the full sample, while in Columns (7) and (8) we further restrict the full sample by excluding province-product pairs with fewer than three observations through time. All estimates are based on the period 2006-2012. The dependent variables are expressed as four-year differences. In odd-numbered columns, the dependent variable is the logarithm of the value of exports, while in even-numbered columns, it is the logarithm of the quantity of export. The independent variable is the four-year difference of the share of the stock of Italian emigrants aged 25 to 65. This variable is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. The IV is the four-year difference of an economic-weighted, network-based indicator for each province, capturing exogenous variation in migration pressures over the 2006-2012 period. This IV is further interacted with binary variables such as $RHCI^{high}_{g}$, $Quality^{high}_{pg,t/t-4}$, and $RHCI^{high}_{g} * Quality^{high}_{pg,t/t-4}$. Controls include the four-year differences of the share of immigrants aged 15 to 65, the logarithm of total population of Italians aged 15 to 65, the gross registration rate in the business register and financing risks, the relative export quality as well as province-year and product-year FEs. All Standard errors are in parentheses clustered at the province-product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$