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Article

Beyond Borders: The Effects of Immigrants on Value-Added Trade

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Abstract: While the effects of immigrants on aggregate trade flows have been extensively examined, the role of immigrants in shaping trade in value added (TiVA) remains underexplored. Employing a panel dataset covering 38 Organization for Economic Co-operation and Development (OECD) member host countries and 64 immigrant home countries spanning 2000–2018 and estimating a random intercept and random slope mixed-effects model, we find that immigrants play a significant role in enhancing the value added from their home countries that is embedded in their host countries' exports to the world. We document these effects at the aggregate level and across sectors (i.e., manufacturing, agriculture, and services). There is, however, considerable variation in the influence of immigrants on TiVA across country pairs. Our findings highlight that immigrants significantly enhance trade sophistication by promoting specialization and upward movement in the value chain, yielding economic benefits for their home and host countries.

Keywords: immigration; value-added trade; trade costs; productive capacity

JEL Classification: F22; F14; F23; F10



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1. Introduction

Immigrants play indispensable and multifaceted roles in shaping the economic footprints of both their home and host countries, especially in the global marketplace. As workers, they fill critical labor market gaps, bringing unique skills and perspectives that drive productivity and innovation (Kerr 2023). As consumers, their preferences for home country products significantly influence bilateral trade flows (Gould 1994). As entrepreneurs, they enhance their host country's competitive edge in global trade by introducing new products and services, creating value, and contributing to research and development (Hunt and Gauthier-Loiselle 2010). Immigrants also stimulate economic activity in their home countries through remittances, facilitating new businesses and fostering the inflows of foreign direct investments (Cuadros et al. 2016; Flisi and Murat 2011).

Immigrant networks are also vital in promoting international trade through reductions in related transaction costs. Gould (1994) first proposed that immigrants, through ethnic networks (i.e., business and social connections) and their knowledge of home and host country markets, bridge information asymmetries, enhance the enforcement of contracts, and influence the bilateral trade preferences of their home and host countries. Several studies confirm the positive influences of immigrants on bilateral trade flows (e.g., Head and Ries 1998; Genc et al. 2012). For example, Rauch and Trindade (2002) find that the presence of ethnic Chinese networks significantly increases bilateral trade.¹ Parsons and Vézina (2018) conclude that in addition to facilitating the flow of final products, immigrant networks help to ensure the smooth flow of intermediate goods and services, which

are essential for establishing trading relationships and value creation at various stages of production.

Building on these insights, several studies have employed innovative methodologies to isolate the causal effects of migration on trade. [Parsons and Vézina \(2018\)](#) leverage a natural experiment involving Vietnamese boat people resettled in the U.S. to establish a causal link between migration and trade. They find that U.S. exports to Vietnam were significantly higher in states with larger Vietnamese populations, with a 10 percent increase in Vietnamese immigrants corresponding with a 4.5 percent increase in exports. This study provides compelling evidence of the trade-creation effect of immigrants, particularly through their role in reducing information barriers and contract enforcement costs.

The role of ethnic networks in facilitating international trade has been further elucidated by [Rauch and Trindade \(2002\)](#), who focus on ethnic Chinese networks. They find that these networks significantly increase bilateral trade, with the effect being particularly pronounced for differentiated products. For countries with ethnic Chinese populations in the first and third quartiles, the networks are associated with increases in bilateral trade of 60 percent for differentiated goods and 150 percent for all goods combined. This underscores the importance of social and business networks in overcoming informational barriers to trade, especially for complex, differentiated products that often comprise a significant portion of value-added trade.

[Hatzigeorgiou \(2010\)](#) provides additional evidence on migration's trade-facilitating role, finding that immigration and emigration positively impact trade flows. The study reveals that a 10 percent increase in immigrant stock is associated with a 4.5 percent increase in imports and a 5 percent increase in exports. In comparison, a similar increase in the emigrant stock corresponds to a 5 percent rise in imports and a 4.5 percent increase in exports. These findings highlight the bidirectional nature of the migration-trade relationship and suggest that immigrants and emigrants can serve as conduits for trade through their knowledge of home and host country markets.

Furthermore, [Kugler and Rapoport \(2011\)](#) extend the analysis beyond trade to examine the relationship between migration, foreign direct investment (FDI), and trade margins. They find that skilled migration is positively associated with future FDI, particularly in the service sector. This relationship is complementary to trade, with migration contributing to both the extensive (new trade relationships) and intensive (increased volume of existing trade) margins. Their findings suggest that migrants facilitate trade and play crucial roles in attracting FDI and expanding the scope of international economic relationships. This can further enhance value-added trade between countries.

The available literature suggests that immigrant networks reduce informational barriers, making host country firms more likely to engage in international outsourcing of intermediate inputs to the immigrants' home countries ([Bandyopadhyay et al. 2008](#); [Hiller 2013](#)). [Hiller \(2013\)](#) reports that immigrant employees increase the likelihood of a firm engaging in exports by approximately 5–6 percentage points compared to firms without immigrant employees. Similarly, [Bandyopadhyay et al. \(2008\)](#) find that a 10% increase in the immigrant population from a specific country within a U.S. state is associated with approximately a 1.5% increase in that state's exports to the immigrants' country of origin. Similarly, [Mitaritonna et al. \(2017\)](#) also conclude that access to immigrants' contacts and knowledge likely facilitates host country imports of inputs and participation in supply chain networks centered around major hub countries.

Given their myriad positive influences, it can be inferred that immigrants affect international trade in value added (TiVA) by reducing information asymmetry and transaction costs and making a smoother flow of intermediate goods and services possible, particularly in the complex domain of value-added trade. Thus, any analysis of the immigrant-trade relationship solely focusing on their effects on gross trade flows is incomplete. Specifically, because gross trade flows account for the total monetary value of traded goods without distinguishing the origins of their components, they overlook the intricacies of global value chains (GVCs), where product components are sourced from multiple countries. Immi-

grants may influence GVCs through trade in final goods and the value added at various stages of production (Timmer et al. 2015); their roles might be more prominent in specific segments of these chains, such as in producing intermediate goods or in sectors where the immigrants' home countries have a comparative advantage (Bastos and Silva 2012).

Since immigrants often possess specific skills and knowledge relevant to industries in which their home (host) country has a competitive advantage, they may provide knowledge that significantly enhances the productive capacity of the host (home) country, especially in sectors where such skills are in short supply. The resulting increase in productivity may increase the value added in the production processes (Docquier and Rapoport 2012). For example, skilled immigrants contribute to innovation and technological advancements in their host countries, potentially leading to the development of new products and services (Kerr et al. 2016). The ability of a country to add value is shaped by several key factors: the availability of resources such as labor; physical and human capital (the skills, knowledge, and expertise of the workforce); technological capabilities and infrastructure; and the efficiency of management practices and institutional frameworks. Therefore, controlling for the relative productive capacities of the home and host countries when analyzing how immigrants influence value-added trade is crucial.

Finally, due to their specialized knowledge, skills, and networks, immigrants can enhance trade in ways not immediately apparent through gross trade figures. For instance, immigrants may facilitate trade by reducing transaction costs, connecting businesses across borders, or driving demand for specific goods and services from their home countries (Aleksynska and Peri 2014). Such contributions may indirectly influence value creation through improved production efficiencies or heightened demand for specialized components. Thus, to fully grasp the impact of immigrants on international trade, it is essential to look beyond their effects on gross trade values.

Our primary objective is to investigate the influence of immigrants on TiVA while controlling for differences in the productive capacities of their home and host countries that determine value creation. Estimating a series of multilevel models using panel data that span the years 2000–2018 on aggregate and sector-specific measures of TiVA in 38 Organization for Economic Co-operation and Development (OECD) countries that serve as hosts to immigrants from 64 home countries, we find that an increase in the stock of immigrants from a typical home country that reside in each host country has positive and statistically discernible impacts on the value that is generated in the home countries and embedded in the exports of the host countries to international markets.

Our study makes two key contributions. First, by demonstrating the impacts of immigrants purely on the TiVA from their home countries that is embedded in the exports of their host countries—representing the economic footprints of both the home and host countries in the global production networks—we highlight their multifaceted role in enabling countries to specialize, move up the value chain, and enhance trade sophistication. Second, by demonstrating the impact of immigrants on trade in goods and services that crosses at least two borders, we shed light on immigrants' significant yet overlooked role in global trade, underscoring the need for supportive, forward-looking immigration policies that recognize and harness immigrants' economic potential in highly globalized markets.

We proceed as follows: Section 2 offers an overview of the literature exploring the nexus between immigrants and TiVA. Section 3 outlines our empirical framework, detailing the data sources, primary variables, and controls. Our results, including interpretations and robustness checks, are presented in Section 4. Finally, Section 5 concludes the article with an emphasis on potential policy implications.

2. Literature Review

Due to its policy implications, particularly in the face of rising globalization, the relationship between international migration and trade garners attention from both theoretical and empirical perspectives. Traditional international trade theories, such as the Ricardian model, offer cultural and preference explanations for the complementarity between immi-

grants and trade flows. [Gould \(1994\)](#), [Rauch and Trindade \(2002\)](#), and [Rauch \(2001\)](#), for example, identify immigrants as vital intermediaries in bilateral trade for easing language barriers, aiding business matchmaking, and reducing information asymmetries.

More recent studies incorporating heterogeneous firm trade theories underscore the role of immigrant networks in reducing the costs associated with international trade. Utilizing Melitz's firm ([Melitz 2008](#)) heterogeneity framework, researchers have proposed a "business network" narrative, which suggests that immigrants provide vital market information, contacts, and resources, thereby facilitating firm entry into foreign markets ([Kugler and Rapoport 2011](#); [Iranzo and Peri 2009](#)). Drawing on [Chaney \(2014\)](#) and [Burchardi et al. \(2019\)](#), for example, observe that skilled immigrants act as "pioneers", providing information about opportunities in destination countries and encouraging the engagement of firms from their countries of origin.

Summarizing the theoretical underpinnings, [Felbermayr et al. \(2010\)](#) assert that the presence of immigrants promotes trade between their home and host countries by mitigating incomplete information, attenuating frictions due to asymmetric information, and serving as a loyal consumer base. First, by helping overcome informal barriers to international trade, such as differences in languages, cultures, or institutions, immigrants create business relationships and make valuable information on foreign sales and sourcing opportunities more readily available. Second, through their networks, immigrants reduce friction caused by asymmetric information and lower the risk of opportunistic behavior in business dealings, which may reduce the volume of transactions below the socially desirable level. Lastly, immigrants boost trade between their home and host countries through natural preferences for the goods produced in their home countries.

Extensive empirical research presents strong evidence that supports the role played by immigrants in shaping bilateral trade patterns both at national and subnational levels (e.g., [Bove and Elia 2017](#); [Aleksynska and Peri 2014](#); [Bastos and Silva 2012](#); [Peri and Requena-Silvente 2010](#); [Bandyopadhyay et al. 2008](#); [Dunlevy 2006](#); [Combes et al. 2005](#); [Herander and Saavedra 2005](#); [Rauch and Trindade 2002](#); [Girma and Yu 2002](#); [Wagner et al. 2002](#); [Head and Ries 1998](#); and [Gould 1994](#)). Pooling 284 export and 229 import elasticities from 48 studies that apply the gravity model in the context of the trade-creation effect of immigrants and conducting a meta-analysis, [Genc et al. \(2012\)](#) report average elasticities of bilateral exports and imports to increased immigrant stocks of 0.16 and 0.15, respectively.²

Despite the voluminous research addressing immigrants' impacts on aggregate trade flows, studies examining their influence on value-added trade are limited. Immigrants may affect value-added trade in more distinct ways than aggregate trade flows. First, they introduce specialized skills essential for the operation of industries. These skills enhance the efficiency and productivity of the sectors involved in international trade, thereby increasing the value added by these industries ([Ottaviano et al. 2018](#)). Second, they facilitate economic and cultural linkages that can improve international cooperation and reduce transaction costs, making them invaluable in streamlining operations and enhancing the integration of supply chains, further bolstering the value added to products and services ([Zhou and Anwar 2022](#)). Third, by fostering innovation and entrepreneurship, immigrants may introduce new processes and products, strengthening a country's competitive position globally ([Kerr and Lincoln 2010](#)). They also provide labor market flexibility, adapting quickly to changes in production demands, which is crucial for industries that must respond dynamically to global market conditions ([Azoulay et al. 2022](#)). This flexibility, combined with their unique insights into regulatory and market environments, enhances trade facilitation, which is a critical component in the efficiency of GVCs.

Finally, immigrants often have profound cultural and emotional connections to products from their home countries, such as food items, clothing, and entertainment, that go beyond the essential utility of these goods, creating loyal consumer bases for specific host country imports. Many goods (e.g., ethnic foods or traditional attire) are unique and not easily replicable; the specialized nature of these products may require indigenous production processes, ingredients, or craftsmanship, which enhances the value-added content of these

imports. People often regard the quality and authenticity of certain goods, particularly items of cultural significance, from their home countries as superior. This perception may lead them to favor imports from their home countries over local alternatives. Consequently, while the mechanism applies to both gross trade and value-added trade, the preference effects of immigrants on value-added trade may be substantial.

3. Empirical Model, Data, and Variables

3.1. The Empirical Model

Given that we focus on values that cross at least two borders, excluding domestic consumption, instead of the traditional economic mass (i.e., levels of GDP), our baseline model attributes TiVA to the productive capacities of countries i and j , each located in region k , during year t (PCI_{it}^k and PCI_{jt}^k , respectively, which are in the vector ω_{ijt}), the immigrant stock from home country i that resides in the host country j ($Immig_{ijt}^k$), and ad valorem tariff-equivalent bilateral trade costs (τ_{ijt}) affecting trade flows between the home and host countries. Equation (1) illustrates the model.

$$Y_{ijt}^k = \lambda_0 + \gamma \ln \omega_{ijt}^k + \delta \ln Immig_{ijt}^k + \theta \ln \tau_{ijt}^k + u_{ijt}^k \quad (1)$$

Our primary dependent variable (Y_{ijt}^k) is the value added generated in the home country i that is embedded in the aggregate- and sector-level (agricultural, manufacturing, and services) exports of host country j to the world during year t ($TiVA_{ijt}^k$). For comparison, we also use the host country j 's gross imports from (exports to) the home country i during year t as our dependent variable.

As noted, ω_{ijt}^k includes the measures of productive capacity for each home and host country. The values are multidimensional indexes representing advanced technologies, skilled workforces, efficient infrastructures, and effective institutions. The productive capacities of the home (host) countries determine their abilities to produce and deliver goods and services (UNCTAD 2021). Encompassing a country's capacity to specialize, attain economies of scale, broaden their output variety, uphold superior quality standards, draw investments, and foster innovation at a broader level, a nation's productive capacity is pivotal in shaping its TiVA. Equation (2) further describes the relationship.

$$\omega_{ijt}^k = PCI_{it}^k \times PCI_{jt}^k \quad (2)$$

The second term in Equation (1), $Immig_{ijt}^k$, is the number of immigrants from home country i that reside in country j during year t . As noted, immigrants' access to business and social networks may facilitate trade, investment, and knowledge exchanges. It is also anticipated that through skill transfer, entrepreneurship, capital inflows, remittances, knowledge dissemination, and the creation of business networks, immigrants shape the productive capacities of their home and host countries. Additionally, large diaspora communities may invest in significant projects in their home countries that bolster productive capacity (e.g., infrastructure development, educational institutions, or technological hubs).

Productive capacities may be pivotal in influencing how immigrants foster TiVA between their home and host countries. For example, a host country with a robust productive capacity may offer an environment that is more conducive to innovation and integration into established industries, allowing immigrants to act as bridges for trade by sharing unique insights into market demand and the business practices of their home countries. Conversely, if the host nation has a limited productive capacity, immigrants might face challenges in contributing to TiVA between their native and adopted lands. Accordingly, we augment Equation (2) with a term that interacts the immigrant stock variable and the productive capacity measures.

$$\omega_{ijt}^k = [PCI_{it}^{\alpha_1} \times PCI_{jt}^{\alpha_2}] \times [Immig_{ijt}^{\alpha_3}] \quad (3)$$

The final variable in Equation (1), τ_{ijt}^k , is an ad valorem tariff-equivalent measure of bilateral trade costs. Derived from the inverse gravity framework (Novy 2013), the measure captures trade costs in its broad sense, including both international transport costs and tariffs as well as other trade cost components, as discussed by Anderson and van Wincoop (2004), such as the direct and indirect costs of linguistic differences, currency exchange, and cumbersome import or export procedures that inhibit trade between the host and home countries.

Combining Equations (1)–(3) and log-transforming the variables yields a form of the gravity model of trade, presented as Equation (4), that describes bilateral TiVA.

$$\begin{aligned} \ln Y_{ijt}^k = & \alpha_0 + \alpha_1 \ln Immig_{it}^k + \alpha_2 \ln PCI_{it}^k + \alpha_3 \ln PCI_{jt}^k \\ & + \alpha_4 [\ln Immig_{ijt}^k \times \ln PCI_{it}^k] + \alpha_5 [\ln Immig_{ijt}^k \times \ln PCI_{jt}^k] \\ & + \alpha_6 \ln \tau_{ijt} + n_{ijt}^k + u_{ijt}^k \end{aligned} \quad (4)$$

In Equation (4), the slope coefficients α_1 , α_4 , and α_5 reflect the effects of the stock of immigrants from home country i that reside in host country j .³ Additionally, α_2 and α_3 represent the impacts of home and host countries' productive capacities, respectively, with the vector n_{ijt}^k representing a series of home, host, and time-specific fixed effects and u_{ijt}^k being an assumed identically and independently distributed random error term.

We estimate Equation (4) using three alternative approaches: (a) the High-Dimensional Fixed-Effects (HDFE) estimation approach incorporating the multilateral resistance terms and the dyadic fixed effect to account for various sources of unobserved heterogeneity that could bias the results; (b) the PPML (Poisson Pseudo-Maximum Likelihood) and HDFE (High-Dimensional Fixed-Effects) gravity model approach, which allows for handling the issue of zero trade flows, which are common in the data; and (c) the mixed-effects (random intercept and random coefficient) model.

The first two estimation approaches possess two distinct characteristics. First, although they permit accounting for unobserved heterogeneity that may influence the dependent variable, they presume a consistent effect of immigrants across all country pairs. While the primary mechanisms through which immigrants affect trade might be consistent, the assumption may not always hold. For example, deviations in the effects of immigrants may arise due to variations in their size and skill composition, the overall diversity of immigrants from each of the home countries that reside in the host countries, or differences in the standards and regulations that govern trade in intermediate products (i.e., value added). Second, both approaches presume that the terms u_{ijt}^k and $u_{ijt}^{k'}$, are mutually exclusive. However, the trade interactions between country pairs, especially among geographically proximate countries or two home countries nested in the same region, may result in a closer resemblance for a given pair than other pairs, potentially resulting in correlated error terms.⁴

To tackle these issues, following Baltagi et al. (2003), we introduce a home–host country pair-specific random component, ζ_i , which allows the error term u_{ijt}^k , to be decomposed into two distinct parts.

$$u_{ijt}^k \equiv \zeta_{1i} + \epsilon_{ijt}^k \quad (5)$$

Substituting Equation (5) into Equation (4) yields the multilevel mixed-effects model (random intercept and random coefficient) presented as Equation (6).

$$\begin{aligned} \ln Y_{ijt}^k = & \alpha_{0ij} + \alpha_{1ij} \ln Immig_{it}^k + \alpha_2 \ln PCI_{it}^k + \alpha_3 \ln PCI_{jt}^k \\ & + \alpha_4 [\ln Immig_{ijt}^k \times \ln PCI_{it}^k] + \alpha_5 [\ln Immig_{ijt}^k \times \ln PCI_{jt}^k] \\ & + \alpha_6 \ln \tau_{ijt} + \epsilon_{ijt}^k \end{aligned} \quad (6)$$

The terms $\alpha_{0ij} = \zeta_{00k} + u_{0ij}$ and $\alpha_{1ij} = \zeta_{10k} + u_{1ij}$ represent the random intercepts and random slopes (i.e., the impacts of immigrants) on TiVA for a specific home–host country

pair. ζ_{00k} and ζ_{10k} indicate the mean intercept and slope for a given region k , while u_{0ij} and u_{1ij} identify the random effects that correspond to the home–host country pairs. A positive deviation ($u_{1ij} > 0$) suggests that the influence of immigrants on TiVA for a specific country pair exceeds the average effect. Conversely, a negative deviation ($u_{1ij} < 0$) suggests that the impact of immigrants on TiVA for the given country pair is below the average. The terms α_2 and α_3 highlight the impact of the productive capacities of the home and host countries. As before, α_4 and α_5 signify the degrees to which the immigrant stock interplays with the productive capacity metrics of the home and host countries, while α_6 represents the influence of trade costs on TiVA. The random error term for country pair i and j at time t is denoted by ϵ_{ijt}^k .

3.2. The Variables, Data Sources, and Expected Signs

3.2.1. Dependent Variables

Our dependent variables are bilateral TiVA measures originating from 64 home (including OECD member) countries and embedded in the exports of 38 OECD member host countries for which data on the stocks of immigrants in the respective OECD countries during the study period (2000–2018) and productive capacity indices are available. The measures include the total value added from all industries in each home country that is embedded in the exports of the host countries, disaggregated by sectors (i.e., manufacturing, agriculture, and services), to international markets. The measures, sourced from the Origin of Value Added in Gross Exports (OECD 2021) and expressed in millions of U.S. dollars at current prices, provide insights into the complex production and supply networks that connect immigrants' home and host countries.

We also utilize gross bilateral exports (imports) between the home and host countries for comparative purposes and to put the estimated effects of immigrants on TiVA into perspective.

3.2.2. Explanatory Variables

Given their potential to amplify trade between their home and host countries, our primary interest is the coefficient of the immigrant stock variable. As indicated, immigrants may contribute to TiVA by facilitating the sourcing of products and services from their home (host) countries to fill market gaps in their host (home) countries. Dual cultural understanding also allows immigrants to effectively mediate trade negotiations, reducing misunderstandings and fostering mutual trust. Additionally, diaspora networks can potentially cultivate formal business relationships, partnerships, and other collaborations between firms in the immigrants' home and host countries, particularly in value-added trade. Similarly, the inherent trust, cultural overlaps, and shared experiences that immigrants introduce to the trade dynamic can reduce transaction costs and enrich the volume and quality of value-added trade flows.⁵ Lastly, immigrants' extensive awareness of production standards, quality benchmarks, and business ethos across borders solidifies their position as crucial connectors, ensuring that products adhere to global norms and facilitating seamless trade in differentiated products (Rauch and Trindade 2002).

We examine the effects while controlling for the host and home countries' productive capacities to generate value and the bilateral trade costs, determining the feasibility of trade between the potential partners. Encompassing technological prowess, infrastructure, skilled labor force, and efficient institutional frameworks, the productive capacity index (PCI) measures the ability of a country to produce and trade goods or provide services efficiently. The measure is quantified as a geometric mean of eight key dimensions: human capital, which emphasizes the quality of labor, education, skills, and overall health conditions; natural capital, reflecting a country's renewable and non-renewable resources like minerals and forests; energy access, indicating the reliability of energy sources; structural change, reflecting economic transformation towards high-productivity sectors; institutions, outlining the governance and regulatory frameworks; the vigor of the private sector, focusing on aspects like innovation and access to finance; transport infrastructure, which

includes roads, railways, and ports that are vital for trade; and information and communications technology integration and accessibility, depicting a nation's embrace of digital tools and technologies (UNCTAD 2021).⁶

A high productive capacity promotes technological spillover, reliable supply chains, and access to quality inputs, all of which contribute value to the goods and services produced by trade partners. It also creates economies of scale, allowing countries to produce at lower costs. This can lead to competitive pricing in international markets, making products more appealing to consumers in other countries and encouraging trade.

Trade costs encompass a myriad of factors impeding the exchange of goods and services between countries. Direct financial obstacles include explicit tariffs and non-tariff barriers such as quotas, embargoes, and differing regulations, which inflate the production costs for manufacturers needing to meet varying international standards (Anderson and van Wincoop 2004). Indirect costs encompassing transportation expenses are tied to geographical and infrastructural factors and procedural inefficiencies at borders that cause costly delays and spoilage of perishable goods, affecting the timely delivery of components (Hummels 2007; Portugal-Perez and Wilson 2012). In addition, intangible factors (e.g., lack of market information, cultural and linguistic barriers, and financial challenges, particularly in developing economies) can deter firms from engaging in international trade (Rauch 1999; Ahn et al. 2011) or make it more expensive for countries to import components for further enhancement or export goods after imbuing them with added value.

To adequately capture the effect, we utilize the ad valorem tariff-equivalent measures of bilateral trade costs (ltrcost) sourced from UNESCAP through the World Bank (2021). Expressed as a percentage, the estimates reflect both the tangible (e.g., tariffs and transportation costs) and intangible barriers (e.g., cultural or regulatory discrepancies) to trade, essentially representing the supplementary costs that would equalize the appeal of domestic and international trade.⁷

We expect partners that face higher bilateral trade costs to have lower volumes of value-added trade, suggesting a negative coefficient for the variable in our empirical model. The magnitude of the coefficient of the trade cost variable sheds light on the sensitivity of value-added trade to changes in the trade costs. A large negative coefficient would suggest that even a small increase in the trade costs could lead to a substantial decrease in the value-added trade of the home (host) countries. Conversely, a smaller coefficient would imply that value-added trade is less responsive to changes in trade costs.

3.3. Descriptive Statistics

Table 1 presents the descriptive statistics. Starting with the dependent variable series, we note that, on average, across country pairs, the annual gross exports and imports are equal to USD 69.6 million and USD 1.874 billion, respectively. The average total value-added trade from a typical home country included in a typical host country's export is USD 876.59 million. Manufacturing and services contribute significantly to the total TiVA, with average annual values of USD 649.39 million and USD 200.35 million. The average value-added trade in agricultural products (USD 10.56 million) is much lower.

In our sample, approximately 36,085 immigrants from a typical home country reside in a typical host country. With a standard deviation of more than a quarter million, there is considerable variation across country pairs. Moving to the other explanatory variables, our data's typical home and host countries exhibit comparable productive capacity index values (54.11 and 60.01, respectively), with standard deviations of 9.55 and 6.34, suggesting diverse productive capacities. The ad valorem tariff-equivalent bilateral trade costs range from 0.156 percent to 954.92 percent, with a mean of 150.87 percent, indicating additional costs, relative to domestic trade, of approximately 1.5 times the value of the goods.

Table 1. Descriptive statistics.

	Mean	Std. Dev.
Trade flow measures:		
Gross exports of host country i to home country j (millions, USD)	69.60398	334.5786
Gross imports of host country i from home country j (millions, USD)	1874.258	8706.77
Value-added trade (TiVA): value added from home country i that is included in the exports of host country j		
Total (millions, USD)	876.5885	2789.897
Manufactures (millions, USD)	649.3937	2248.778
Agriculture (millions, USD)	10.5588	42.60521
Service (millions, USD)	200.3528	655.2618
Immigrant population: number of individuals from home country i that reside in host country j		
Immigrant stock	36,085.39	288,064.1
Productive capacity measures:		
Overall productive capacity index, home country	54.11173	9.552657
Overall productive capacity index, host country	60.01368	6.338487
Bilateral trade costs:		
Ad valorem tariff-equivalent bilateral trade costs (%), all goods	150.8702	87.5284
N = 33,754.		

4. Empirical Results

4.1. Immigrants and TiVA

Table 2 presents the results from our random intercept and random coefficient (mixed-effects) estimations. Columns (a) through (d) report the results for TiVA that originates from immigrants' home countries and is embedded in their host countries' exports to the world at the aggregate (a) and sector levels: agriculture (b), manufacturing (c), and services (d). We also report the corresponding results for the host countries' gross imports from and exports to the home countries in columns (e) and (f), respectively. The random-effects components, depicting the variability in the dependent variable series across the home–host country pairs and within various geographic regions, are presented at the bottom of the table. Given that we estimate a two-level mixed-effects model to discern the effects of immigrants on trade in value-added, a brief discussion of the random-effects components is relevant.

Using the random coefficient components presented in column (a) of Table 2 for total value-added trade as an example, the standard deviation of the random intercepts, representing the country pairs within each region, is 0.942 and statistically significant. This indicates that country pairs in the same region have inherent characteristics that increase their value-added trade compared to the average.⁸ Second, the standard deviation of the random slopes for the immigrant stock (0.513) suggests the presence of statistically discernible variation in the effects of immigrants on TiVA across their home and host countries, potentially due to differences in the immigrant characteristics (possibly skills and integration), economic policies, or the distinct natures of the industries prevalent in each country pair.

The statistically significant ($p < 0.001$) intraclass correlation coefficients (ICCs) also aid in understanding the model's performance. Indicating approximately 99 percent of the total variance in TiVA at the aggregate and sector levels can be attributed to home–host country pair differences within each region, and the ICC estimates range from 0.9804 for TiVA at the sectoral level (agriculture) to 0.823 for gross exports. Log-likelihood tests that compare the random coefficient and random intercept model to the random intercept-only model produce significant test statistics across all specifications, underscoring the validity and fit of the estimated empirical model. The AIC and BIC measures of the goodness of fit of the models are also reported. Emphasizing the importance of considering the hierarchical

nature of the data to model the impact of immigrant stock on TiVA accurately, we find that much of the variability in TiVA across the country pairs in our study is due to the differences between the country pairs within each region rather than idiosyncratic errors.

Table 2. Determinants of value-added trade (TiVA); mixed-effects model estimation results.

Variables	Trade in Value Added (TiVA)				Gross Imports and Exports	
	(a) ltiva_tot	(b) ltiva_agr	(c) ltiva_mnf	(d) ltiva_ser	(e) log(gimp)	(f) log(gexp)
Ln (Immig)	0.220 *** (0.0132)	0.267 *** (0.0161)	0.187 *** (0.0136)	0.286 *** (0.0144)	0.230 *** (0.0135)	0.397 *** (0.0107)
Ln (PCI1)	3.571 *** (0.0428)	4.431 *** (0.0494)	3.316 *** (0.0447)	3.957 *** (0.0430)	3.362 *** (0.0483)	2.725 *** (0.146)
Ln (PCI2)	5.831 *** (0.0689)	6.455 *** (0.0795)	5.902 *** (0.0719)	5.032 *** (0.0692)	5.931 *** (0.0783)	0.682 *** (0.208)
Ln (TRcost)	−0.403 *** (0.0115)	−0.456 *** (0.0133)	−0.458 *** (0.0120)	−0.309 *** (0.0115)	−0.450 *** (0.0131)	−1.246 *** (0.0466)
Constant	−32.95 *** (0.390)	−43.23 *** (0.408)	−32.16 *** (0.401)	−33.68 *** (0.391)	−31.30 *** (0.406)	−5.854 *** (1.013)
Random-effects components:						
St. Dev. (region)	0.942 *** (0.203)	0.8556 *** (0.159)	0.9528 *** (0.201)	0.9374 *** (0.204)	0.8869 *** (0.228)	0.4724 ** (0.222)
St. Dev. (Immig)	0.5127 *** (0.0249)	0.6466 *** (0.0242)	0.5189 *** (0.0254)	0.5804 *** (0.0232)	0.5031 *** (0.0252)	0.1351 *** (0.0130)
St. Dev. (panel)	3.9354 *** (0.0250)	4.9037 *** (0.0244)	4.0592 *** (0.0252)	4.1828 *** (0.0241)	3.9393 *** (0.0245)	1.1984 *** (0.0733)
St. Dev. (residual)	0.3160 *** (0.00433)	0.3660 *** (0.00436)	0.3298 *** (0.00432)	0.3169 *** (0.00434)	0.3642 *** (0.00429)	2.0481 *** (0.00408)
Log-likelihood	−17,746	−22,593	−19,226	−17,901	−22,149	−71,594
Chi-square (overall)	35,635	36,070	31,680	33,035	27,930	5548
AIC	35,511.4	38,472.1	38,472.3	35,821	44,318.55	143,207.4
BIC	35,595.7	38,556.3	38,556.4	35,905.3	444,02.8	143,291.3
ICC (region-home)	0.9939 *** (0.0010)	0.9946 *** (0.0010)	0.9937 *** (0.0010)	0.9945 *** (0.0011)	0.9919 *** (0.0013)	0.8232 *** (0.0013)
Observations	33,754	33,754	33,754	33,754	33,754	33,754

Standard errors in parentheses; *** $p < 0.01$, and ** $p < 0.05$.

Turning to our variable of interest, the results presented in columns (a) through (d) of the table indicate that the immigrant stock exhibits a consistently positive and statistically significant influence: 0.220 (at the aggregate level), 0.267 (agriculture), 0.187 (manufacturing), and 0.286 (services). Given our double-logarithmic specification, these results can be interpreted as elasticities. Accordingly, a 10 percent increase in immigrants from a given home country that reside in a typical OECD member host country results in a 2.2 percent increase, on average, in the total value-added originating from a typical home country that is embedded in the exports of a typical host country to the world. The observed effects, however, vary considerably across sectors, with manufacturing seeing a 1.87 percent increase, possibly due to sector-specific factors like capital intensity, sensitivity to labor supply, and the complexity of supply chains. Agriculture and services, with coefficients of 2.67 percent and 2.86 percent increases, respectively, show greater sensitivity to a proportionate increase in the stock of immigrants.

The corresponding effects of immigrants on the aggregate imports (exports) of their host countries to (from) their home countries are presented in columns (e) and (f) for comparison. We find that a 10 percent increase in the immigrant stock produces average increases of 2.3 percent (3.97 percent) in host country imports from (exports to) a typical home country. Although the magnitudes of these coefficients cannot be directly compared with those from our TiVA estimations, these findings confirm that immigrants play a dual

role in influencing international trade. First, in line with previous research, immigrants affect trade flows between their countries of origin and their host nations. Second, immigrants influence the value added from their home countries that is embedded into the exports of their host countries to the international market.

As discussed earlier, given the potential for differences in the productive capacities of home and host countries and the extent to which immigrants may influence the values generated in their home countries and embedded in their host countries' exports to the world, we also estimate the model by interacting the immigrant stock variable with the home- and host-country-specific productive capacity indices.⁹

Table 3 presents the marginal effects calculated at the mean values of the variables included in the specification in which we interact the immigrant stock variables with the productive capacity indices. Underscoring the observed effects of immigrants on TiVA, the results show remarkable stability and consistency at the aggregate and sector-specific levels of home country exports. Accordingly, using the results in column (a), we observe that a 10 percent increase in the stocks of immigrants from a typical home country that reside in a typical OECD member host country corresponds with a 2.08 percent increase in the value of goods and services originating from the given home country that is embedded in the given host country's exports to the world. The corresponding estimates for the agriculture, manufacturing, and service sectors are 2.55 percent, 1.78 percent, and 2.71 percent, respectively.

Table 3. Marginal effects of the determinants of TiVA; results from multilevel mixed-effects model with interaction effects.

Variables	Trade in Value Added (TiVA) by Sector				Gross Exports and Imports	
	(a) ltiva_tot	(b) ltiva_agr	(c) ltiva_mnf	(d) ltiva_ser	(e) log(gimp)	(f) log(gexp)
Ln (Immig)	0.208 *** (0.0133)	0.255 *** (0.0161)	0.178 *** (0.0137)	0.271 *** (0.0143)	0.227 *** (0.0135)	0.407 *** (0.0106)
Ln (PCI1)	3.520 *** (0.0431)	4.381 *** (0.0496)	3.278 *** (0.0451)	3.892 *** (0.0431)	3.341 *** (0.0487)	2.982 *** (0.147)
Ln (PCI2)	6.334 *** (0.0783)	6.960 *** (0.0904)	6.263 *** (0.0820)	5.691 *** (0.0783)	6.069 *** (0.0892)	0.463 ** (0.220)
Ln (TRcost)	−0.399 *** (0.0114)	−0.453 *** (0.0133)	−0.455 *** (0.0120)	−0.305 *** (0.0115)	−0.450 *** (0.0131)	−1.219 *** (0.0465)
Observations	33,754	33,754	33,754	33,754	33,754	33,754

Standard errors in parentheses; *** $p < 0.01$, and ** $p < 0.05$.

Given that TiVA refers to the economic value (additional worth) created at each stage of the production process, this finding is critical. First, while prior research has strongly identified a positive influence of immigrants on home–host country trade flows, our results identify the vital role that immigrants play in enhancing the integration of the value added generated in their home countries that is embedded in their host countries' exports both at the aggregate level and across sectors. Beyond highlighting an added dimension through which immigrants transform the trade profiles of their host countries from essential commodities to more complex goods and services with greater economic value (potentially elevating the quality, innovation, and sophistication of trade), our observations underscore the multifaceted contributions of immigrants—spanning skills and expertise¹⁰, the bridging of economic and cultural gaps,¹¹ the fostering of innovation¹² and entrepreneurship,¹³ and the development of global trade networks¹⁴—to the intricate landscape of value-added trade between their home and host countries.

4.2. The Control Factors

In examining the effects of immigrants on the value added that is generated in their home countries and embedded into their host countries' exports to the international market, in addition to the unobserved time- and country-specific heterogeneities, we control for

three critical variables: the productive capacities of the home and host countries involved in the creation and integration of the values added, and the ad valorem tariff-equivalent estimates of trade costs between country pairs.

The results presented in Tables 2 and 3 include coefficients of the productive capacities of the home and host countries that are positive and statistically significant across all specifications. For example, the results presented in Table 3, where we permit the interaction effects between the productive capacity indices and the stocks of immigrants, indicate that a 1 percent increase in typical home (host) countries' productive capacities is associated with a 3.52 percent (6.32 percent) increase in the total TiVA on average, specifically indicating the role of a higher productive capacity in the host countries in influencing the values from the home countries that are embedded in the host countries' exports to the world. Across sectors, the effects of a proportional 1 percent increase in the host country's productive capacity on the values from home countries that are embedded in their exports range from 6.26 percent (in manufacturing) to 5.69 percent (services) to 6.96 percent (agriculture). An equivalent increase in home countries' productive capacities is associated with increases in TiVA of 3.28 percent (manufacturing), 4.38 percent (agriculture), and 3.89 percent (services), indicating that an expanded productive capacity enhances the comparative advantage, enabling specialization in more tasks or processes (production stages) within the GVC.

Higher trade costs, reflecting the more expensive international exchange of intermediate inputs and final goods, reduce incentives for firms to offshore production stages or source components from overseas partners (Johnson 2018; Irarrazabal et al. 2013). Consistent with this notion, the results presented in Table 3 show that a 1 percent increase in the ad valorem tariff-equivalent bilateral trade costs results in a 0.39 percent decline in the value added that is embedded in the exports from the host countries at the aggregate level. This effect ranges from 0.31 percent (services) to 0.45 percent (manufacturing and agriculture).

Examining the corresponding effects on gross trade flows, we find that a 1 percent increase in bilateral trade costs is associated with a 1.29 percent (0.45 percent) decline in the gross exports (imports) of a typical host (home) country to (from) a typical home (host) country, respectively. This confirms that in addition to reducing bilateral trade flows among the home and host countries, high trade frictions diminish the value added from the home countries that is integrated into the exports of the host countries to the world market, leading to more localized value chains (Miroudot and Cadestin 2017).

4.3. Heterogeneity in the Effects of Immigrants

While estimating the specification used to generate the results presented in Tables 2 and 3 yields interesting insights into the country pair-specific effects of immigrants, our model permits us to compute the relative country-specific effects of immigrants on the integration of the value generated from each of the home countries into the exports of the host countries. First, we compute the best linear unbiased predictors (BLUPs) at the home country level. A positive country-specific BLUP implies that immigrants from the corresponding home country have an above-average influence on the value added from their home countries integrated into the exports of their host countries to international markets. Conversely, negative BLUP values suggest a below-average effect. We add the corresponding home-country-specific BLUPs to the coefficient of the immigrant stock variable for the sample to obtain the home-country-specific effects of immigrants. Figure 1 displays the corresponding estimates for the total value-added trade.

Among the 64 home countries, 34 have BLUPs below zero, while 30 are above zero. Notably, countries like Ireland (0.544), Peru (0.505), the United States (0.471), Malta (0.437), and Luxembourg (0.414) exhibit positive BLUP values, hence showing the highest positive effects of immigrants. This indicates that a higher stock of immigrants from these countries significantly boosts the value-added trade that is embedded in the exports of their host countries. In contrast, countries such as the Russian Federation, the Netherlands, Brazil, and South Korea have values close to zero, implying little deviation from the sample average. Conversely, countries with lower-than-average fixed effects (negative BLUPs),

such as Myanmar (−0.401), Indonesia (−0.344), South Africa (−0.132), and Cambodia (−0.027), diverge considerably, resulting in negative effects of immigrants on TiVA (i.e., increases in the stocks of immigrants from these countries to the host countries is associated with a decline in the values from these home countries that are integrated into the exports of the host countries to the world).

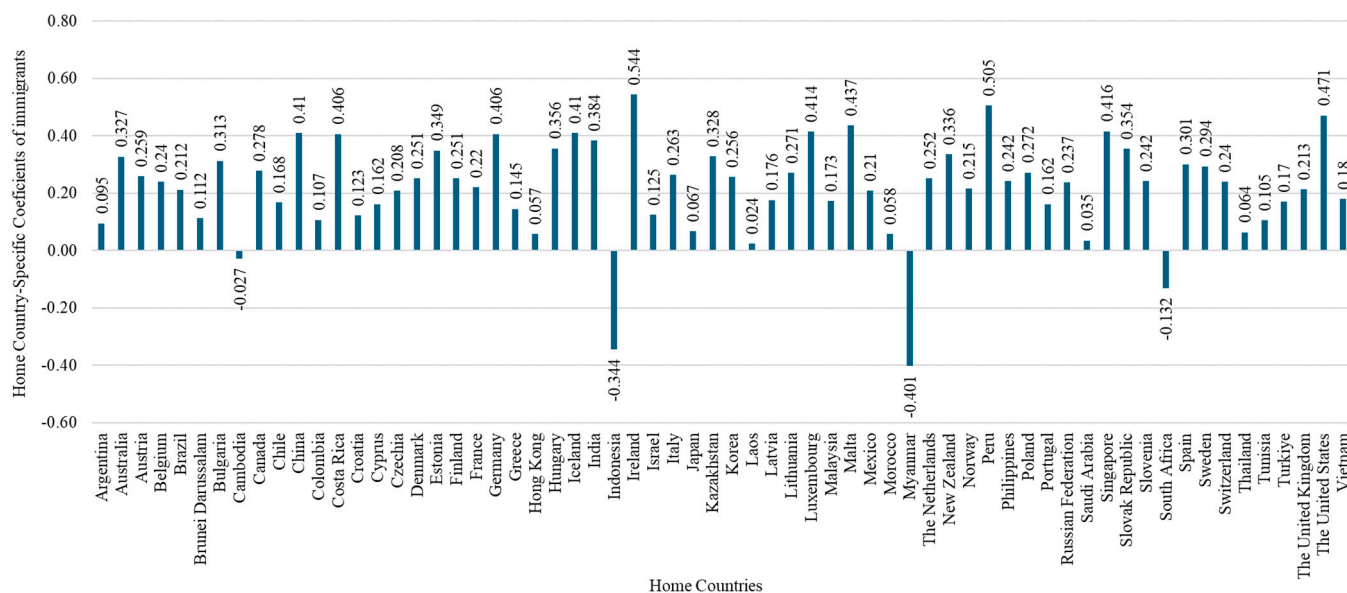


Figure 1. Home-country-specific effects of immigrants on TiVA.

The estimated home-country-specific effects provide valuable insights for policymakers and business analysts by highlighting sectors and home countries where immigrants significantly influence TiVA, offering strategic opportunities for targeted trade and immigration policies. The information may aid in identifying home countries with immigrant networks that are specifically beneficial. These insights can guide policymakers in designing immigration policies to strengthen economic ties and suggest that efforts to improve trade should extend beyond immigration.

4.4. Robustness Checks

Our mixed-effects model clearly shows that immigrants have a statistically significant impact on the value added originating in their home countries that is embedded in their host country's exports to the world at the aggregate level and across the three sectors considered (manufacturing, agriculture, and services). We introduce innovative variables, such as productive capacity indices and estimates of bilateral trade costs, to account for potential differentials in a country's competitive edge, capabilities, and trade frictions that affect comparative advantages and incentives for firms to offshore production stages or source components from overseas partners.

To ensure the robustness of our findings, we also estimate our specifications using the multilevel linear and Poisson Pseudo-Maximum Likelihood and High-Dimensional Fixed-Effects approaches. The corresponding results are presented in Table 4 Panel A for linear fixed effects and Panel B for PPML. The results from both estimation approaches, albeit the expected minor differences in the magnitude of the coefficients, confirm that immigrants have a statistically significant positive effect on TiVA both at the aggregate level and across the sectors.

Using the results in Panel A of the table, we observe that the immigrant stock variable maintains a positive and highly significant coefficient across all estimations, with its coefficients ranging from 0.0967 (manufacturing) to 0.121 (agriculture). The results indicate that a 1 percent increase in immigrant stocks is associated with increased value-added

trade in the aggregate and across all sectors, ranging from 0.10 percent in manufacturing to 0.12 percent in agriculture.

Table 4. Determinants of value-added trade; multilevel linear and PPML estimation results.

Panel A: HDFE Multilevel linear model estimation results						
Variables	Dependent Variable: Value-Added Trade (Log)				Gross Exports and Imports	
	(a) ltiva_tot	(b) ltiva_agr	(c) ltiva_mnf	(d) ltiva_ser	(e) log(gimp)	(f) log(gexp)
Ln (Immig)	0.104 *** (0.00237)	0.121 *** (0.00253)	0.0967 *** (0.00238)	0.119 *** (0.00242)	0.155 *** (0.00296)	0.143 *** (0.00904)
Ln (PCI1)	1.848 *** (0.0706)	1.902 *** (0.0755)	1.851 *** (0.0710)	1.907 *** (0.0722)	2.065 *** (0.0881)	1.092 *** (0.277)
Ln (PCI2)	1.616 *** (0.135)	1.864 *** (0.144)	1.927 *** (0.135)	0.386 *** (0.138)	2.787 *** (0.168)	1.250 ** (0.518)
Ln (TRcost)	−1.533 *** (0.0103)	−1.528 *** (0.0110)	−1.587 *** (0.0103)	−1.422 *** (0.0105)	−1.801 *** (0.0128)	−1.831 *** (0.0390)
Constant	−2.597 *** (0.628)	−8.332 *** (0.670)	−4.032 *** (0.630)	0.111 (0.641)	−6.037 *** (0.783)	2.818 (2.422)
Observations	33,754	33,754	33,754	33,754	33,734	32,716
R-squared (within)	0.570	0.551	0.576	0.541	0.564	0.122
Log-likelihood	−28,444	−30,674	−28,600	−29,168	−35,856	−70,718
F-statistic	11,170	10,314	11,445	9928	10,870	1138
RMSE	0.563	0.601	0.566	0.575	0.702	2.105
Panel B: Multilevel PPML estimation results						
Variables	Dependent Variable: Value-Added Trade (Levels)				Gross Exports and Imports	
	TOT	AGR	MNF	SER	IMP	EXP
Ln (Immig)	0.206 *** (0.0125)	0.298 *** (0.0152)	0.196 *** (0.0130)	0.223 *** (0.0117)	0.260 *** (0.0128)	0.289 *** (0.0162)
Ln (PCI1)	2.688 *** (0.238)	1.902 *** (0.273)	3.081 *** (0.261)	1.883 *** (0.227)	2.704 *** (0.217)	4.060 *** (0.555)
Ln (PCI2)	2.958 *** (0.494)	2.137 *** (0.410)	3.173 *** (0.528)	2.910 *** (0.509)	3.474 *** (0.410)	1.678 (1.160)
Ln (TRcost)	−0.752 *** (0.0639)	−0.729 *** (0.0759)	−0.800 *** (0.0632)	−0.601 *** (0.0665)	−0.864 *** (0.0659)	−0.832 *** (0.0690)
Constant	−13.96 *** (2.549)	−12.86 *** (2.524)	−16.32 *** (2.771)	−12.74 *** (2.430)	−14.70 *** (2.152)	−14.07 *** (5.324)
Observations	33,754	33,754	33,754	33,754	33,754	33,754
Pseudo R-square	0.918	0.861	0.922	0.913	0.9409	0.7853
Log-likelihood	$−3.84 \times 10^6$	−90,016	$−2.90 \times 10^6$	−941,141	$−1.48 \times 10^7$	$−2.90 \times 10^7$
Chi-square	3315	7326	2879	3549	7480	1892
RMSE	0.566	0.565	0.566	0.564	0.503	0.974

Standard errors in parentheses; *** $p < 0.01$, and ** $p < 0.05$.

The home-country productive capacity index variable has a positive and highly significant coefficient, ranging from 1.85 (total) to 1.91 (services). This indicates that a 1 percent increase in the productive capacities of the home countries boosts the value added from the home countries that is embedded in the host countries' exports by 1.85 percent (in total) and 1.91 percent in the service sector, on average. Similarly, the coefficient of the productive capacity index of the host countries is positive and highly significant in all models, although with a notably smaller coefficient in the services sector (0.386) compared to other sectors, which is 1.62 (at the aggregate level) to 1.93 (in the manufacturing sector).

For all specifications, as expected, an increase in bilateral trade costs has a negative and statistically significant effect on the value added from the home countries that is embedded in the exports of the host countries. The observed effects of a 1 percent increase in bilateral trade costs range from −1.42 percent (in the services sector) to −1.59 percent

(in the manufacturing sector), demonstrating how higher trade costs reduce value-added trade across all sectors.¹⁵

The results from the Poisson Pseudo-Maximum Likelihood and High-Dimensional Fixed-Effects (PPML HDFE) estimations presented in Panel B similarly highlight the statistically significant impact of immigrant stocks and productive capacity indices of the potential trading partners on value-added trade originating from home countries and embedded in the exports of host countries. For example, with an estimated coefficient ranging from 0.196 (manufacturing) to 0.206 (total) and 0.298 (agriculture), we find that a 1 percent increase in immigrant stocks leads to an approximately 0.206 percent average increase in the total value-added originating from home countries that are included in the exports of the host countries to the world. This positive impact is even more pronounced in the agriculture sector, with a coefficient of 0.298 percent.

The consistency in the positive and statistically discernible coefficients of our primary variable of interest, the immigrant stock, and the core control variables (the productive capacity indices), as well as the negative impacts of a rise in bilateral trade costs, across the three different estimation approaches we employed, underscore the robustness of our findings. Our estimation results consistently show that increased immigrant stocks significantly boost the value added from home countries that is embedded in the host countries' exports to the world at the aggregate and sectoral levels (agriculture, manufacturing, and services). The high pseudo-R-squared values and significant F-statistics across both models further validate that our conclusions about the positive relationship between immigrant stocks and value-added trade are robust to different estimation techniques.

5. Conclusions

Our research demonstrates the significant impact of immigrants on value-added trade (TiVA) between their home and host countries. Analyzing data from 2000 to 2018 across 38 OECD host countries and 64 home countries, we find that a 10 percent increase in immigrant stock leads to a 2.08 percent increase in TiVA.¹⁶ This observation highlights the role of immigrants in value-added trade through skills transfer, knowledge diffusion, and network creation.

By focusing on value-added trade, our research extends the literature on the immigration–trade nexus, enhancing our understanding of immigrants' contributions to global value chains. Immigrants facilitate trade in final goods and play a vital role in the trade of intermediate goods and services within modern global production networks. This insight supports a more comprehensive theory of how human mobility impacts international economic integration.

Using the random intercept and random slope mixed-effects model to examine the relationship allows for capturing the variation in immigrants' impact on TiVA across different country pairs, providing a more nuanced picture than the traditional fixed-effects panel data models. Our broad sector-specific analysis depicts that immigrants' impacts vary across the agricultural, manufacturing, and service sectors, offering valuable insights for policymakers and researchers. Understanding these sectoral differences helps identify the specific channels through which immigrants influence international trade.

Beyond depicting the crucial relevance of leveraging immigrants' contributions to value-added trade for enhancing countries' competitiveness and prosperity in an interconnected world and highlighting the economic benefits of diversity and international connections, as well as inclusive immigration policies and international cooperation, our findings have important implications for immigration policies, trade negotiations, and immigrant integration programs. Policymakers should consider the trade benefits of immigration, recognizing the positive effects of immigrants on value-added trade. Trade negotiators can leverage the role of immigrant networks in facilitating trade to inform strategies for trade promotion and market access, especially in countries with significant diaspora populations.

Targeted strategies can be developed to maximize the benefits of immigrant networks, particularly in sectors where the impact of immigrants is most pronounced. Poli-

cies can facilitate knowledge transfer and network building in these high-impact sectors. Governments might also invest in programs supporting immigrants' economic integration, such as language training and professional networking events. Supporting immigrants and native-born citizens' education and skills development can enhance a country's participation in global value chains. These policies can also help small- and medium-sized enterprises (SMEs) leverage immigrants' knowledge and network connections for international expansion.

While our study provides valuable insights into the impact of immigrants on value-added trade, it is essential to acknowledge certain limitations. Although our methodology is robust at the aggregate level, it may not fully capture the nuanced bilateral relationships between specific country pairs or products. As noted in footnotes 10 through 14, the impact of immigrants may vary significantly based on factors such as the specific skills of immigrant groups, cultural affinities, and product specializations. For example, the effect of Italian artisans on the U.S. luxury goods sector or French immigrants on Japan's wine market would not be applicable for all country pairs' immigrant–trade relationships.

Despite these limitations, our findings offer a valuable foundation for understanding the broader impact of immigrants on value-added trade and highlight the need for complementary, detailed case studies. Future research could explore detailed sub-sector analyses, mechanisms through which immigrants facilitate TiVA, the impact of immigrants' composition and educational attainment on TiVA, and the effects of changing immigration policies over time.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Determinants of TiVA; results from mixed-effects model estimation with interaction effects.

Variables	Trade in Value Added (TiVA)				Gross Imports and Exports	
	(a) ltiva_tot	(b) ltiva_agr	(c) ltiva_mnf	(d) ltiva_ser	(e) log(gimp)	(f) log(gexp)
Ln (Immig)	−0.965 *** (0.0864)	−0.953 *** (0.100)	−0.649 *** (0.0903)	−1.372 *** (0.0870)	−0.0209 *** (0.0081)	−0.135 *** (0.018)
Ln (PCI1)	3.412 *** (0.102)	4.203 *** (0.118)	3.244 *** (0.107)	3.471 *** (0.103)	3.599 *** (0.115)	0.339 (0.288)
Ln (Immig)#Ln (PCI1)	0.0348 *** (0.0132)	0.0445 *** (0.0153)	0.0477 *** (0.0138)	0.0581 *** (0.0133)	−0.0357 ** (0.0150)	0.359 *** (0.0373)
Ln (PCI2)	4.358 *** (0.155)	4.991 *** (0.180)	4.831 *** (0.162)	3.186 *** (0.157)	5.378 *** (0.177)	2.061 *** (0.479)
Ln (Immig)#Ln (PCI2)	0.273 *** (0.0242)	0.272 *** (0.0279)	0.198 *** (0.0253)	0.346 *** (0.0243)	0.0954 *** (0.0275)	−0.217 *** (0.0693)
Ln (TRcost)	−0.399 *** (0.0114)	−0.453 *** (0.0133)	−0.455 *** (0.0120)	−0.305 *** (0.0115)	−0.450 *** (0.0131)	−1.219 *** (0.0465)
Constant	−26.18 *** (0.628)	−36.21 *** (0.700)	−27.41 *** (0.652)	−24.02 *** (0.632)	−29.97 *** (0.692)	−2.196 (2.091)

Table A1. Cont.

Variables	Trade in Value Added (TiVA)				Gross Imports and Exports	
	(a) ltiva_tot	(b) ltiva_agr	(c) ltiva_mnf	(d) ltiva_ser	(e) log(gimp)	(f) log(gexp)
Random-effects components:						
St. Dev. (Region)	−0.0500 (0.220)	−0.146 (0.224)	−0.0412 (0.223)	−0.0504 (0.218)	−0.121 (0.228)	−0.696 *** (0.223)
St. Dev. (Immig)	−0.668 *** (0.0250)	−0.444 *** (0.0243)	−0.651 *** (0.0254)	−0.555 *** (0.0232)	−0.687 *** (0.0253)	−2.086 *** (0.145)
St. Dev. (Panel)	1.379 *** (0.0250)	1.585 *** (0.0245)	1.414 *** (0.0252)	1.428 *** (0.0241)	1.373 *** (0.0246)	0.143 * (0.0762)
St. Dev. (Residual)	−1.156 *** (0.00433)	−1.008 *** (0.00437)	−1.112 *** (0.00432)	−1.155 *** (0.00433)	−1.011 *** (0.00430)	0.717 *** (0.00407)
Log-likelihood	−17,650	−22,517	−19,183	−17,708	−22,143	−71,547
Chi-square (overall)	36,049	36,436	31,839	33,841	27,956	5851
AIC	35,324.93	45,057.18	38,389.87	35,439.78	44,310.15	143,118.8
BIC	35,426.05	45,158.3	38,491.0	35,540.9	44,411.27	143,219.6
ICC (region- home)	0.994 *** (0.003)	0.9946 *** (0.0010)	0.9937 *** (0.0010)	0.9945 *** (0.0011)	0.9919 *** (0.0013)	0.8733 *** (0.0013)
Observations	33,754	33,754	33,754	33,754	33,754	33,754

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$

Table A2. The Effect of Immigrants on Value-Added Trade, Results from HDFE and PPML Estimation Approaches.

Panel A: Multilevel Linear Model Estimation Results						
VARIABLES	Dep Variable: Value Added Gtrade (Logs)				Gross Exports and Imports	
	(a) Tiva_Total	(b) Tiva_Agri	(c) Tiva_Mnf	(d) Tiva_Serv	(e) Gr_Imp	(f) Gr_Exp
Ln (Immig)	0.103 *** (0.0024)	0.122 *** (0.0025)	0.0954 *** (0.0024)	0.117 *** (0.0024)	0.155 *** (0.0029)	0.141 *** (0.0093)
Ln (PCI1)	1.784 *** (0.0737)	1.859 *** (0.0782)	1.759 *** (0.0740)	1.890 *** (0.0751)	2.065 *** (0.0881)	0.959 *** (0.291)
Ln (PCI2)	1.470 *** (0.145)	1.565 *** (0.154)	1.601 *** (0.146)	0.559 *** (0.148)	2.787 *** (0.168)	1.084 * (0.564)
Ln (TRcost)	−1.529 *** (0.0106)	−1.521 *** (0.0112)	−1.579 *** (0.0106)	−1.424 *** (0.0108)	−1.801 *** (0.0128)	−1.850 *** (0.0405)
Constant	−1.727 ** (0.671)	−6.944 *** (0.713)	−2.332 *** (0.674)	−0.465 (0.684)	−6.037 *** (0.783)	4.143 (2.611)
Observations	31,769	31,769	31,769	31,769	31,769	31,769
R-Squared (Within)	0.566	0.551	0.571	0.540	0.564	0.122
Log Likelihood	−26,718	−28,623	−26,865	−27,331	−35,856	−66,807
F-Statistic	10,334	9701	10,549	9288	10,870	1063
RMSE	0.562	0.597	0.565	0.573	0.702	2.119
Panel B: Multilevel PPML Estimation Results						
VARIABLES	Dep Variable: Value Added Trade (Levels)				Gross Exports and Imports	
	TOT	AGR	MNF	SER	IMP	EXP
Ln (Immig)	0.203 *** (0.0127)	0.299 *** (0.0153)	0.193 *** (0.0132)	0.222 *** (0.0118)	0.257 *** (0.0128)	0.292 *** (0.0162)
Ln (PCI1)	2.651 *** (0.245)	1.898 *** (0.272)	3.054 *** (0.269)	1.856 *** (0.231)	2.677 *** (0.227)	3.716 *** (0.575)
Ln (PCI2)	2.802 *** (0.513)	2.041 *** (0.435)	3.032 *** (0.551)	2.606 *** (0.552)	3.597 *** (0.428)	2.009 * (1.161)
Ln (TRcost)	−0.750 *** (0.0640)	−0.719 *** (0.0768)	−0.797 *** (0.0632)	−0.603 *** (0.0671)	−0.864 *** (0.0658)	−0.821 *** (0.0688)
Constant	−13.13 *** (2.639)	−12.49 *** (2.563)	−15.61 *** (2.877)	−11.34 *** (2.584)	−15.06 *** (2.234)	−14.12 *** (5.377)
Observations	31,769	31,769	31,769	31,769	31,769	31,769
Pseudo R-Square	0.918	0.861	0.921	0.913	0.940	0.783
Log Likelihood	$−3.719 \times 10^6$	−85,740	$−2.813 \times 10^6$	−898,260	$−1.440 \times 10^7$	$−2.770 \times 10^7$
Chi-Square	3075	7068	2678	3361	7055	1845
RMSE	0.566	0.561	0.567	0.561	0.505	0.976

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$

Table A3. List of OECD Member Host Countries Included in the Study.

OECD Member Host Countries			
Australia	Finland	Korea	Slovakia
Austria	France	Latvia	Slovenia
Belgium	Germany	Lithuania	Spain
Canada	Greece	Luxembourg	Sweden
Chile	Hungary	Mexico	Switzerland
Colombia	Iceland	Netherlands	Türkiye
Costa Rica	Ireland	New Zealand	United Kingdom
Czech Republic	Israel	Norway	United States
Denmark	Italy	Poland	
Estonia	Japan	Portugal	

Notes

¹ Rauch (2001) notes that businesses meet local demand by leveraging immigrant expertise to customize their products and services, thereby adding value and gaining a competitive advantage in foreign markets.

² A separate survey by Hatzigeorgiou and Lodefalk (2021) also reports a consistent positive influence of immigrants on home–host country trade.

³ In ancillary estimations, the results of which can be obtained from the authors, we replace the trade cost measure with standard gravity model variables, including geodesic distance (a common proxy for transportation costs), economic remoteness (to represent multilateral resistance to trade), and dummy variables that identify whether countries are landlocked, have a prior colonial relationship, share a common border or language, or are parties to one or more trade agreement(s). The alternative specification is as follows:

$$\ln Y_{ijt} = \beta_0 + \beta_1 \ln \text{GDPC}_{it} + \beta_2 \ln \text{GDPC}_{jt} + \beta_3 \ln \text{GDIST}_{ij} + \beta_4 \text{REMT}_{it} + \beta_5 \text{REMT}_{jt} \\ + \beta_6 \text{LLOCK}_i + \beta_7 \text{LLOCK}_j + \beta_8 \text{COMLANG}_{ij} + \beta_9 \text{FTA}_{ijt} + \beta_{10} \ln \text{Immig}_{ijt} + \epsilon_{ijt}$$

⁴ One of the key benefits of multilevel models over the linear high-dimensional fixed-effects (HDFFE) approach is their ability to incorporate both fixed and random effects. This flexibility allows for modeling random variations across different levels of the hierarchy, improving the ability to generalize findings beyond the sampled data (Bell and Jones 2015). By incorporating random effects, multilevel models also offer better estimates of group-level effects, such as country-specific effects, while accounting for unobserved heterogeneity within groups (e.g., home countries in the same region). This can yield more reliable and comprehensive results (Browne et al. 2018). Multilevel models also provide enhanced interpretability, particularly in hierarchical settings. They allow for the separate estimation of within-group and between-group effects, offering clearer insights into relationships at different levels of analysis. This can be especially valuable for understanding the dynamics within and between different groups in a dataset, such as regions or institutions (Raudenbush and Bryk 2002).

⁵ For example, a tech manufacturer in the host (home) country might rely on specific semiconductor components from the immigrant's home (host) country, enabling the efficient sourcing of components, integration into the manufacturing process, and the global export of the final product.

⁶ The World Bank (2019) posits that natural capital, and the availability of a skilled workforce are pivotal to a nation's competitive edge. Limão and Venables (2001) highlight the importance of efficient transport networks and the transformative nature of ICT integration and accessibility in modern economies. McMillan et al. (2017) underscore the importance of structural economic shifts, while Robinson and Acemoglu (2012) stress the significance of institutional frameworks in shaping economic interaction and the central role of the private sector in growth dynamics, respectively. Thus, a country with a robust productive capacity can specialize in producing specific components or stages of production more efficiently and economically rather than manufacturing the entire product.

⁷ It is important to note that the ad valorem tariff-equivalent trade cost estimates include the trade costs of all goods (some of which are not traded internationally); the estimates also vary greatly depending on underlying assumptions used for the elasticity of substitution; hence, such estimates should preferably be used for comparative exercise, to analyze changes in trade costs over time, or for technical analysis, such as in an econometric model of trade (UNESCAP 2021).

⁸ For example, a country pair that is one standard deviation above the mean might have more favorable initial conditions or inherent characteristics that increase their value-added trade.

⁹ For brevity, estimation results with the interaction terms from which the marginal effects presented in Table 3 are derived are presented in Appendix A Table A1.

¹⁰ One example is skilled Italian artisans migrating to the U.S. and contributing to the luxury goods sector, increasing the value added in American exports of designer products back to Italy or to other markets.

- 11 French immigrants in Japan, for example, may influence the Japanese demand for French luxury goods while also helping French winemakers tailor their products to the Japanese palate, thereby enhancing TiVA between the countries.
- 12 For instance, the tech industry in Silicon Valley has significantly benefited from immigrants' contributions to software development and IT that have bolstered the value added to U.S. exports in these sectors (Saxenian 2006).
- 13 An example would be Vietnamese immigrants in Australia who increase TiVA by starting a seafood processing firm that exports high-quality seafood products to Vietnam.
- 14 Mexican U.S. immigrants may use their networks to help U.S. firms navigate the Mexican market for refined petroleum products, adding value to U.S. exports.
- 15 To address the concerns about potential reverse causality, we also estimate our models using a one-period lag of the immigrant stock variable. The results, presented in Appendix A Table A2, remain consistent and statistically significant, with minimal coefficient changes compared to our original estimations.
- 16 Appendix A Table A3 provides the list of OECD member host countries included in the present study.

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