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Effects of Business and Social Networks on Trade between Africa and Europe

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Abstract By using "structural" specifications this paper finds evidence for the trade creating effects of social and business networks on trade flow between Africa and Europe. Trade flow data starts from 1980 to 2006. The social network is measured by stock of migrants from Africa to Europe, and likewise from Europe to Africa, who live and work in their host country, this data is available from 1960 to 2010. The business network is considered to be active firms in Africa which are partly or wholly owned by a European investor. In all specifications, both networks, positively and significantly affect trade. The highest corresponding coefficient for social network is 0.06. While the highest trade creating magnitude of social network is 8.2 percent. With regard to business network, the highest corresponding coefficient is 1.57 and the highest magnitude of trade creation of business network is 93 percent. Generally trade is better in presence of social and business network, but business network explains more trade between Africa and Europe than social network.

Keywords Trade flow · Social network · Business network · Africa · Europe
JEL Classification F12. F14. F21. F22

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1 Introduction

Africa and Europe share bonds of history and culture, this explains inherent interdependence between the two continents. The key objectives of the Africa-Europe strategic partnership, which was signed by the heads of states in 2007 in Lisbon, insists on the ways to harness benefits from trade, migration and industrialization. Indeed, the strategy seeks for the ways to reduce impediments to trade such as distorting subsidies, tariff peaks, and anti-dumping rules in order to promote trade. Additionally, the strategy promotes legal migration and mobility that benefits both origin and destination countries respectively (AU and EU, 2007).

International migration, hereby referred to as social network, has been identified as a variable which boosts international trade, among others these studies provide evidence supporting this argument (Genc et al, 2012; Bettin and Turco, 2012).

Foreign direct investment, which in this paper is measured by counting firms in Africa which are partly or wholly owned by Europeans, henceforth business network, indeed, in the literature business network is shown to positively improve international trade (Hussain and Haque, 2016; Amighini and Sanfilippo, 2014).

Moreover, the impact of social network and business network on trade flow have been simultaneously analysed, and the conclusion reached is that; trade is better in presence of social network and business network than in their abscence(Combes et al, 2005).

The mechanisms through which social network positively impacts trade flow is by diffusion of preference; meaning that; old habits, patriotism "chauvinism" which are stuck with migrants, because and from which, they continue to consume goods produced in their home country, then some of their hosts immitate them, thus, the diffusion of preference. Which increases demand of imports from migrants' home country, and through reduction of information costs, this is the case because of migrants' knowledge of language, laws and knowledge of the needed goods. Additionally, business network improves trade through reduction of information costs.

Indeed, patterns of trade are not wholly determined by traditional theories of factor endowments and comparative advantage (Neary, 2009). Clearly, presence of trade between "relatively similar countries" involving "relatively similar goods" in which trade is more biased within rather than between industries augmented by presence of increasing returns to scale and product differentiation as documented in Krugman (1979) invokes the branch of new trade theory.

To achieve empirical analyses, this study uses gravity models to perform various regression specifications. Gravity models are known for analysing bilateral trade flows between trading partners. For example Peri and Requena-Silvente (2010) use gravity model to analyse the impact of immigrants on exports. Moreover, using a firm level data a paper by Hiller (2014) applies gravity models to study the effect of emigration on export sales.

This paper contributes by using "structual" specifications to measure the trade creating effects of social and business networks on trade between Africa and Europe. This is achieved though extention of the model of Combes et al (2005) by augmenting on it; tariffs, dummies for language, legal origin and official language, these adjustments make the model a basis for international trade analysis, unlike the original model which is used for analysing intranational trade. Furthermore, social network is captured by migration between Africa and Europe from 1960 to 2010, while business network is obtained by counting active firms in Africa in 2016. Which are partly or wholly owned by Europeans, trade flow between Europe and Africa is from 1980 to 2006. Indeed, we find that trade flow between Africa and Europe is positively affected by social network and business network, but trade creation from business network is higher than that created by social network. To the best of our knowledge there is no any paper which have used "structural" specification approach to study trade between Africa and Europe.

The remainder of the paper is organised as follows. Section 2 reviews the literature on the new trade theory and the effects of social and business networks on trade. Section 3 presents theoretical and econometric models this is the core of "structural" specifications. Section 4 discusses data and empirical results, and lastly, section 5 concludes.

2 Literature Review

Effects of social network on trade

Studies have shown positive link between migration (both intra-national and inter-national migration) and trade (both intra-national and inter-national trade). In a study on United States of America and her 73 trade partners White (2007) identifies two channels through which immigrants influence trade; first, "transplanted home bias" which refers to the fact that immigrants enter the host country with preferences for goods which are produced in their home country, due to this trade between host and home countries will increase, second, "network effects" when they arrive immigrants may possess business contacts, necessary knowledge about social and political needed to conduct business in their home country.

There are different categories of migrants being; temporary or permanent migrants, and they therefore affect trade flow differently Jansen and Piermartini (2009, p. 752) separate the effect on bilateral trade of temporary migrants from that of the permanent ones into the United States of America. They conclude that temporary migrants impact more on exports and imports than permanent migrants.

The empirical study by Helliwell (1997) exploits Canadian census data which shows province of migrant's residence in Canada and their respective home province or country (in this case United States of America); using the gravity equation estimation of the extent to which migration patterns of "province—province and province—state" shows that migration is responsible for differences in the intensity of trade linkages with higher intensity for province-province migration than it is for province-state migration.

Wagner et al (2002) analyse the effects of immigration on trade by including country fixed effects in order to control for unobserved characteristics which influence immigration between Canada and her trading partners, then they estimate the effects of immigration on trade across Canadian provinces. They conclude that there is positive association between migration and trade.

Partridge and Furtan (2008, p. 194) used "enhanced gravity model" with which they estimated the effect of "lagged immigration wave" on imports and exports by province that is subnational, of Canada. They found that immigrants positively affect both imports and exports but "new immigrants" immediately positively affect imports. However, immigrants' positive effect on export (from Canada to the immigrants' home country) is realized after at least five years of settling in Canadian province.

Using Swiss and French migration data Tai (2009) studies the effect of migration on trade focusing on the channel of exports and imports market structures respectively. In this contribution he shows that effect of migration is higher on Swiss imports than exports this dissimilarity is attributed by the fact that product composition describes the different effects of migration on trade.

Using 50 Spanish provinces micro-data on individual trade transaction with 77 immigrants' home countries Peri and Requena-Silvente (2010) disentangle the extensive margin meaning number of transactions and intensive margin meaning average value per transaction of export; they found that the most part of the effect of immigrants on export is determined by the extensive margin.

Effects of foreign workers on intra industry trade rather than volume of trade is studied by Blanes and Martín-Montaner (2006) using Spanish data. They looked at individual characteristics of foreign workers and their corresponding participation in the Spanish labour market; in this respect they are able to establish the mechanisms of the link between intra industry trade and migration.

In Sweden and other developed countries, it is evident that unemployment among immigrants is higher than that among hosts Hatzigeorgiou and Lodefalk (2015) show how integrating immigrants into the labour force is beneficial to enhancing Swedish exports.

Ghatak et al (2009) analyse the impact of stock and flow of migrants originating from Central and East European countries to the United Kingdom, the gravity model used to analyse the panel data show that the stock of migrants and flow of migrants both positively influence bilateral trade flows.

Studying the trade migration nexus in OECD countries Felbermayr and Jung (2009) disentangle the effect of migrants' information and preference effects on bilateral trade. Generally they found that migrants positively and significantly affect bilateral trade in the OECD region. However, the migrants' preference effect on bilateral trade counts for 63 percent of the total effect.

Sandeep (2015) writes about the effect of Indians immigrant in OECD countries on export from India to those host countries. They found a positive effect of Indian immigrants on export.

The findings of Karagöz (2016) using a panel data of Turkish emigrants in 15 OECD countries confirm that the stock of Turkish emigrants have positive impact on Turkey's exports, imports and overall bilateral trade.

Law et al (2009) study the global stock of migrants and their effect on trade. They show that stock of migrants positively affects trade; they further identify product categories for which migrants' effect is higher.

Studying the stock of emigrants from 131 home countries who live in 110 host countries Tadesse and White (2011) investigate the effect of immigrants on trade on the perspective of both home and host countries. Results from their model show that host country's export (the effect of immigrant) to the home country is 0.15 percent while the host country's import (the effect of emigrant on the perspective of home country) is 0.17 percent.

Using a gravity model on the Bolivian panel data from 1990 to 2003 Canavire Bacarreza and Ehrlich (2006) estimate the impact of both immigration and emigration on exports and imports and intra industry trade with 30 trade partners. They found that immigration and emigration have positive effects on the volume of export and import trade as well as on intra industry trade.

Bettin and Turco (2012) evaluate South-North migration and trade from 1990 to 2005 their contribution is on how South-North migration affects trade in primary goods and final goods as well as labour and capital intensive goods. They conclude that migration positively affects trade of primary and final goods through a preference channel, even more important they show that migrants from South affect the export of labour intensive goods through the technology channel.

In their study Rauch and Trindade (2002) look at trade between countries whose population composition is at least one percent of Chinese origin with China; they concluded that ethnic Chinese networks have positive impact on bilateral trade. However, they observed diminishing returns to Chinese network size.

Karayil (2007) shows that Indian diaspora in the Gulf Cooperation Council countries positively affects and shapes the composition of India's export to the gulf countries. They use a gravity model to analyse the link between migration from India to the gulf countries and they mainly suggest that preference channel is the main mechanism through which the Indian diaspora positively influences Indian export to the gulf countries.

Tadesse and White (2013) examined whether immigrants from Africa can positively affect trade flow between their home countries and their respective host countries. They used "non-structural" estimation of the gravity model and found that, indeed African immigrants positively and significantly influence trade flow between their home countries and their host countries.

Effects of business network on trade

Firms' networks re-enforce trade through smooth contract implementation within business groups, and cross border replication of vertical trade relationships and intra-group dissemination of information on opportunities abroad.

China is "Thailand's largest trading partner" Keorite and Pan (2016) examine how trade between Thailand and China is accrued by FDIs from China to Thailand. They found that having Chines FDIs in Thailand reduces exportation of unfinished products from Thailand to China, while at the same time increase exportation of finished goods from Thailand to China. On the other hand they show that Chines exports to Thailand have also increased due to the Chines FDIs in Thailand.

Using a dataset of 1790 Japanese manufacturing FDIs which import capital goods from Japan in 1996 Belderbos et al (2012) show that if these FDIs continue to import from manufacturers of capital goods in Japan then the positive effects of FDIs on Japanese export is observed, however, when the Japanese manufacturers of capital goods relocate their production abroad, then the effect of FDIs on Japanese export vanishes.

Japan, the USA, Germany, France, Italy and Sweden are famously known as "traditional auto-producing countries" Nishitateno (2015) use gravity equation to estimate the network effects on auto parts exports from "traditional

auto-producing countries" indeed, the results suggest that, a 10 percent increase in overseas production by "traditional auto-producing countries" automakers leads to a 4.3 percent increase in auto parts exports from their home country.

Small scale enterprises which have collaboration with foreign institutions can also positively influence trade Serrano et al (2016) investigate a sample of 342 firms in subsectors of "food, meat, drink and tobacco" reported in a panel between 1994 and 2012. Despite of hindrances due to small size of these firms, the fact that they have collaborations capacitates them to positively affect international trade with the host countries of their collaborators.

Tomiura (2007) use a gravity model to analyse Japanese firm level data and concludes that small scale enterprises which have affiliations with business associations easily overcome "entry barriers to exporting".

Greaney (2005) among other question examines how Japanese business networks, that is, Japanese FDI in the US affect the US-Japan trade, the author finds that Japanese affiliates trade more with Japan which leads to high US imports from Japan.

Using "the two country home and foreign model" and investigation of global data Markusen and Venables (1998) document that; generally business network grew faster than trade. Moreover, some suggestions from Markusen and Venables (1998, p.202) are such that "investment liberalization in the world economy should shift production to economies which are smaller and poorly endowed with the factor used intensively in the multinationalized sector".

Additionaly, Ricci and Trionfetti (2012, p.555) formulated a business network index with nine ingredients being "Firm is in a joint venture, Firm uses E-mail, Firm has website, Firm belongs to a chamber of commerce, Foreign financing, Foreign participation, Time spent with government regulations, State participation, and Unionization"; in this cross-country analysis Ricci and Trionfetti (2012, p.557) found that: "Overall, an improvement of the network index by one standard deviation is associated with a higher probability of exporting of about 15%"

Effects of social and business networks on trade

Among others there are studies which show a joint analysis of the effects of both social and business networks on trade flows. For example de la Mata (2014) investigates whether business and social network replicate consistently the empirical results in service sector, as they do in the literature on manufacturing sector. For the service sector the author used data on hospitality sector, specifically restaurant and accommodation. Generally social and business network has positive and significant effect on the service sector but Social networks have a larger effect on restaurants than on accommodations.

Moreover, using a dataset of 23 OECD member countries Lee (2012) expands the notion of network from the two usual social and business networks and adds internet as another network. The author concludes that all forms of

networks positively and significantly influence trade flow in the OECD trading partners.

3 Theoretical and Econometric Models

3.1 Theoretical Model

Consumption and trade flow

Let importer and exporter countries be represented by i and j respectively. Indeed, consumption x_{ijh} of varieties h which are produced in any country j is required by country i in order to satisfy utility U_i which is represented by the following function:

$$U_i = \left(\sum_{j=1}^{N} \sum_{h=1}^{nj} (a_{ij} x_{ijh})^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where $\sigma > 1$ refers to constant elasticity of substitution. Besides, a_{ij} represents weight attached to varieties imported from country j, it shows the weight of preferences of consumers in country i with respect to varieties from country j, n_j is the number of varieties produced in country j, and N is the total number of exporting countries j.

Delivery price p_{ij} for varieties from country j sold in country i is $p_{ij} = p_j(1 + \tau_{ij})$, where τ_{ij} is *iceberg* type advalorem equivalent transaction cost between trading partner countries j and i. On the other hand, $x_i = \Sigma_j \Sigma_h x_{ijh}$ which refers to quantities of total consumption in country i of differentiated good varieties imported from all countries j and from country i itself, while $P_i = \left(\Sigma_j a_{ij}^{\sigma-1} n_j p_{ij}^{1-\sigma} \right)^{\frac{1}{(1-\sigma)}}$ indicates the price index in importer country i.

After the optimization process of the utility function U_i subject to price index P_i we obtain the following demand function in country i:

$$x_{ij} = x_i P_i^{\sigma} n_j p_j^{-\sigma} a_{ij}^{\sigma-1} (1 + \tau_{ij})^{-\sigma}. \tag{2}$$

Transaction costs and preferences

Transaction costs consist of physical costs, Ξ_{ij} and information costs, Γ_{ij} they are formulated as below:

$$1 + \tau_{ij} = \Xi_{ij} \Gamma_{ij}. \tag{3}$$

(i) Physical costs: Compose of distance and bilateral tariffs

$$\Xi_{ij} = (dist_{ij}^{\delta})(1 + tar_{ij})^{\eta}, \tag{4}$$

where $dist_{ij}$ refers to distance between exporting country j and importing country i, while tar_{ij} is industry level bilateral tariffs charged by countries i and j respectively.

(ii) Information costs: These costs originate from social network, which is; stocks of emigration (henceforth mig_{ij}) and immigration (henceforth mig_{ji}), firms' network (henceforth $firm_{ij}$) and different kinds of dumies, being colonial links (henceforth col_{ij}), common official language (henceforth $lang_{ij}$), and common legal origin (henceforth leg_{ij}) of the trading partners. Information costs are formulated as follows:

$$\begin{aligned}\Gamma_{ij} =&(1+mig_{ij})^{-\alpha_\Gamma}(1+mig_{ji})^{-\beta_\Gamma}(1+firm_{ij})^{-\gamma_\Gamma}\\ &\exp\left(\varphi_\Gamma-\varrho_\Gamma col_{ij}-\lambda_\Gamma lang_{ij}-\Lambda_\Gamma leg_{ij}\right),\end{aligned} \tag{5}$$

where $\varphi_\Gamma > 0$ which shows that information also affect preference. On the other hand, $col_{ij} = 1$ if countries have ever been in a colonial relationship, $lang_{ij} = 1$ if countries share official language, and $leg_{ij} = 1$ if countries have same legal origin.

In addition to that, the function of information cost shows that information cost Γ_{ij} reduces with both kinds of stock of migration, firms' network, colonial relationship, sharing of official language and legal origin.

(iii) Consumers' preferences

Assuming a systematic preference such that local goods produced in the country of consumption are more preferred than goods produced in the country where the migrant consumer was born. Thus, the latter effect increases with stock of migration,

$$a_{ij} = (1+mig_{ij})^{\alpha_a}\exp(e_{ij}-\varphi_a), \tag{6}$$

where $\alpha_a > 0$. And $\varphi_a > 0$ is information aspect which affect consumer preference. Thus, migrants have both preference and informational effects on trade. e_{ij} is a random component of preference, such that $0 \leq e_{ij} \leq 1$.

3.2 Econometric Model

Our approach follows Combes et al (2005) who studied intra-national trade in France, however we depart from them by modifying the model in order to explain the context of international trade with which the components of transaction and information costs are different from intra-national trade scenario.

Narrow specification

In this specification, we keep only dyadic variables, hence the name narrow specification. The simple log-linear effects of distance and tariffs represent costs of conducting trade while log-linear effects of social and business networks

alleviate barriers to trade.

$$\begin{aligned} ln(x_{ij}) = \zeta_i + \zeta_j + (-\delta)ln(dist_{ij}) + (-\eta)ln(1+tar_{ij}) \\ + \alpha ln(1+mig_{ij}) + \beta ln(1+mig_{ji}) + \gamma ln(1+firm_{ij}) \\ + \varrho col_{ij} + \lambda lang_{ij} + \Lambda leg_{ij} + \epsilon_{ij}, \end{aligned} \tag{7}$$

where ζ_i and ζ_j are importer and exporter fixed effects respectively. Moreover, $\epsilon_{ij} = e_{ij} + e_{ji}$ which means that errors are correlated, thus, we assume $\epsilon_{ij} \overset{ind}{\sim} Po(\lambda)$ in order to use Pseudo Poisson Maximum Likelihood, henceforth PPML in the estimation.

Estimations with broader specifications

In these specifications, we use both country specific and dyadic variables, hence the name broader specifications. From demand function Eq.(2), if we let r to be the reference country. Indeed, any country may be used as a reference country, but when that specific country is chosen, it must be used consistently. In this study, the reference country is Germany, which is the highest exporter. Hence, we obtain the following ratio:

$$\frac{x_{ij}}{x_{ir}} = \left(\frac{a_{ij}}{a_{ir}}\right)^{\sigma-1} \left(\frac{1+\tau_{ij}}{1+\tau_{ir}}\right)^{-\sigma} \left(\frac{p_j}{p_r}\right)^{-\sigma} \left(\frac{n_j}{n_r}\right), \tag{8}$$

considering Dixit-Stiglitz-Krugman model of monopolistic competition assumption which posit that; firms are too small to have a sizable impact on the overall price index on the national income when those firms set their prices to maximize profits. Thus, standard constant markup over marginal cost pricing rule; $p_j = \left(\frac{\sigma}{(\sigma-1)}\right) g\, \omega_j$, where g and ω_j are unit labour requirement and wage rate in country j respectively.

Zero profit condition gives the equilibrium output of each firm, which is the same in all countries that is q. If v_j is the value of total production in country j we obtain: $v_j = n_j p_j q$, thus applying the pricing rule we get $\frac{n_j}{n_r} = \frac{v_j \omega_r}{v_r \omega_j}$. Thus, using the definition of the delivered price and the pricing rule, Eq.(8) can be rewritten as:

$$\frac{x_{ij}}{x_{ir}} = \left(\frac{a_{ij}}{a_{ir}}\right)^{\sigma-1} \left(\frac{1+\tau_{ij}}{1+\tau_{ir}}\right)^{-\sigma} \left(\frac{\omega_j}{\omega_r}\right)^{-(\sigma+1)} \left(\frac{v_j}{v_r}\right), \tag{9}$$

substituting into Eq.(9) the transaction costs (Eq.(3), the information costs Eq.(5)) and the preference Eq.(6), we obtain the basic odd, complete odd and freeness specifications.

Basic odd specification

In this specification r is a reference country, as explained earlier in this study Germany is set to be a reference country.

$$\begin{aligned} ln\left(\frac{x_{ij}}{x_{ir}}\right) &= \zeta_i + \zeta_j + \phi ln\left(\frac{v_j}{v_r}\right) + (-(\sigma+1))ln\left(\frac{\omega_j}{\omega_r}\right) \\ &+ (-\sigma\delta)ln\left(\frac{dist_{ij}}{dist_{ir}}\right) + (-\eta)ln\left(\frac{1+tar_{ij}}{1+tar_{ir}}\right) \\ &+ \alpha ln\left(\left(\frac{1+mig_{ij}}{1+mig_{ir}}\right)\left(\frac{1+mig_{ji}}{1+mig_{ri}}\right)\right) \\ &+ \gamma ln\left(\frac{1+firm_{ij}}{1+firm_{ir}}\right) + \varrho col_{ij} + \lambda lang_{ij} \\ &+ \Lambda leg_{ij} + \epsilon_{ij}, \end{aligned} \tag{10}$$

where $\epsilon_{ij} = (\sigma-1)(e_{ij}-e_{ir})$ this correlation of errors is attended to by assuming that $\epsilon_{ij} \overset{ind}{\sim} Po(\lambda)$.

Complete odd specification

In the complete odd specification the reference country is *the country itself* thus $r = i$.

$$\begin{aligned} ln\left(\frac{x_{ij}}{x_{ii}}\right) &= \zeta_i + \zeta_j + \phi ln\left(\frac{v_j}{v_i}\right) + (-(\sigma+1))ln\left(\frac{\omega_j}{\omega_i}\right) \\ &+ (-\eta)ln\left(1+tar_{ij}\right) + \alpha ln\left(\left(1+mig_{ij}\right)\left(1+mig_{ji}\right)\right) \\ &+ \gamma ln\left(1+firm_{ij}\right) + \varrho col_{ij} + \lambda lang_{ij} \\ &+ \Lambda leg_{ij} + \epsilon_{ij}, \end{aligned} \tag{11}$$

where $\epsilon_{ij} = (\sigma-1)(e_{ij}-e_{ii})$ again this correlation of errors is attended to by assuming that $\epsilon_{ij} \overset{ind}{\sim} Po(\lambda)$.

Indeed, in complete odd specification, we don't use the ratio for the following variables: tariff, stock and firm networks because we don't have observations for these variables for within "self" country. Thus, for these variables, we treat them as in the narrow specification.

In addition, as in Head and Mayer (2004) a variable for domestic (internal) flows, $x_{ii} = v_i - x_{ji}$, where x_{ji} is export from country i to country j.

Freeness of trade specification

Freeness (or phi-ness) of trade is defined as:

$$\Phi_{ij} = \sqrt{\left(\frac{x_{ij}}{x_{ii}}\right)\left(\frac{x_{ji}}{x_{jj}}\right)}, \tag{12}$$

where if $\Phi_{ij} = 0$ means no trade (that is; *autarky*), and $\Phi_{ij} = 1$ means completely costless trade, furthermore, if $0 \leq \Phi_{ij} \leq 1$ refers to the degree of freeness of trade.

Substituting Eq. (12) into Eq. (11), we obtain econometric specification for freeness of trade.

$$\begin{aligned} ln\Phi_{ij} = {} & \zeta_i + \zeta_j + (-\eta) ln\left(\sqrt{1 + tar_{ij}}\ \right) \\ & + \alpha ln\left(\left(\sqrt{1 + mig_{ij}}\right)\left(\sqrt{1 + mig_{ji}}\right)\right) + \gamma ln\left(\sqrt{1 + firm_{ij}}\right) \\ & + \varrho col_{ij} + \lambda lang_{ij} + \Lambda leg_{ij} + \epsilon_{ij}, \end{aligned} \tag{13}$$

where $\epsilon_{ij} = \frac{(e_{ij})+(e_{ji})}{2}$, to account for this correlation in the errors, we assume that $\epsilon_{ij} \overset{ind}{\sim} Po(\lambda)$.

Estimation technique

According to Silva and Tenreyro (2010) because of convergency purposes it is ideal to use PPML, analysis model for estimation, because this helps to solve the problem posed by having many zeros in the dependent variable. Table (1) shows composition of zeros in the dependent variables.

Table 1: Composition of zeros in the dependent variables

Dependent variable	Composition	Number of observations
Bilateral flow $= 0$	25%	2,447,368
Bilateral flow > 0	75%	2,447,368
Bilateral flow relative to reference country $= 0$	25%	2,445,033
Bilateral flow relative to reference country > 0	75%	2,445,033
Bilateral flow relative to internal flow $= 0$	25%	2,447,368
Bilateral flow relative to internal flow > 0	75%	2,447,368
Freeness of trade $= 0$	25%	2,447,368
Freeness of trade > 0	75%	2,447,368

Note: 25 percent of each dependent variables is composed of zeros.

4 Data and Empirical Results

4.1 Data

In order to implement the econometric models derived in the previous section, data for the variables required for the study have been obtained. These data include: Bilateral trade flow, country's production, country's wage, bilateral industry level tariff, distance between capitals of trading countries, dummy variable for whether trading countries have ever been in a colonial relationship, dummy variable for whether countries share common legal origin, dummy variable on whether trading countries have common official of primary language, stocks of immigration and emigration, and lastly firms' network. Below we explain and show the source for each of these variables used in the study.

Trade flow, production, wage and tariff

These variables are obtained from TradeProd database of Recherche et Expertise sur l'Èconomie Mondiale (henceforth, CEPII). Bilateral flow of trade (in 1,000$), shows bilateral trade it is also obtained from CEPII, it details manufactured goods under International Standard of Industrial Classification (henceforth, ISIC) Revision 2, it is available from 1980 to 2006.

Production and wages variables are as well obtained from CEPII, they show records of values (in 1,000$) of production and wages respectively of manufactured goods classified by ISIC Revision 2. They are availabble from 1980 to 2006. While bilateral industry-level tariff (in %) also classified with ISIC Revision 2, shows the tariff barrier to trade between countries, this variable is available from 1989 to 2001.

Distance

Distance variable is obtained from CEPII, variable is a dyadic, in the sense that it includes variables valid for pairs of countries. Distance between capital cities of trading countries is measured in km.

Dummies for colonial relationship, official language, and legal origin

These data are obtained from Gravity database of CEPII. Indeed, a dummy for colonial relationship is 1 if the pairs have ever been in a colonial relationship, a dummy for official language is 1 if the country pairs share a common official of primary language, while a dummy for legal origin is 1 if pair countries share common legal origin.

Stocks of immigration and emigration

Stocks of migration is from Global Bilateral Migration Database of The World Bank, the data is from 1960 to 2000. It shows the stock of migrants who live and work in the destination country. In this study; immigrants refers to Europeans living and working in Africa, while emigrants refers to Africans living and working in Europe.

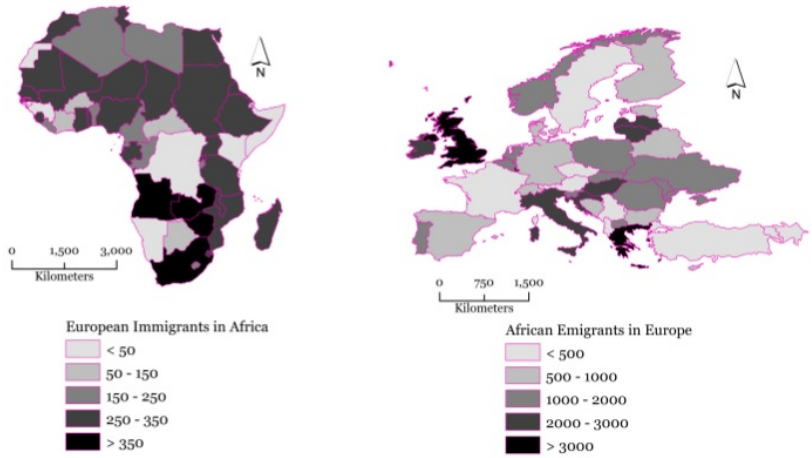

Fig. 1: On the left handside, average European immigrants in Africa. And on the right hand side, average African emigrants in Europe.

Indeed, Fig.(1) displays the social network in Africa and Europe respectively. This refers to Europeans who migrated to Africa, and inversely, Africans who migrated to Europe.

Firms' network

This data is from Bureau van Dijk Orbis database. It is a count of active firms in Africa in 2016 which are partly or wholly owned by European investors.

Fig.(2) shows the business network in Africa, meaning those firms in Africa which are partly or wholly owned by Europeans, while its right hand side shows the countries of origin of the European investor who invests in Africa.

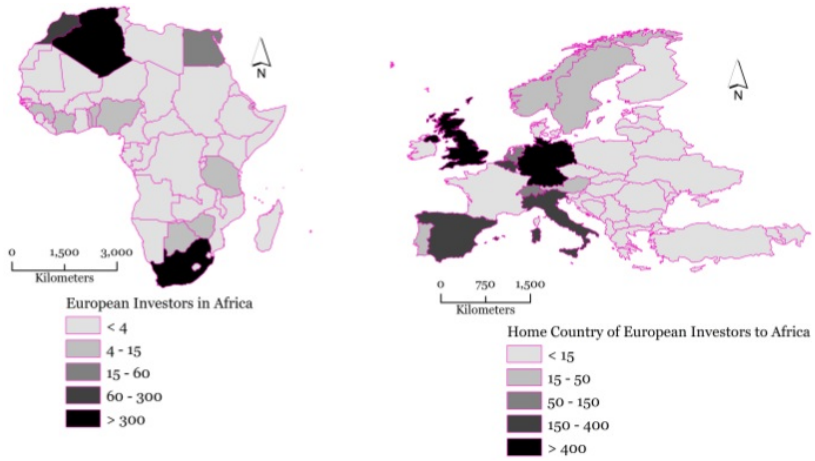

Fig. 2: On the left hand side, European investors in Africa. And on the right hand side, home country of European investors to Africa.

Summary statistics

Table (2) shows mean, standard deviation, minimum and maximum of variables used for specifications in the study, except the dummy variables.

Table 2: Summary statistics of variables in the study

Variable	Mean	S.D.	Min	Max
Bilateral flow of trade (in 1000$)	43,487.66	1,035,715	0	192,000,000
Production (in 1000$)	3,526,935	11,100,000	0	1,500,000,000
Wages (in 1000$)	26.27	19.78	0	148.31
Bilateral tariff (in %)	55.82	63.67	0	1,738.80
Bilateral distance (in km)	5,798.24	2,538.47	6.69	11,532.52
Stock of immigration	128.89	518.11	0	213,123
Stock of emigration	157.55	2,158.88	0	1,493,990
Firm's network	37.30	188.99	0	1,242

Note: Summary statics for the sample used for estimation. The dummy variables are not included.

4.2 Results

This section presents results in two categories; narrow specification and broader specifications. In narrow specification the estimation is solely based on bilateral variables, while in the broader specifications the estimations are done using basic odd, complete odd and freeness specifications respectively; in these broad specifications we include country specific variables which are; production and wage.

Generally in all specifications, the first model exclusively shows the effect of migration (that is, social network) on trade flow, the second model exclusively shows the effect of firms' ownership (that is business network) on trade flow, then the third model shows simultaneously the effects of both social and business networks on trade. Lastly the fourth model shows the effect of business and social networks and all other control variables on trade flow. Moreover, all models include exporter and importer fixed effects.

Effects of social and business networks on trade

Estimated coefficients for variables in the right hand side of the models are interpreted as elasticities, showing how each of the dependent variables affect trade flow between Africa and Europe.

Narrow specification

Narrow specification in which all variables are bilateral as described in Eq.(7) and its results presented in Table (3). It is observed that; social network is captured in two categories; immigrants and emigrants respectively, these variables are significant and consistent with theory. A 10 percent increase in immigration increases trade flow by 0.6 percent, while emigration increases trade by 0.1 percent. Indeed, in absolute terms the coefficient of immigrants is larger than that of emigrants. Firms' network is significant and consistent with theory. Thus, a 10 percent increase in firms' network increases trade by 9 percent. Firms' network affects the increase of trade flow more than immigration and emigration.

Control variables in narrow specification are consistent with theory; distance has the correct sign but it is not significant, tariff significantly reduces trade flow, such that increasing tariff by 10 percent reduces trade flow by 0.1 percent, while if countries have ever been in a colonial relationship increases trade by 1 percent, if countries share legal origin this increases trade flow by 0.1 percent, and lastly if countries share official language this increase trade flow between them by 0.6 percent.

Table 3: Narrow specification

Dependent variable: Bilateral flow				
Models	(1)	(2)	(3)	(4)
Immigrants	0.0571***		0.0571***	0.0570***
	(0.0026)		(0.0026)	(0.0026)
Emigrants	0.0051**		0.0051**	0.0052**
	(0.0025)		(0.0025)	(0.0024)
Firms' ownership		0.8810***	0.8808***	0.9305***
		(0.0206)	(0.0206)	(0.0336)
Distance				-0.0058
				(0.0077)
Tariff				-0.0139***
				(0.0007)
Colony				0.0945***
				(0.0310)
Legal origin				0.0055***
				(0.0018)
Off. language				0.0648***
				(0.0221)
Constant	0.1746***	-1.7636***	-1.7607***	-1.8289***
	(0.0128)	(0.0418)	(0.0418)	(0.0888)
N	2,401,717	2,447,368	2,401,717	2,401,717
R^2	0.6025	0.6062	0.6025	0.6025
Exp. Effects	Yes	Yes	Yes	Yes
Imp. Effects	Yes	Yes	Yes	Yes

Note: All variables in logarithm except colonial relationship and common legal origin dumies. In brackets, it is standard errors. Additionally, ***, **, or * means a coefficient is significant at 1%, 5% or 10% respectively.

Broader specification

Broader specification takes into account both bilateal and country specific variables, these variables are; production and wages.

Basic odd specification

This is formulated in Eq.(10) and the Table (4) shows the respective estimated results with respect to the reference country. In all models social network is significant and consistent with the theory. If migration increases by 10 percent trade flow increases by 0.3 percent, while firms' network is as well significant and as predicted by theory, when firms' network is entered alone and when it is entered with migration a 10 percent increase in firms' network increases trade flow by 8.3 percent. When firms' network is entered with all other variables its absolute effect on trade flow reduces to 6.5 percent.

Production and wages are significant and consistent with predictions of the theory. When production is inceased by 10 percent, trade flow increases by 0.2 percent. While increasing wages by 10 percent would decrease trade flow by 1.2 percent. A 10 percent increase in tariff would decrease trade flow by 1.3 percent, legal origin, and official language are significant and they are as expected by theory. Additionally, if countries share the same legal origin trade flow between them would increase by 1.7 percent, while it would increase by 6.7 percent if they share official language.

Table 4: Basic odd specification

Dependent variable: Bilateral flow relative to reference				
Models	(1)	(2)	(3)	(4)
Migration	0.0280***		0.0280***	0.0259***
	(0.0018)		(0.0018)	(0.0017)
Firms' ownership		0.8340***	0.8338***	0.6466***
		(0.0155)	(0.0155)	(0.0482)
Production				0.0217***
				(0.0013)
Wage				-0.1164***
				(0.0066)
Distance				-0.0055
				(0.0081)
Tariff				-0.0128***
				(0.0007)
Colony				0.0327
				(0.0326)
Legal origin				0.0168***
				(0.0019)
Off. language				0.0648***
				(0.0221)
Constant	0.1636***	0.1635***	0.1636***	0.1912***
	(0.0130)	(0.0130)	(0.0130)	(0.0463)
N	2,393,451	2,393,451	2,393,451	2,393,451
R^2	0.5905	0.5905	0.5905	0.5906
Exp. Effects	Yes	Yes	Yes	Yes
Imp. Effects	Yes	Yes	Yes	Yes

Note: All variables in logarithm except colonial relationship and common legal origin dumies. In brackets, it is standard errors. Additionally, ***, **, or * means a coefficient is significant at 1%, 5% or 10% respectively.

Complete odd specification

In complete odd specification shown in Eq.(11) and its results reported in Table (5). It can be seen that both social and business networks are significant and consistent with theory. If migration increases by 10 percent trade flow increase by 0.2 perecent, nevertheless it increases by 0.3 percent when it is entered together with all regressors. If there is 10 percent increase in firms' ownership trade flow increase by 9 percent.

Moreover, 10 percent increase in production would increase trade flow by 1.8 percent, wage would decrease trade flow by 1.5 percent, tariff would decrease trade flow by 0.3 percent. In addition to that; if countries share legal origin, trade flow would increase by 3 percent, and if they share official language trade flow would increase by 5 percent.

Table 5: Complete odd specification

Dependent variable: Bilateral flow relative to internal flow				
Models	(1)	(2)	(3)	(4)
Migration	0.0213***		0.0213***	0.0273***
	(0.0013)		(0.0013)	(0.0021)
Firms' ownership		0.8625***	0.8625***	0.9115***
		(0.0215)	(0.0215)	(0.0371)
Production				0.1783***
				(0.0008)
Wage				-0.1523***
				(0.0037)
Tariff				-0.0256***
				(0.0008)
Colony				-0.0392
				(0.0389)
Legal origin				0.0283***
				(0.0021)
Off. language				0.0471*
				(0.0253)
Constant	-2.3367***	-0.4415***	-2.3366***	-1.5081***
	(0.0449)	(0.0192)	(0.0449)	(0.0804)
N	2,447,368	2,447,368	2,447,368	2,447,368
R^2	0.6055	0.6056	0.6056	0.6344
Exp. Effects	Yes	Yes	Yes	Yes
Imp. Effects	Yes	Yes	Yes	Yes

Note: All variables in logarithm except colonial relationship and common legal origin dumies. In brackets, it is standard errors. Additionally, ***, **, or * means a coefficient is significant at 1%, 5% or 10% respectively.

Freeness of trade specification

Estimation of freeness of trade is done by using Eq.(13) and consequential results are presented in Table (6). The effect of social network is such that; increasing migration by 10 percent would increase trade flow by 0.3 percent, while 10 percent increase in business network would increase trade flow by 16 percent, this effect increases to 17 percent when all regressors are included in the model.

When tariff is increased by 10 percent, trade flow would decrease by 0.4 percent. When countries share legal origin and official language trade flow would increase by 1 percent and 4.5 percent respectively.

Table 6: Freeness of trade estimation

Dependent variable: Freeness of trade index				
Models	(1)	(2)	(3)	(4)
Migration	0.0321***		0.0321***	0.0332***
	(0.0056)		(0.0056)	(0.0056)
Firms' ownership		1.5686***	1.5686***	1.6819***
		(0.0327)	(0.0327)	(0.0548)
Tariff				-0.0445***
				(0.0014)
Legal origin				0.0064***
				(0.0020)
Off. language				0.0445**
				(0.0180)
Constant	0.5983***	-1.1250***	-1.1250***	-1.2370***
	(0.0118)	(0.0343)	(0.0343)	(0.0593)
N	2,447,368	2,447,368	2,447,368	2,447,368
R^2	0.5307	0.5307	0.5307	0.5308
Exp. Effects	Yes	Yes	Yes	Yes
Imp. Effects	Yes	Yes	Yes	Yes

Note: All variables in logarithm except colonial relationship and common legal origin dumies. In brackets, it is standard errors. Additionally, ***, **, or * means a coefficient is significant at 1%, 5% or 10% respectively.

4.3 Magnitude of social and business networks on trade

This section presents the magnitude of trade creation for every specification. The intuition is clear, that; larger coefficient of a network variable does not necessarily mean larger trade creation. The magnitudes hereby determined are according to the sample of the study.

Magnitude of trade creation from narrow specification

In Eq. (14) we show how to obtain magnitude of trade creation from narrow specification.

$$(\overline{1+ns})^{\hat{a}} \;=\; \hat{a}\; ln(\overline{1+ns}), \tag{14}$$

where $(\overline{1+ns}) \;=\; (\overline{1+mig_{ij}})$, $(\overline{1+mig_{ji}})$, $(\overline{1+firm_{ij}})$ denotes the average value of each network variable. And $\hat{a}$ is the estimate of the corresponding elasticity.

Thus, magnitude of trade creation in narrow specification is presented in Table (7) in which we see that; magnitude of trade flow due to immigration

is 8.2 percent, and magnitude due to emigration is 0.5 percent, and lastly magnitude of trade flow due to business network is 60.8 percent, but when business network is entered with all other regressors its magnitude increases to 64.3 percent.

Table 7: Trade creation (in percent (%))

Network variables	lonely entered	both entered	entered with controls
Immigration	8.2	8.2	8.2
Emigration	0.5	0.5	0.5
Firms' ownership	60.8	60.8	64.3

Note: Percentage of trade increase computed as given in Eq.(14).

Magnitude of trade creation from basic odd specification

Formulation on how to calculate magnitude of trade creation from basic odd specification is set in Eq.(15) and its corresponding results are shown in Table (8). The magnitude of trade creation by migration is 4 percent when migration is entered alone, and when it is entered with social network, however, the magnitude decreases to 3.7 percent when migration is entered with the rest of regressors. In addition to that magnitude of business network is 93 percent both when entered alone and with migration, nevertheless, it decreases to 72.1 percent when entered with all regressors.

$$(\overline{1+bo})^{\hat{a}} \;=\; \hat{a}\; ln(\overline{1+bo}), \tag{15}$$

where $(\overline{1+bo}) \;=\; \left(\overline{\left(\frac{1+mig_{ij}}{1+mig_{ir}}\right)\left(\frac{1+mig_{ji}}{1+mig_{ri}}\right)}\right)$, $\left(\overline{\frac{1+firm_{ij}}{1+firm_{ir}}}\right)$ represents the average value of each network variable. And $\hat{a}$ is the estimate of the corresponding elasticity.

Table 8: Trade creation (in percent (%))

Network variables	lonely entered	both entered	entered with controls
Migration	4	4	3.7
Firms' ownership	93	93	72.1

Note: Percentage of trade increase computed as given in Eq.(15).

Magnitude of trade creation from complete odd specification

Magnitute of trade creation for complete odd specification is calculated using Eq.(16) and reported in Table (9). In which it can be seen that; magnitute of social network when entered alone and when entered with business network is 3.9 percent, but when entered together with all regressors the magnitude of social network improves to 5.1 percent. At the same time, magnitude of business network when entered alone and when entered with social network is 59.6 percent, while when it is entered with all regressors it becomes 62.9 perecent.

$$(\overline{1+co})^{\hat{a}} \;=\; \hat{a}\; ln(\overline{1+co}), \tag{16}$$

where $(\overline{1+co}) \;=\; \left(\overline{(1+mig_{ij})\,(1+mig_{ji})}\right)$, $\left(\overline{1+firm_{ij}}\right)$ represents the average value of each network variable. And $\hat{a}$ is the estimate of the corresponding elasticity.

Table 9: Trade creation (in percent (%))

Network variables	lonely entered	both entered	entered with controls
Migration	3.9	3.9	5.1
Firms' ownership	59.6	59.6	62.9

Note: Percentage of trade increase computed as given in Eq.(16).

Magnitude of trade creation from freeness of trade specification

Indeed, magnitude of trade creation from freeness of trade specification is obtained using Eq.(17) and its results are presented in Table (10). Clearly, when social network is entered alone and when it is entered with business network its magnitude is 3.8 percent. While the magnitude of trade creation by business network when entered alone and when entered with social network is 54.2 percent, then, it improves to 58.1 percent when it is entered with all regressors.

$$(\overline{1+fr})^{\hat{a}} \;=\; \hat{a}\; ln(\overline{1+fr}), \tag{17}$$

where $(\overline{1+fr}) \;=\; \left(\overline{\left(\sqrt{1+mig_{ij}}\right)\left(\sqrt{1+mig_{ji}}\right)}\right),\; \left(\overline{\sqrt{1+firm_{ij}}}\right)$ denoted the average value of each network variable. And $\hat{a}$ is the estimate of the corresponding elasticity.

Table 10: Trade creation (in percent (%))

Network variables	lonely entered	both entered	entered with controls
Migration	3.8	3.8	4
Firms' ownership	54.2	54.2	58.1

Note: Percentage of trade increase computed as given in Eq.(17).

In all specifications, the results show that; the magnitude of business network on trade out performs that of social network.

5 Conclusions

This article used "structural" specifications to evaluate corresponding coefficients and trade creating effects of social and business networks on trade flow between Africa and Europe.

The study has been able to show that social network significantly and positively affects trade flow. This outcome is consistent with literature, to emphasise on this argument we can look at Genc et al (2012) who summarise the World effect of social network on trade, from fixed effect model results, their meta analysis of 31 papers published in academic journals show the elasticity between trade and social network to be 0.09, the nearest coefficient to this figure from our study, is from narrow specification, in which we obtain a coeffient of 0.06. Furthermore, trade creating effect of social network on trade ranges from 4 percent to 8 percent depending of the estimation.

With regard to business network, again, the coefficients are significant and consistent with the literature. Our coefficients are larger than those obtained in Combes et al (2005) whose largest coefficient is 0.65 in freeness specification, while in the same specification our coefficient for business network is 1.57 a possible reason would be that business network explain more trade flow between developed and developing countries than it does for intra-national trade within a developed country. Trade creating effect of business network on trade ranges from 54 percent to 93 percent depending on specification.

Generally, all specifications demonstrate that trade flow between Africa and Europe improves in presence of social and business networks than in their abscence. But in absolute values increases more with business network than social network.

References

Amighini A, Sanfilippo M (2014) Impact of south–south fdi and trade on the export upgrading of african economies. World development 64:1–17

AU, EU (2007) The African-EU Strategic Partnership: A Joint Africa-EU Strategy. Tech. rep.

Belderbos R, Wakasugi R, Zou J (2012) Business groups, foreign direct investment, and capital goods trade: The import behavior of japanese affiliates. Journal of the Japanese and International Economies 26(2):187–200

Bettin G, Turco AL (2012) A cross-country view on south-north migration and trade: dissecting the channels. Emerging Markets Finance and Trade 48(4):4–29

Blanes JV, Martín-Montaner JA (2006) Migration flows and intra-industry trade adjustments. Review of World Economics 142(3):567–584

Canavire Bacarreza GJ, Ehrlich L (2006) The impact of migration on foreign trade in bolivia. Revista Latinoamericana de Desarrollo Economico (6):125–146

Combes PP, Lafourcade M, Mayer T (2005) The trade-creating effects of business and social networks: evidence from France. Journal of International Economics 66(1):1–29

Felbermayr GJ, Jung B (2009) The pro-trade effect of the brain drain: Sorting out confounding factors. Economics Letters 104(2):72–75

Genc M, Gheasi M, Nijkamp P, Poot J (2012) The impact of immigration on international trade: a meta-analysis1. Edward Elgar Publishing

Ghatak S, Silaghi MIP, Daly V (2009) Trade and migration flows between some cee countries and the uk. The Journal of International Trade & Economic Development 18(1):61–78

Greaney TM (2005) Measuring network effects on trade: are japanese affiliates distinctive? Journal of the Japanese and International Economies 19(2):194–214

Hatzigeorgiou A, Lodefalk M (2015) Trade, migration and integration–evidence and policy implications. The World Economy 38(12):2013–2048

Head K, Mayer T (2004) Market potential and the location of Japanese investment in the European Union. Review of Economics and Statistics 86(4):959–972

Helliwell JF (1997) National borders, trade and migration. Pacific Economic Review 2(3):165–185

Hiller S (2014) The export promoting effect of emigration: Evidence from denmark. Review of Development Economics 18(4):693–708

Hussain ME, Haque M (2016) Foreign Direct Investment, Trade, and Economic Growth: An Empirical Analysis of Bangladesh. Economies 4(2):7

Jansen M, Piermartini R (2009) Temporary migration and bilateral trade flows. The World Economy 32(5):735–753

Karagöz K (2016) Migration–trade nexus revisited: Empirical evidence from turkish emigrants in oecd countries. Theoretical and Applied Economics 22(4 (609), Winter):127–142

Karayil SB (2007) Does migration matter in trade? a study of india's exports to the gcc countries. South Asia Economic Journal 8(1):1–20

Keorite M, Pan H (2016) The impacts of chinese direct investment in thailand on the sino-thai bilateral trade. Journal of Chinese Economic and Foreign Trade Studies 9(1):24–39

Krugman PR (1979) Increasing returns, monopolistic competition, and international trade. Journal of international Economics 9(4):469–479

Law D, Genç M, Bryant J, et al (2009) Trade, diaspora and migration to new zealand. NZ Institute for Economic Research Working Papers No 4

Lee J (2012) Network effects on international trade. Economics Letters 116(2):199–201

Markusen JR, Venables AJ (1998) Multinational firms and the new trade theory. Journal of international economics 46(2):183–203

de la Mata T (2014) Does trade creation by social and business networks hold in services? Applied Economics 46(13):1509–1525

Neary JP (2009) Putting the "new" into New Trade Theory: Paul Krugman's Nobel Memorial Prize in Economics. The Scandinavian Journal of Economics 111(2):217–250

Nishitateno S (2015) Network effects on trade in intermediate goods: Evidence from the automobile industry. Japanese Economic Review 66(3):354–370

Partridge J, Furtan H (2008) Immigration wave effects on Canada's trade flows. Canadian Public Policy 34(2):193–214

Peri G, Requena-Silvente F (2010) The trade creation effect of immigrants: evidence from the remarkable case of Spain. Canadian Journal of Economics/Revue canadienne d'économique 43(4):1433–1459

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

Ricci LA, Trionfetti F (2012) Productivity, Networks, and Export Performance: Evidence from a Cross-country Firm Dataset. Review of International Economics 20(3):552–562

Sandeep K (2015) Migration and bilateral trade flows: Evidence from india and oecd countries. Applied Econometrics and International Development 15(2):179–196

Serrano R, Acero I, Fernandez-Olmos M, et al (2016) Networks and export performance of agri-food firms: New evidence linking micro and macro determinants. Agricultural Economics (Zemědělská Ekonomika) 62(10):459–470

Silva JS, Tenreyro S (2010) On the existence of the maximum likelihood estimates in Poisson regression. Economics Letters 107(2):310–312

Tadesse B, White R (2011) Emigrant effects on trade: Re-examining the immigrant-trade link from the home country perspective. Eastern Economic Journal 37(2):281–302

Tadesse B, White R (2013) Do african immigrants enhance their home nations' trade with their hosts? The Journal of Developing Areas 47(2):199–228

Tai SH (2009) Market structure and the link between migration and trade. Review of World Economics 145(2):225–249

Tomiura E (2007) Effects of r&d and networking on the export decision of japanese firms. Research Policy 36(5):758–767

Wagner D, Head K, Ries J (2002) Immigration and the Trade of Provinces. Scottish Journal of Political Economy 49(5):507–525

White R (2007) Immigrant-trade links, transplanted home bias and network effects. Applied Economics 39(7):839–852