Immigrant Links, Trade Creation, and Trade Diversion

Tomáš Konečný

Abstract I derive a simple gravity model of trade that differentiates between native agents and immigrants and allows for shifts in bilateral trade flows due to immigrant links. I calculate the share of total trade between the OECD and non-OECD countries attributable to immigrant links and find that immigrant-driven trade accounts for as much as 10.98 percent of aggregate OECD exports to and 9.99 percent of aggregate OECD imports from the non-OECD source countries in the sample. The evidence nonetheless suggests that part of immigrants' contribution might be offset by less trade with other trade partners. A one-percentage-point increase in the aggregate size of the overseas immigrant diaspora relative to the country of origin's population would result in a decrease in the OECD country's total exports by roughly 1.75 percent and its total imports by 2.28 percent.

Keywords International trade - Migration - Informal trade barriers - Gravity equation

JEL Classification F22 - O15 - O24

Address: CERGE-EI, P.O. Box 882, Politických vězňů 7, 11121 Prague, Czech Republic. CERGE-EI is a joint workplace of the Center for Economic Research and Graduate Education, Charles University, and the Economics Institute of Academy of Sciences of the Czech Republic.
E-mail: tomas.konecny@cerge-ei.cz. Phone: (+420) 724 875 504. Fax: (+420) 224 005 333.

1 Introduction

Informal trade barriers have become one of the central points in the debate launched by Trefler's "mystery of the missing trade " (Trefler 1995), i.e., the finding that nations tend to trade too much intranationally and too little internationally. Particular attention has been directed towards insufficient information on available trading opportunities and imperfect contract enforcement. Some social networks seem to be well equipped to deal with both kinds of informal trade barriers. These networks, often defined by common ethnicity or religion, can provide useful information and trade contacts to their members and/or employ some sort of collective punishment mechanism that could substitute for inadequate enforcement institutions. In particular, numerous studies have examined the impact of immigrant networks on trade. The results of these studies consistently support the notion that immigrant links indeed facilitate bilateral trade between host and source countries.

My paper offers three extentions to the existing literature. First, I derive a simple measure of immigrant links and calculate the share of aggregate trade attributable to immigrant populations for each host and source country. This has not been possible in studies that have employed the natural logarithm of immigrant stock as a measure of immigrant links (e.g., Head and Ries 1998; Girma and Yu 2002; and Heerander and Saavedra 2006), given that it only allows the calculation of immigrants' marginal but not overall contribution to trade. I find that immigrant links account for as much as 10.98 percent of the OECD's aggregate exports to and 9.99 percent of aggregate imports from the source countries in the sample.

Second, the existing literature focuses almost exclusively on the direct impact of immigrants on bilateral trade between the host country and country of origin. I use a formal framework to model potential complementary effects on countries' aggregate trade and find some empirical support for the hypothesis that immigrant-driven trade gains might be partially offset by lower trade volumes with other trade partners. The present estimates thus represent a likely upper bound for the contribution of immigrant links to international trade.

Finally, the literature on migration and trade suffers from a lack of evidence on the direction of causality. I instrument the immigrant links by the natural logarithm of population density and the share of passport costs in real GDP per capita in the source country (McKenzie 2005) and find some evidence for the causal link running from immigration to trade.

The following section reviews the existing empirical research on the role of immigrant links in international trade. The model is presented in Section 3 and data employed in Section 4. The following sections discuss empirical results and their robustness. Section 7 concludes.

2 Evidence on trade and immigrant links

A number of country-specific studies exist that estimate the relationship between trade and immigrant links. For example, (Gould 1993) analyzes migration inflows in the U.S. using panel data from 1970 to 1986 and predicts a 10-percent increase in immigrant stock to raise U.S. exports by 4.7 percent and U.S. imports by 8.3 percent. An exercise using Canadian data has been produced by Head and Ries (1998). The authors employ two different measures of immigrant links, namely the cumulative sum of immigrant inflows after 1970 and the imputed immigrant populations using census data, and they report a 10-percent increase in the immigrant stock to raise Canadian bilateral exports by 1.0-1.3 percent and imports by 3.1-3.9 percent.[1] Other more recent country studies include e.g., Girma and Yu (2002) for the U.K.; (Blanes 2005) for Spain; and (White 2007a) for Denmark. A recent study on Australian data by Clarke and Hillberry (2009) is, to the author's knowledge, the only one that does not find any significant effect of immigration on bilateral trade.

A number of studies focus on the characteristics of immigrants' country of origin influencing immigrant-driven trade. The Canadian study by Head and Ries (1998) finds that a trade contribution of more recent immigrant cohorts from East Asian and Latin American countries tends to exceed that of traditional migrant communities from within the European continent. The U.S. study by (White 2007b) divides source countries into four income groups and estimates the immigrant-link effect for each distinct group. His results indicate that immigrant networks from low income economies exert stronger influence on trade than their higher income counterparts. On the contrary, (White 2007a) finds the opposite result for Danish data.

Herander and Saavedra (2005) explore the spatial dimension of immigrant networks. Focusing on trade-creation effects of immigrant networks operating within and between the U.S. states, the results show a consistently stronger impact on U.S. state export volumes to a source country for local as compared to out-of-state populations. In particular, their results qualitatively conform to previous estimates in that a 10-percent increase in the local state immigration should on average increase the state's exports by 1.6 percent. The estimated impact of the out-of-state immigrant population then raises the states' export volumes by 0.7 percent only.

The study by (Dolman 2007) uses the total share of immigrants in the host country and finds that immigrants have an effect on the directions of trade rather than on total trade volumes. Unlike (Dolman 2007), the present study derives the total share measure within a formal framework and examines an additional dimension of trade spillovers, namely the role of foreign diasporas defined as immigrant networks from the same country of origin located in different host economies. The following section presents the estimation framework.

3 Model

I consider three mechanisms through which immigrants influence trade. 1) Immigrants located in a given host country facilitate trade by forming joint ventures with agents in their country of origin. 2) Immigrants' joint ventures reduce the probability of forming a joint venture between host-country's natives and agents in the immigrants' country of origin. 3) Immigrant communities in a given host country divert a fraction of joint ventures that would have otherwise been created between host's natives and agents from the concerned country of origin.

Assume the world population N is distributed across $J + I$ countries, where J and I are labelled host and source economies respectively, and which differ in size and structure of their population. Each agent regardless of location and status has linear preferences and is endowed with x units of indivisible input normalized to zero, which

[1] The link between immigration and Canadian trade has also been studied by (Helliwell 1997) and Wagner, Head and Ries (2003).

can be used either for local production or as an input into a joint venture with a foreign partner. Local production technology transforms the normalized input into 1 unit of output. Within the joint venture, each of the participating parties has to invest their whole endowment to produce a) either $2a$ in case the venture has been formed between native agents from i and j, or b) $2b$ once both parties originate from j, yet one has the status of immigrant in host j. Different productivities between joint ventures $\{a, b\} > 1$ are measures of match quality. The present model assumes that $\{a, b\} > 1$ is a result of the combination of host country and source country's specific knowledge. Distinct productivities of joint ventures reflect, e.g., different outside options of immigrants versus native agents in host country j. Agents within one country or agents from two host countries cannot form a joint venture.

The total N_j population in each host economy j consists of $\sum_i m_{ij}$ immigrants from source countries i and $N_j - \sum_i m_{ij}$ native agents, where m_{ij} equals the immigrant population from i residing in j. Source economies i consist of native agents only. Native agents in i and j have to incur search costs s in case they opt for foreign investment and look for potential trade partners. During their random search for a joint venture, native agents in j might fail to meet foreign agents with a probability $(1 - p_j)$, where p_j equals the probability that a searching native agent from country j forms a joint venture. Immigrants in j coming from source countries i are identical to native agents, but they know the identity of agents from source country i without having to incur search costs s. Note that immigrants never choose to produce locally or to form a joint venture with agents from other than their source country i. Instead, they contact native agents in source economy i and set up a joint venture. Native agents in i always agree to form a joint venture because $a > 1$ and the agents do not have to incur search costs, given that they were contacted by the foreign party.

The remaining populations in each country anticipate the choices of immigrants and of contacted native agents in source economies and select local production if and only if net expected profits exceed gains from a joint venture and/or uncontacted native agents in source i would not accept the potential offer. The participation constraints of native agents in host country j are as follows:[2]

$$\text{produce locally iff} \quad 1 > \big[(1 - p_j) + p_j a\big] - s$$
$$\text{invest in other countries iff} \quad 1 \leq \big[(1 - p_j) + p_j a\big] - s \text{ and } 1 \leq [(1 - p_i) + p_i a] - s,$$

where p_j corresponds to

$$p_j = \frac{\sum^i \left[N_i - \sum^j m_{ij}\right]}{N_I} \min\left[1, \frac{N_I}{N_J}\right],$$

and p_i equals

$$p_i = \frac{\sum^j \left[N_j - \sum^i m_{ij}\right]}{N_J} \min\left[1, \frac{N_J}{N_I}\right].$$

I take an approximation and assume the shares of overall immigrant populations in host countries and the size of immigrant communities with respect to their source country populations are sufficiently small, i.e., $h_j = \frac{\sum^i m_{ij}}{N_j} \to 0, \forall j$ and $d_i = \frac{\sum^j m_{ij}}{N_i} \to 0,$

[2] I assume both investors in a joint venture play a Nash bargaining solution and split the resulting joint surplus $2a$ equally. Searching parties cover their costs s individually.

$\forall i, j$.[3] Then $p_j \to 1$, $p_i \to 1$, and country j's share in the aggregate output of all host countries equals

$$\frac{GDP_j}{GDP_J} = \frac{N_j \left[\left(1-h_j\right)(1-s) + bh_j + (a-s)\left(1-h_j\right) p_j\right]}{\sum^j N_j \left[\left(1-h_j\right)(1-s) + bh_j + (a-s)\left(1-h_j\right) p_j\right]} = \frac{N_j}{\sum^j N_j}, \quad (1)$$

where the terms in the brackets correspond to the contributions of local production, immigrant joint ventures, and joint ventures of native agents.

Similarly, a source country i's share in output of all source countries corresponds to

$$\frac{GDP_i}{GDP_I} = \frac{N_i \left[(1-d_i)(1-s) + bd_i + (a-s)(1-d_i) p_i\right]}{\sum^i N_i \left[(1-d_i)(1-s) + bd_i + (a-s)(1-d_i) p_i\right]} = \frac{N_i}{\sum^i N_i}. \quad (2)$$

For $N_J \leq N_I$ and using (1), trade volume T_{ij}^N generated by host j natives' joint ventures equals[4][5]

$$T_{ij}^N = (a-s) N_J \frac{GDP_i GDP_j}{GDP_I GDP_J} \left(1 - \frac{\sum_{j=1}^J m_{ij}}{N_i}\right) \left(1 - \frac{\sum_{i=1}^I m_{ij}}{N_j}\right) \quad (3)$$

and trade volume T_{ij}^I generated by the immigrants from i residing in j is

$$T_{ij}^I = bN_J \frac{m_{ij}}{N_j} \frac{GDP_j}{GDP_J}, \quad (4)$$

where use was made of (1).

The empirical counterpart of the sum of (3) and (4) equals

$$\ln T_{ij} = b_0 + b_1 \ln GDP_i + b_2 \ln GDP_j + b_3 \frac{\sum_{j=1}^J m_{ij}}{N_i} + b_4 \frac{\sum_{i=1}^I m_{ij}}{N_j} + b_5 \frac{\frac{m_{ij}}{N_j}}{r_i r_j GDP_i}$$
$$+ a'z + \alpha_j + \varepsilon_{ij}, \quad (5)$$

where

$$r_i r_j = \left(1 - \frac{\sum_{j=1}^J m_{ij}}{N_i}\right) \left(1 - \frac{\sum_{i=1}^I m_{ij}}{N_j}\right),$$

and lnT_{ij} corresponds to the natural logarithm of either exports or imports flowing between countries i and j.

The coefficients b_3 and b_4 indicate the indirect impact on *native*-driven bilateral trade between i and j that has been caused by the immigrants' choice to trade with their source countries (see Equation 3) and are expected to be equal to minus one. The

[3] The average immigrant share in host countries $\frac{\sum^i m_{ij}}{N_j}$ in the sample is 0.026 and the average size of immigrants relative to source country populations $\frac{\sum^j m_{ij}}{N_i}$ equals 0.033.

[4] The case where $N_I \leq N_J$ does not change the line of argument.

[5] It might happen that the middle term in brackets, and hence predicted trade, can turn negative. The situation corresponds to a hypothetical country with its overseas diaspora larger than the country's domestic population. As all observations in the present sample are positive, I assume such a situation does not occur.

coefficient b_3 captures the effect on bilateral trade of source country diasporas located in other countries. The larger is the overall diaspora relative to the population of the country of origin, the lower are the chances of a host's *native* agents to find a match in the concerned source country. Since b_3 relates to the population of a source country N_i and approximates the potentially negative spillovers to *native*-driven bilateral trade, in the following I call the relative size of the diaspora $\frac{\sum_{j=1}^{J} m_{ij}}{N_i}$ the source country trade diversion term.

The coefficient b_4 captures the role of the overall share of immigrants in host j's population. Using the logic of the present empirical model, the more immigrants in a given host country that match with agents in their countries of origin, the lower will be the probability of the host's *native* agents trading with a given trade partner. For these reasons, I label the overall immigrant share in host j's population $\frac{\sum_{i=1}^{I} m_{ij}}{N_j}$ the host country trade diversion term.

The coefficient b_4 reflects the direct trade contribution by immigrants from i located in j (see also Equation 4) and is expected to be positive. As the coefficient b_4 reflects direct positive immigrant effects on trade, the corresponding term will be referred to as the trade creation term.

The vector z is a $k \times 1$ vector of additional explanatory variables that vary either at the level of host j, source i, or at the level of country pairs ij. The vector includes the natural logartihms of GDP per capita, share of exports in GDP, the Heritage Foundation measure of institutional quality, and dummies for colonial past, common language, shared border and trade agreement between both partners.

The error term has two components; ε_{ij} is a random term specific to individual country pairs ij and independent of other errors. An error term α_j is correlated within host country j. If common group errors α_j have not been controlled for, the resulting standard error estimates might suffer from a notable downward bias (Moulton 1986). I thus allow for a more general covariance structure and heteroscedasticity of α_j as proposed by Liang and Zeger (1986).

Silva and Tenreyro (2006) propose an alternative estimator that deals with general heteroscedasticity in log-linearized models. Their pseudo-maximum likelihood (PML) estimator provides consistent estimates under heteroscedasticity and will serve as a benchmark for following the calculations of shares of immigrant-driven trade and trade spillovers.

Finally, I employ the 2-step estimation approach developed by Donald and Lang (2007) for the case of common-group errors and small numbers of groups. The two-step procedure starts with the OLS regression of the natural logarithm of bilateral exports/imports on variables differing across country pairs ij, country j- and i-fixed effects:

$$\text{1st stage: } \ln T_{ij} = \mathbf{x}'_{ij} b + a_0 \frac{\frac{m_{ij}}{N_j}}{r_i r_j GDP_i} + d'_i + d'_j + \varepsilon_{ij},$$

where the term following the coefficient a_0 is the newly added share in the host population of a given immigrant stock relative to the country of origin GDP_i.

In the second stage, I run a feasible GLS with the relevant fixed effect coefficient estimates from the first stage as dependent variables and country i- (or j-) level variables on the right-hand side of the regression:

$$\text{2nd stage:} \quad \hat{d}_j = c(J) + b_1 \ln GDP_j + \mathbf{x}_j' z + a_1 \frac{\sum_{i=1}^{I} m_{ij}}{N_j} + u_j, \;\; va\hat{r}(u_j) = \hat{\sigma}^2 I(J) + \Sigma_{\hat{d}_j} \tag{6}$$

$$\text{and} \quad \hat{d}_i = c(I) + b_2 \ln GDP_i + \mathbf{x}_i' w + a_2 \frac{\sum_{j=1}^{J} m_{ij}}{N_i} + u_i, \;\; va\hat{r}(u_i) = \hat{\sigma}^2 I(I) + \Sigma_{\hat{d}_i}, \tag{7}$$

where Equation 6 estimates the coefficient on the host trade diversion term, Equation 7 estimates the coefficient on the source trade diversion term, and $va\hat{r}(u_{\{j,i\}})$ stands for the variance of the respective 2nd-stage error term $u_{\{j,i\}}$. The GLS procedure uses fixed effect covariance estimates $\Sigma_{\{\hat{d}_j, \hat{d}_i\}}$ from the 1st stage for the construction of weights.[6]

4 Data

4.1 Immigrants

The cross-country information on the numbers of foreign-born persons over 15 years of age for 21 OECD member countries was retrieved from the OECD Statistics Portal on Demography and Population (OECD 2008). The main advantage of the present dataset rests in the variation at both the source *and* host country levels, which permits the estimation of trade-diversion effects. This was not possible in empirical studies focusing exclusively on a single host country.

The data have been drawn from population registers, residence or work permits, surveys and censuses taking place usually every 5 or 10 years. Due to the different timing of censuses, the reference year varies between 1999 and 2002, depending on the specific country. The unknown populations have been distributed using country-of-origin shares in the total number of foreign born in a concerned host country. The new entities on territories of the former Soviet Union and Yugoslavia have not been included due to differences in aggregation across host countries.[7]

The figures for Germany were listed only by broad source regions instead of countries. For the Netherlands, the data included only all foreign born instead of those over 15 years of age. I replaced the data for Germany with figures from the Federal Statistical Office of Germany and, since the available data for both Germany and the Netherlands covered total foreign-born population only, I adjusted them by the shares of immigrants over 15 years of age in the total foreign-born population by source country as recorded for comparatively open Belgium.

4.2 Trade and remaining data

The data on bilateral exports and imports have been obtained from the Direction of Trade Statistics compiled by the International Monetary Fund. Five-year averages

[6] For more details see Donald and Lang (2007), p. 224-225.

[7] The post-communist countries (Poland, Hungary, the Czech Republic and Slovakia), Turkey and Mexico are labelled as source rather than host countries. The results with the abovementioned countries as hosts remain qualitatively similar to the main regression results and can be provided upon request.

of real trade volumes over 1999-2003 have been chosen to reduce the problem with zero observed exports and imports.[8] Finally, since the focus of the present study is immigrant networks and the home links of overseas Chinese communities quite likely cover both China and Hong Kong, the two entities are treated as a single country.

[TABLE 1 ABOUT HERE]

The circle distance between capital cities was retrieved from Jon Haveman's web page[9] and added manually if values were missing. Dummies for common colonial past, language, and trade agreement were taken from Silva and Tenreyro (2009). As a measure of institutional quality, I use the five-year averages for countries i and j of the restricted Index of Economic Freedom produced by the Heritage Foundation. The Index of Economic Freedom over 1999-2003 compiles evaluations of nine areas essential for functioning market environment. The restricted version includes only those areas that most closely relate to institutional quality within a trade context – corruption, non-tariff trade barriers, rule of law, and regulatory burden – and omits fiscal burden, inflation, restrictions on banks, labor regulation, and government intervention. Finally, figures on population, GDP, GDP per capita, and export shares in hosts' GDP were collected from the World Development Indicators published by the World Bank. To avoid the potential endogeneity problem of the GDP variables, I use GDP and GDP per capita figures from 1998 as proxies. The main sample consists of 21 host countries and 117 source countries, generating an unbalanced cross-section dataset of 2,089 observations. Table 1 presents the summary statistics for key variables.

5 Estimation results

The estimated coefficients for the trade creation and diversion terms are reported in Table 2.[10][11] The first columns for both exports and imports display the estimates from the benchmark OLS regression with regional dummies for host and source countries and clustering by host country. In the following columns, I present the estimates using the PML approach, and the results from Donald and Lang's (2007) 2-step procedure, where the trade creation estimates have been obtained in the 1st stage with host and source country fixed effects. Columns (3) and (6) merge the 2nd stage estimates of the host and source trade diversion terms for exports and imports.

[8] While 23 out of the total 2,089 sample observations on exports from host countries (i.e. roughly 1.4 percent) reported zero trade in at least one year over the 1999-2003 period, none of them did so for the whole five-year period. For imports to host countries the figures equalled 57 (i.e., 3.4 percent) and 18 respectively.

[9] Jon Haveman's web page can be found at http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeData.html#Gravity.

[10] For Liang and Zeger's (1986) OLS estimation with clustering, Equation 5 has been supplied with regional dummies to control for possible correlation of explanatory variables with unobserved region characteristics. The two regional dummies for host countries correspond to North America and Europe. For source countries the regions are Northern Africa, Subsaharan Africa, the Gulf states, South Asia and South-East Asia, South America, Central America, and Central and Eastern Europe.

[11] For complete estimation results please see Table A2 and Table A3 in the Appendix.

Regardless of specification and direction of trade, the estimated coefficients on trade creation are positive, relatively stable, and significantly different from zero at the 1 percent significance level. While obtaining the elasticity of trade on migration is not as straightforward as in the studies employing the natural logarithm of immigrant variables,[12] the trade creation term allows the calculation of the share of aggregate trade attributable to immigrant populations. The estimated shares for individual host and source countries are presented in Table A1. For the OECD economies, the model predicts that immigrant links to the non-OECD country of origin account for as much as 10.98 percent of their aggregate exports to and 9.99 percent of aggregate imports from the source countries in the sample. The largest shares of immigrant-driven trade can be observed for the non-European OECD economies, while the shares for the European economies remain notably lower (with the sole exception of Austria).

The source trade diversion estimates are consistently negative and for all but the OLS results in columns (1) and (4) do not differ statistically from minus one as predicted by the model from Section 3. The evidence in favor of the trade diversion hypothesis is nonetheless not particularly strong, given that the coefficients are significantly negative only in the PML estimation. Using the PML estimates in columns 2 and 5, a one-percentage-point increase in the size of the total immigrant community $\sum_{j=1}^{J} m_{ij}$ relative to the source country i's population would result in a decrease in its *total* exports by roughly 1.75 percent and its *total* imports by 2.28 percent on average. The calculations of trade shares based on the trade creation estimates in Table 2 thus represent an upper bound for the contribution of immigrant links to international trade.

Contrary to (Dolman 2007), the sign and statistical significance of the host diversion estimates does not support the trade diversion argument outlined in Section 3. The host diversion estimates are nonetheless merely indicative given the relatively low number of host countries.

The next section focuses on the robustness of the results.

[TABLE 2 ABOUT HERE]

6 Sensitivity analysis

While previous studies on immigrant networks have avoided the endogeneity issue, the potential endogeneity concerns might cast some doubt on the presented results. Over time, trade partners could learn about the living conditions in the host country and might pass the information further to potential migrants. Growing bilateral trade might likewise provide employment opportunities within the immigrant communities engaged in trading and thus reduce the *ex ante* uncertainty of agents considering migration. Similar reasoning seems to be in line with the findings of the literature on international migration (e.g., Mayda 2005).

Indeed, finding a suitable instrument for the trade creation variable proves to be a daunting task. An exception is the study of (Javorcik et al. 2006) on migrant networks' links and foreign direct investment. The authors use the natural logarithm of population

[12] The results using the natural logarithm of immigrant stock are listed in Table 3.

density and the share of passport costs in real GDP per capita in the source country from (McKenzie 2005), both identified as significant push factors for migration. For the present purposes, however, the correlations between the trade creation variable, population density in the source country, and passport costs seem to be negligible and in the former case even with the opposite sign. Instead of the trade creation term I use the natural logarithm of immigrant stock as the instrumented variable.

Columns 3 and 6 in Table 3 contain the estimates for the 2SLS regressions using the instruments from (McKenzie 2005). The Wald test rejected the null hypothesis of weak instruments at the 5-pecent level of significance for both directions of trade. The levels of Durbin's χ^2 and Wu-Hausman's statistics support the exogeneity of the natural logarithm of immigrant stock. The 2SLS estimates also provide further supportive evidence for the source trade diversion term, which is negative and statistically different from zero at least at the 5-percent level.

In order to provide a comparison with the results in the existing literature, the table also contains the estimates from the OLS regression with regional dummies and the PML estimates. Using the OLS figures from Table 3, the elasticity of trade on migration equals 0.179 for exports and 0.222 for imports, which is consistent with previous findings. For example, a static version of the model by Girma and Yu (2002) produces a 1.6 percent increase in UK exports and a 1 percent rise in UK imports from non-Commonwealth countries following a 10-percent increase in immigrant stock, Head and Ries (1998) find a 1-1.3 percent boost for Canadian bilateral exports and 3.1-3.9 percent for imports, and the study on U.S. exports by Herander and Saavedra (2005) reports 1.6 percent.

[TABLE 3 ABOUT HERE]

The potential endogeneity of the trade diversion terms seems to be of minor relevance. The trade diversion variables relate the *total* immigrant shares in host and source population to *bilateral* trade. If bilateral trade between countries i and j promotes international migration between the two economies, but not between the host or source country and other economies, its contribution to the total immigration shares would be most likely negligible.[13] Moreover, the mutual relationship between the immigration shares and bilateral trade should be positive, whereas the trade diversion terms establish a *negative* link. Hence, if anything, the endogeneity would underestimate the impact of trade diversion by immigrant networks.

7 Conclusion

The results from previous sectors indicate that the contribution of immigrant networks to trade seems to be non-negligible and might in some cases reach more than 20 percent of the host country's aggregate trade. The immigrant-driven welfare improvements will, however, tend to be lower, as the study finds some evidence in favor of negative spillovers to host and source countries' trade with other trade partners. While immigrant networks can mitigate some informal barriers to trade (e.g., the lack of information on foreign markets or ineffective contract enforcement institutions), the

[13] The shares in the host population for the largest source country i do not exceed 2.1 percent.

same networks' advantages coupled with the pervasive presence of informal trade barriers might lead to shifts in trade patterns. The mechanisms driving these negative trade spillovers, including the degree of sharing of immigrants' knowledge and enforcement mechanisms with the rest of the host country's population, provide a potentially fruitful area for future research.

More work also needs to be done in the search for valid instruments that could better capture potential endogeneity concerns relating to the immigrant network variables. Using the natural logarithm of immigrant stock as the instrumented variable, I find that immigrants facilitate trade even after controlling for potential endogeneity. The instruments borrowed from (McKenzie 2005), however, proved to be weak with respect to the alternative trade creation variable developed in Section 3.

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Table 1
Summary statistics

Variable	N	Mean	Standard deviation	Minimum	Maximum
Imports_{ij}(mln.1998 $)	2,089	528.09	4,387.42	0	125,753.77
Exports_{ij}(mln.1998 $)	2,088	376.61	2,736.64	0	94,501.85
Immigrant stock_{ij}	2,089	16,828.49	192,444.87	0	8,250,913
Trade creation_{ij}	2,089	0.027	0.057	0	0.491
Host diversion_j	2,089	0.060	0.115	0.001	0.777
Source diversion_i	2,089	0.079	0.042	0.007	0.160
Host GDP_j(bln.1998 $)	2,089	1,006.92	2,041.31	47.18	9,012.5
Source GDP_i(bln.1998 $)	2,089	52.95	107.95	0.186	1027.52
Host GDP/capita_j	2,089	22,319.71	7,057.48	10,305.64	36,044.56
Source GDP/capita_i	2,089	3,109.07	5,063.40	99.62	29,230.43
Distance_{ij}	2,089	6,888.21	3,864.18	216.87	19,158.67
Export share host_j	2,089	37.28	18.89	10.90	86.70
Export share source_i	2,089	34.71	22.04	5.60	124.50
Institutional quality host_j	2,089	76.63	5.85	66.76	87.52
Institutional quality source_i	2,006	50.22	12.92	23.88	81.08
Colony_{ij}	2,089	0.032	0.176	0	1
Language_{ij}	2,089	0.124	0.329	0	1
Border_{ij}	2,089	0.005	0.072	0	1

Table 2
Estimation results

Real exports 1999-2003			
	(1) OLS reg. dummies i and j	(2) PML (S&T 2006)	(3) 2-step est. (D&L 2007)
Trade creation$_{ij}$	4.041	4.619	2.662
	(0.447)***	(0.641)***	(0.403)***
Host diversion$_j$	-1.125	-0.981	0.309
	(0.719)	(1.371)	(3.43)
Source diversion$_i$	-0.274	-1.749	-0.298
	(0.242)	(0.805)**	(0.425)
R^2	0.856	0.937	0.961
N	2,006	2,006	2,087

Real imports 1999-2003			
	(4) OLS reg. dummies i and j	(5) PML (S&T 2006)	(6) 2-step est. (D&L 2007)
Trade creation$_{ij}$	4.549	3.657	2.636
	(0.746)***	(0.934)***	(0.683)***
Host diversion$_j$	1.427	0.825	0.41
	(1.199)	(1.375)	(4.751)
Source diversion$_i$	-0.064	-2.283	-0.154
	(0.41)	(1.181)*	(0.803)
R^2	0.748	0.929	0.894
N	2,001	2,006	2,082

Note. ***,**,* - Significant at 1%, 5%, and 10% respectively.

Table 3
Estimation results with ln(Immigrant stock)

Real exports 1999-2003			
	(1) OLS reg. dummies i and j	(2) PML (S&T 2006)	(3) 2SLS
Ln(Immigrant stock$_{ij}$)	0.179	0.218	0.204
	(0.014)***	(0.026)***	(0.072)***
Host diversion$_j$	-2.55	-2.36	-5.798
	(0.723)***	(1.335)*	(1.132)***
Source diversion$_i$	-0.389	-1.019	-0.652
	(0.238)	(0.633)	(0.292)**
R^2	0.862	0.943	0.893
N	2,006	2,006	1,125
2SLS Wald test for weak instruments:			36.322**
Endogeneity tests:			
	Durbin (score) chi2(1)		0.188
	Wu-Hausman F(1,1099)		0 .184
Real imports 1999-2003			
	(4) OLS reg. dummies i and j	(5) PML (S&T 2006)	(6) 2SLS
Ln(Immigrant stock$_{ij}$)	0.222	0.169	0.362
	(0.024)***	(0.034)***	(0.121)***
Host diversion$_j$	-0.428	-0.209	-2.487
	(1.213)	(1.443)	(1.917)
Source diversion$_i$	-0.224	-2.052	-2.12
	(0.406)	(1.188)*	(0.501)***
R^2	0.754	0.932	0.79
N	2,001	2,006	1,121
2SLS Wald test for weak instruments:			37.579**
Endogeneity tests:			
	Durbin (score) chi2(1)		0.381
	Wu-Hausman F(1,1095)		0.372

Note. ***,**,* - Significant at 1%, 5%, and 10% respectively.

Table A1

Exports and imports shares attributable to immigrant links (in %)

Country	Exports	Imports	Country	Exports	Imports
Australia	19.64	18.66	Burkina Faso	4.37	7.3
Austria	31.97	22.66	Burundi	11.76	15.85
Belgium	4.37	3.1	Cambodia	33.23	28.58
Canada	20.52	21.64	Cameroon	6.45	9.98
Denmark	5.25	3.56	Chad	4.61	7.72
Finland	0.69	0.58	Chile	2.54	3.2
France	4.59	3.46	China	12.5	11.45
Germany	2.51	2.06	Colombia	6.7	6.98
Greece	6.53	4.4	Congo	20.88	34.66
Ireland	3.35	3.2	Costa Rica	6.37	6.72
Italy	3.75	2.66	Cote d'Ivoire	5.55	9.33
Japan	4.39	3.74	Croatia	19.08	30.43
The Netherlands	8.56	5.43	Czech Rep.	12.7	18.6
New Zealand	19.09	19.43	Dem.Rp.Congo	12.86	19.12
Norway	5.02	3.97	Djibouti	13.58	23.46
Portugal	1.21	0.98	Dominican Rep.	34.36	37.37
Spain	6.73	3.68	Ecuador	26.05	32.62
Sweden	7.34	5.34	Egypt	2.71	3.37
Switzerland	10.32	7.2	El Salvador	11.48	9.7
UK	7.32	6.09	Eq.Guinea	0.95	1.27
USA	19.19	14.56	Ethiopia	14.52	17.27
			Fiji	26.98	29.14
Albania	18.24	19.72	Gabon	2.31	4.28
Algeria	2.89	4.18	Gambia	28.81	36.26
Angola	4.47	6.72	Georgia	3.82	3.97
Argentina	0.78	0.9	Ghana	29.66	35.21
Armenia	28.06	28.19	Guatemala	28.4	30.41
Azerbaijan	4.69	5.29	Guinea	6.97	10.07
Bahamas	10.91	12.85	Guinea-Bissau	8.9	13.84
Bahrain	1.07	1.35	Guyana	7.94	10.77
Bangladesh	5.31	5.84	Haiti	11.43	16.6
Barbados	43.09	47.37	Honduras	39.03	42.33
Belarus	3.39	3.53	Hungary	9.39	14.13
Belize	16.06	16.77	Iceland	3.77	6.88
Benin	7.42	12.84	India	4.06	3.83
Bolivia	7.87	8.15	Indonesia	1.75	2.13
Bosnia	29.45	33.14	Iran	4.9	5.41
Brazil	0.6	0.77	Israel	1.34	1.41
Bulgaria	10.42	13.65	Jordan	7.36	7.84

Table A1 continued

Exports and imports shares attributable to immigrant links (in %)

Country	Exports	Imports	Country	Exports	Imports
Kazakhstan	3.35	4.8	Slovenia	10.47	16.85
Kenya	13.04	17.48	South Africa	2.97	4.04
Korea	2.39	2.47	Sri Lanka	18.87	23.6
Kuwait	0.92	0.97	Sudan	4.07	4.9
Kyrgyzstan	6.25	8.39	Suriname	22.04	25.37
Laos	6.63	7.8	Syria	6.39	8.05
Lebanon	17.6	21.18	Tajikistan	4.34	4.82
Madagascar	2.63	4.1	Tanzania	8.6	10.44
Malawi	9.86	13.83	Thailand	1.91	2.09
Malaysia	2.24	2.76	Togo	20.34	30.35
Mali	28.22	45.93	Trinidad and Tbg	38.07	41.81
Malta	25.89	33.01	Tunisia	9.11	14.64
Mauritania	15.86	25.42	Turkey	4.88	7.66
Mauritius	22.69	33.46	Turkmenistan	1.04	1.36
Mexico	25.67	27.92	Uganda	16.63	22.38
Mongolia	3.42	3.83	Untd Arab Em.	0.21	0.24
Morocco	23.99	34.61	Uruguay	2.53	3.16
Mozambique	3.06	4.33	Uzbekistan	1.79	1.76
Nepal	3.79	4.21	Venezuela	1.6	1.94
Nicaragua	51.13	55.49	Vietnam	27.57	24.3
Niger	3.55	5.77	Yemen	3.81	4.31
Nigeria	5.45	6.33	Zambia	11.54	15.68
Oman	0.16	0.21	Zimbabwe	9.09	12.51
Pakistan	8.22	9.38			
Panama	15.94	17.8			
Papua N. Guin.	1.52	2.16			
Paraguay	2.42	2.44			
Peru	6.85	7.14			
Philippines	19.28	17.91			
Poland	6.71	8.21			
Romania	10.65	13.82			
Russia	1.66	1.67			
Rwanda	6.87	9.28			
Samoa	11.18	12.99			
Saudi Arabia	0.16	0.17			
Senegal	10.46	15.58			
Sierra Leone	34.64	39			
Slovak Rep.	10.99	15.64			

Table A2
Regression results, dependent variable real exports 1999-2003

	Real exports 1999-2003		
	(1) OLS reg. dummies i and j	(2) PML (S&T 2006)	(3) 2-step est. (D&L 2007)
Trade creation$_{ij}$	4.041	4.619	2.662
	(0.447)***	(0.641)***	(0.403)***
Host diversion$_j$	-1.125	-0.981	0.309
	(0.719)	(1.371)	(3.43)
Source diversion$_i$	-0.274	-1.749	-0.298
	(0.242)	(0.805)**	(0.425)
ln(Host GDP$_j$)	1.259	1.069	1.238
	(0.031)***	(0.05)***	(0.164)***
ln(Source GDP$_i$)	1.029	0.917	1.023
	(0.02)***	(0.032)***	(0.037)***
ln(Host GDP/cap$_j$)	-0.045	-0.086	-0.365
	(0.099)	(0.192)	(0.485)
ln(Source GDP/cap$_i$)	0.022	0.231	-0.02
	(0.039)	(0.074)***	(0.07)
ln(Distance$_{ij}$)	-0.965	-0.712	-1.186
	(0.047)***	(0.089)***	(0.051)***
HF Index Host$_j$	0.008	-0.01	0.022
	(0.006)	(0.007)	(0.029)
HF Index Source$_i$	0.011	0.001	0.011
	(0.002)***	(0.004)	(0.005)**
Openess Host$_j$	0.024	0.02	0.026
	(0.002)***	(0.003)***	(0.009)***
Openess Source$_i$	0.016	0.013	0.017
	(0.001)***	(0.002)***	(0.002)***
Colony$_{ij}$	0.296	0.002	0.699
	(0.142)**	(0.149)	(0.131)***
Language$_{ij}$	0.376	0.352	0.292
	(0.079)***	(0.133)***	(0.074)***
Border$_{ij}$	0.507	0.712	0.794
	(0.318)	(0.197)***	(0.277)***
Constant	-0.166	0.288	11.453
	(0.85)	(1.984)	(0.478)***
R^2	0.856	0.937	0.961
N	2,006	2,006	2,087

Note. ***,**,* - Significant at 1%, 5%, and 10% respectively.

Table A3
Regression results, dependent variable real imports 1999-2003

	Real imports 1999-2003		
	(4) OLS reg. dummies i and j	(5) PML (S&T 2006)	(6) 2-step est. (D&L 2007)
Trade creation$_{ij}$	4.549	3.657	2.636
	(0.746)***	(0.934)***	(0.683)***
Host diversion$_j$	1.427	0.825	0.41
	(1.199)	(1.375)	(4.751)
Source diversion$_i$	-0.064	-2.283	-0.154
	(0.41)	(1.181)*	(0.803)
ln(Host GDP$_j$)	1.513	1.241	1.49
	(0.052)***	(0.068)***	(0.19)***
ln(Source GDP$_i$)	1.25	0.957	1.253
	(0.033)***	(0.045)***	(0.069)***
ln(Host GDP/cap$_j$)	-1.542	-0.87	-1.464
	(0.165)***	(0.191)***	(0.663)**
ln(Source GDP/cap$_i$)	-0.059	0.221	-0.113
	(0.066)	(0.115)*	(0.129)
ln(Distance$_{ij}$)	-0.716	-0.577	-1.076
	(0.078)***	(0.121)***	(0.086)***
HF Index Host$_j$	-0.004	0.008	-0.007
	(0.01)	(0.007)	(0.039)
HF Index Source$_i$	0.017	-0.015	0.017
	(0.004)***	(0.005)***	(0.008)**
Openess Host$_j$	0.025	0.025	0.026
	(0.003)***	(0.004)***	(0.01)***
Openess Source$_i$	0.024	0.016	0.027
	(0.002)***	(0.003)***	(0.005)***
Colony$_{ij}$	0.121	0.016	0.546
	(0.236)	(0.17)	(0.222)**
Language$_{ij}$	0.142	0.193	0.239
	(0.132)	(0.158)	(0.125)*
Border$_{ij}$	1.096	0.794	0.87
	(0.53)**	(0.353)**	(0.468)*
Constant	10.132	4.902	6.525
	(1.416)***	(2.524)*	(0.953)***
R^2	0.748	0.929	0.894
N	2,001	2,006	2,082

Note. ***,**,* - Significant at 1%, 5%, and 10% respectively.