Migration, Knowledge Diffusion and the Comparative Advantage of Nations*

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Abstract

To what extent are migrants a source of evolution of the comparative advantage of both their sending and receiving countries? We study the drivers of knowledge diffusion by looking at the dynamics of the export basket of countries. The main finding is that migration, and particularly skilled immigration, is a strong and robust driver of productive knowledge diffusion. In terms of their ability to induce exports, we find that a twofold increase of the migration stock, which amounts to 65,000 people for the average country, is associated with a 60% increase in the likelihood of adding a new product to a country's export basket in the next ten year period. We also find that, in terms of expanding the export basket of countries, a migrant is worth about US $90,000 of foreign direct investment. For skilled migrants these same figures are, on average, about 20,000 people and US $250,000. Our identification strategy is based on instrumenting for migration stocks using estimates from a gravity model based on bilateral exogenous geographic, cultural and historic variables, inspired by Frankel and Romer (1999).

1 Introduction

Franschhoek valley, a small town in the Western Cape province of South Africa, is known today for its beautiful scenery and for its high-quality wineries. The town was founded in the late 17th century by French Huguenot refugees, who settled there after being expelled from France following King Louis XIV elimination of the Edict of Nantes. As of today, the wineries in Franschhoek are among the main producers of South African wine exports. Is this story part of a much larger pattern that can be identified in the data?[1] In this paper we explore the role of migrants in developing the comparative advantage of both their sending and receiving countries.

Ricardian models of trade usually assume as given the exogenous productivity parameters that define the export basket of countries which are generated in equilibrium. A large part of the literature has focused on understanding the characteristics of this equilibrium and the mechanisms through which it is conceived (e.g. Eaton and Kortum 2002, Costinot et. al. 2011). However, a burgeoning literature deals with understanding the evolution of these productivity parameters, and consequently, of the actual export baskets of countries (e.g. Hausmann and Klinger 2007; Hausmann et. al. 2014). This paper contributes to this literature by documenting industry-specific productivity shifts as explained by the variation in international factors movement with particular focus on migration. We study productivity by exploiting changes in the export baskets of countries. The key assumption is that, after controlling for product-specific global demand, firms in a country will be able to export a good only after they have become productive enough to compete in global markets (see Bahar et. al. 2014). Of all international factors flows, the results point to migration as the strongest of those drivers. We find that migrants, and even more so, skilled immigrants, can explain variation in good-specific productivity as measured by the ability of countries to export those goods, for products that are intensively exported in the migrants' home/destination countries. In particular we find that, on average, a twofold increase in the stock of migrants, which amounts to about 65,000 people for the average country, is associated with a 60% increase in the likelihood of exporting a new product. The same figure for skilled migrants is reduced to about 20,000 people, on average. Also, in terms of expanding the export basket of countries, a migrant is worth over US $90,000 of

[1] Hornung (2014) studies the Huguenot migration to Prussia and its effect on local productivity with historical data.

foreign direct investment (FDI), while a skilled migrant is worth over $250,000.

By focusing on industry-specific productivity dynamics, this paper contributes to previous literature that focuses on the link between international factor flows and changes in *aggregate* productivity (e.g. Coe and Helpman 1993; Coe et. al. 2009; Aitken and Harrison 1999, Javorcik 2004, Andersen and Dalgaard 2011).

In addition, another contribution of this work is that it focuses on migration, while at the same time controlling for other factor flows such as trade and FDI. The focus on migrants relates to tacit knowledge as a main input for productivity increases (knowledge, either through learning or experience, allows economic agents to do more with the same resources). Bahar et. al. (2014) suggest that the appearance of new industries in the export basket of countries can be partly explained by the local character of knowledge diffusion. That is, productivity inducing knowledge follows a highly geographically localized diffusion pattern, which is attributed to its "tacitness" (e.g. Jaffe, Trajtenberg and Henderson 1993; Bottazi and Peri 2003; Keller 2002; Keller 2004). Therefore, as suggested by Kenneth Arrow (1969), the transmission of this tacit or non-codifiable knowledge relies on human minds rather than on written words. Thus, if tacit knowledge can induce sector-specific productivity as measured by exports, then migrants, who are naturally carriers of tacit knowledge, would shape the comparative advantage of their sending and/or receiving countries. This is precisely what this paper documents.

To do this, we undertake an empirical exercise that looks at how migration figures correlate with a country's extensive and intensive margin of trade. We use new appearances of products in a country's export basket to measure the extensive margin, while the intensive margin refers to the future annual growth rate of a product that is already exported by a country. For this purpose we put together different publicly available data sources that include data on bilateral trade, FDI and migration stock figures. From it, we construct a sample that includes for each country, product and year total exports to the rest of the world. The sample also includes total stocks of trade, FDI and migration (disaggregated in immigrants and emigrants) to or from partner countries.

The empirical analysis takes into consideration a number of other alternative explanations, unrelated to knowledge transmission channels, on how migration could be associated to good-specific productivity increases.

First, even if our focus is on migrants, omitted variable bias could arise if we exclude other correlated flows such as FDI and trade that could be driving the results through channels others than the diffusion of tacit knowledge. Therefore, all of our specifications control for all international factor flows.

Second, if a given country c receives migrants from countries exporters of a given product p, then there could be a local shift in demand for product p, given the plausible shift in aggregate preferences. This could result in a shift in local preferences, that could be simultaneously occurring in all other countries that also received the same type of migrants. This shift in preferences could result in a shift of global demand, which could be supplied by exports from the countries under consideration to the rest of the world.[2] To rule out this possible explanation, we control for global demand of each good by adding product-year fixed effects. We also add country-year fixed effects which would control for all country level time variant characteristics that would make a given country more likely to export and receive migrants at the same time.

Third, migrant networks could generate lower transaction costs for bilateral trade in specific goods, thus inducing bilateral exports between the sending and receiving country of the migrants (i.e. Gould 1996; Rauch and Trindade 2012; Kugler and Rapoport 2007; Aubry et. al. 2012). Therefore, in order to deal with this possibility, we calculate all the specifications using an alteration of the dependent variable, which measures exports to the rest of the world *excluding* flows to countries where migrants are in or from. In this case, the increase in exports cannot be explained by its bilateral component.

Fourth, the changes in the extensive and the intensive margin are explained by an unobserved historical trend that results in new or more exports of particular goods, independently of where migrants come from or go to. To rule out this possibility, we perform a "placebo" test, in which we find that the increases in exports *cannot* be explained in countries that receive or send migrants to other countries that *do not* export such product.

Finally, even after including these controls, endogeneity concerns remain. For instance, migrants can decide to relocate to countries with an ex-ante understanding of the industries that will flourish in that other location. To deal with all endogeneity concerns, we use the instrument for migration stocks using estimates from a bilateral gravity model based on geographic, cultural and historic bilateral variables between the sending and receiving countries of the migrants, following Frankel and Romer (1999). To improve the fit between the estimated and actual values we estimate the gravity model using a poisson

[2]Linder (1961) suggests, in this case, country c will become a trade partner of the home countries of the migrants.

pseudo maximum likelihood estimator. The instruments provide an exogenous variation to the number of migrants in and from partner countries. Furthermore, for this methodology, we use the reconstructed dependent variable which *excludes* exports to countries where migrants are in or from, thus reducing all left endogeneity concerns.

The body of the paper discusses in detail all the data collection, the empirical strategies and present all the results with their correspondent explanation. The paper is divided as follows: the next section describes the data and the construction of the sample. Section 3 details the empirical strategy and the specifications to be estimated. Section 4 presents the main results, and Section 5 discusses them. Section 6 concludes.

2 Data and Sample

Bilateral migration data comes from Docquier et. al. (2010). The dataset consists of total bilateral working age (25 to 65 years old) foreign born individuals in 1990 and 2000. The data provide figures for skilled and non-skilled migrants at the bilateral level as well. Skilled migrants are considered to have completed some tertiary education at the time of the census. Figures 1 and 2 represent the migration data in year 2000.

[Figure 1 about here.]

[Figure 2 about here.]

Bilateral FDI stocks (positions) are from the OECD International Direct Investment Statistics (2012). It tracks FDI from and to OECD members since 1985 until 2009. Using this data we compute 10-year stocks of capital flows for each country in 1990 and 2000[3]. Negative FDI stocks are treated as zero[4].

Bilateral trade data comes from Hausmann et. al. 2011, based on the UN Comtrade data from 1984 to 2010. The dataset uses the 4-digit Standard Industry Trade Classification (SITC) to classify products. Thus, the list of products is fairly disaggregated. For instance, products in this classification are "Knitted/Crocheted Fabrics Elastic Or Rubberized" (SITC code 6553), or "Electrical Measuring, Checking, Analyzing Instruments" (SITC code 8748).

[3]For 1990 we use the stock from 1985 to 1990 due to limitations of the data.

[4]This follows the same methodology suggested by Aubry et. al. (2012). Only 1.7% of the original dataset is affected by this.

The words product, good and industry interchangeably referring to the same concept throughout the paper. We use this trade dataset to construct two variables: first, total exports per product per country to the rest of the world, to be used to compute the dependent variable in the empirical specifications; and second, we also compute 10-year stocks for bilateral trade (imports plus exports) to be used as an independent variable. Both the 10-year Trade and FDI stocks are deflated using the US GDP deflator (base year 2000) from the World Development Indicators (WDI) by the World Bank. Other information at the country level is also taken from the WDI.

Finally, we also incorporate variables from the GeoDist dataset (Mayer and Zignago 2011) from CEPII on bilateral relationships such as distance, common colonizer, colony-colonizer relationship, and common language, to construct the instrumental variables. We also include data from The World Religion Dataset for the same purpose (Zeev and Henderson, 2014).

The final sample consists of 135 countries and 781 products.[5] We define two 10-year periods for the analysis due to the limitations imposed by the bilateral migration data, which are 1990-2000 and 2000-2010.

The summary statistics for the variables to be used in the analysis are in Table 1. Panel A presents the summary statistics for the extensive margin sample (i.e. for all observations of c, p and t for which $RCA_{c,p,t} = 0$), while Panel B does it for the intensive margin sample (i.e. for all observations of c, p and t for which $exports_{c,p,t} > 0$).

[Table 1 about here.]

From Panel A we see that the unconditional probability of achieving an RCA above 1 (starting with an RCA below 0.1 at the beginning of the period) for the average country-product is 1.6%. Similarly, from Panel B , the average country-product exports CAGR is about 4.8% in the data. The tables also include the sum of immigrants and emigrants for the average country and year from and in countries exporting a product with RCA above 1. It presents the same statistics for aggregated FDI and trade figures in million USD, after the deflation process explained above. Note that FDI and trade variables total inwards and outwards stock figures.

[5] Following Bahar et. al. (2014), we exclude Former Soviet Union countries from the sample given their poor trade data in the period 1990-2000, as well as small countries with population below 1 million.

3 Empirical Strategy

3.1 Research Question and Empirical Challenges

The empirical strategy studies the relationship between international factor flows and the dynamics in the export basket of the receiving and sending countries, with emphasis on migration. In particular, the question is: can migrants induce product-specific productivity shifts in their sending (destination) countries, on products already intensively exported in their destination (sending) countries?

For the sake of better understanding, we use the following hypothetical example. Suppose there are two countries in the world: Italy (a pizza exporter), and the US (a hamburger exporter). The analogous question then becomes whether the presence of more Italians in the US is associated with the ability of the US to export pizza, and, whether this same presence is also associated with the ability of Italians to export hamburgers.

There are a number of empirical challenges in studying the relationship between productivity and international factor flows. First, all flows are highly correlated among themselves. Moreover, several empirical studies have shown that migration networks are an important determinant of bilateral trade flows and bilateral FDI.[6]

Hence, the positive correlation between international flows of capital, goods and labor is a matter of consideration to any study of this kind. In fact, in the sample for year 2000, the correlation matrices between total migration, FDI and trade across countries are all positive, and above 0.4, with the exception of migration and FDI per capita (see Tables 2 and 3). That is, countries that receive/send more FDI tend to also receive/send more migrants and export/import in larger quantities. Hence, to deal with this challenge, the empirical specification controls for all three factors simultaneously.

[Table 2 about here.]

[Table 3 about here.]

Second, we are interested exclusively in productivity shifts and not on demand-driven exports. The nature of our dataset allow us to achieve this by introducing

[6]e.g. Gould, 1994; Rauch and Trindade, 2002; Combes, Lafourcade and Mayer, 2005; Iranzo and Peri 2009; Felbermayr and Jung, 2009; Tong, 2005; Kugler and Rapoport, 2007; Javorcik et. al. 2011; Aubry et. al. (2012)

product-by-year and country-by-year fixed effects.[7] This allow us to rule out explanations such as global demand for that particular good (driven by shifts in preferences due to the arrival of migrants), or that results are driven by a third, uncontrolled for, variable such as an openness shock, could induce migration and induce exports at the same time.

In addition, we are also interested in disentangling between an increase of exports due to lower transaction costs induced by migrant networks[8] and exports due to purely productivity increases. Since we are exclusively interested in the latter, we exclude from our dependent variable exports to the countries where migrants are in or from.

We also want to rule out the possibility that our results are driven by unobservable trends that are unrelated to migration. To deal with this, we run placebo tests that use in the right hand side migrants coming from and going to countries that *do not* export the product under consideration. If migrants are an essential part of the dynamics we document, we would expect no results from the placebo test.

Finally, our most important empirical challenge is to rule out all other sources of endogeneity which we are unable to control for. For instance, migrants could relocate themselves based with ex-ante knowledge on future potential of specific sectors of growing. Thus, in order to further reduce these concerns, we implement an instrumental variable approach based on Frankel and Romer (1999). In particular, we construct estimated migration stocks using a gravity model based on bilateral geographic, cultural and historic characteristics between the sending and receiving countries of these migrants. The estimated figures are used to instrument for actual migration stocks.

Having estimated migration stocks using variables such as distance, same region, sharing borders, common colonizer, colony-colonizer relationship, common language and same religion, among others, we create figures that are exogenous to the ability of a country to export a particular good to the rest of the world.[9] Using this exogenous variation we instrument for the actual migration stocks and find that our results hold.

[7]That implies a fixed effect for each combination of product and year, as well as for each combination of country and year.

[8]Evidence suggests that migrant networks can lower transaction costs for bilateral trade (i.e. Gould 1996; Rauch and Trindade 2012; Kugler and Rapoport 2007; Aubry et. al. 2012).

[9]Country-by-year fixed effects in the specification would deal with concerns that countries with particular languages or cultures, for instance, are more likely to gain comparative advantage in particular goods.

3.2 Empirical Specification

The aim of the paper is to study the dynamics of the extensive and intensive margin of trade (with exports to the rest of the world) given different levels of migration stocks, controlling for FDI and trade stocks. The specification also disentangles between immigration and emigration, and between unskilled and skilled migrants.

Throughout the paper we will use the concept of Revealed Comparative Advantage (RCA) by Balassa (1965), which will be used to construct export-related variables both in the left-hand-side and right-hand-side of the specification. RCA is defined as follows:

$$RCA_{c,p} \equiv \frac{exp_{c,p} \big/ \sum_p exp_{c,p}}{\sum_c exp_{c,p} \big/ \sum_c \sum_p exp_{c,p}}$$

where $exp_{c,p}$ is the exported value of product p by country c. This is a yearly measure.

For example, in the year 2000, soybeans represented 4% of Brazil's exports, but accounted only for 0.2% of total world trade. Hence, Brazil's RCA in soybeans for that year was $RCA_{Brazil,Soybeans} = 4/0.2 = 20$, indicating that soybeans are 20 times more prevalent in Brazil's export basket than in that of the world.

The empirical specification is defined as follows:

$$\begin{aligned} Y_{c,p,t\to T} &= \beta_{im} \sum_{c'} immigrants_{c,c',t} \times R_{c',p,t} + \beta_{em} \sum_{c'} emigrants_{c,c',t} \times R_{c',p,t} \\ &+ \beta_{FDI} \sum_{c'} FDI_{c,c',t} \times R_{c',p,t} + \beta_{trade} \sum_{c'} trade_{c,c',t} \times R_{c',p,t} \\ &+ \gamma Controls_{c,p,t} + \alpha_{c,t} + \eta_{p,t} + \varepsilon_{c,p,t} \end{aligned} \tag{1}$$

The definition of the dependent, or left hand side (LHS) variable, $Y_{c,p,t\to T}$, alternates according to whether the specification is studying the intensive or the extensive margin of trade for a specific product p and country c. When studying the *extensive* margin, $Y_{c,p,t\to T}$ is 1 if country c achieved an RCA of 1 or more in product p in the period of time between t and T (conditional on having an $RCA_{c,p,t} = 0$). That is:

$$Y_{c,p,t\to T} = 1 \text{ if } RCA_{c,p,t} = 0 \text{ and } RCA_{c,p,T} \geq 1$$

To avoid noise on the dependent variable, we restrict $Y_{c,p,t\rightarrow T} = 1$ to two additional conditions: first, the country-product under consideration must keep an RCA value above 1 for five years after the end of the period, year T; and second, the country-product under consideration must have had an RCA value equal to 0 during all five years before the beginning of the period, year t.

When studying the *intensive margin*, $Y_{c,p,t\rightarrow T}$ is the annual compound average growth rate (CAGR) in the exports value of product p, between years t and T, conditional on having $exports_{c,p,t} > 0$.[10] That is:

$$Y_{c,p,t\rightarrow T} = \left(\frac{exports_{c,p,T}}{exports_{c,p,t}}\right)^{1/T-t} - 1 \text{ if } exports_{c,p,t} > 0$$

The independent variables include the following:

- The sum of the stock of immigrants and of emigrants from and to other countries (denoted by c') at time t, weighted by a dummy $R_{c,',p,t}$ which is 1 if $RCA_{c',p,t} \geq 1$. In this sense, for each country c and product p, we include in the right hand side the total of immigrants from and emigrants in countries that export product p with an RCA above 1, at the beginning of the period.

- The sum of stock of FDI and stock of trade using the same weighting structure as above.

- Product-by-year fixed effects to allow for a different constant for each combination of year and product. This will control for global demand for the product in that period of time. Thus, all dynamics in exports after this control are supply-induced and therefore can be attributed to productivity shifts.

- Country-by-year fixed effects to control for all the country level time variant characteristics that correlate with both national migration determinants and aggregate productivity levels; such as income, size, institutions, etc.

- A vector of controls of baseline variables when estimating the intensive margin equations: the baseline level of exports for that same product;

[10] Appendix A.1 presents robustness tests that use log-growth as the dependent variable, where $Y_{c,p,t\rightarrow T} = \frac{ln(exports_{c,p,T})-ln(exports_{c,p,t})}{T-t}$

and the compound average growth rate (CAGR) of the export value in the previous period, in order to control for the previous growth trend.[11]

- A binary variable indicating whether $exports_{c,p,t-1} = 0$ (see footnote 11).

All level variables (migration, FDI, trade, export and RCA levels) are transformed using the inverse hyperbolic sine (see MacKinnon and Magee, 1990). This linear monotonic transformation behaves similar to a log-transformation, except for the fact that it is defined at zero. The interpretation of regression estimators in the from of the inverse hyperbolic sine is similar to the interpretation of a log-transformed variable.[12] Results are robust to using a regular log-transformation.

4 Results

4.1 Ordinary Least Squares

Table 4 presents the OLS estimation for Specification (1). The upper panel estimates the extensive margin (measured by the likelihood of adding a new product to a country's export basket) while the lower panel estimates the intensive margin (measured by the annual growth in exports of a product already in the country's export basket). It is important to notice that the dependent variables in both panels are computed using exports from country c to product p to *the world*. The columns titled "All" indicate that the migration figures include both skilled and unskilled, whereas the columns titled "Unskilled" and "Skilled" includes only unskilled and skilled migration figures as independent variables, respectively.

Note that, as explained above, the migration, FDI and trade independent variables correspond to a sum over all partner countries c' weighted by the

[11]The CAGR during 1985-1990 for the 1990-2000 period, and 1990-2000 for the 2000-2010 period. In order to correct for undefined growth rates caused by zeros in the denominator, we compute the CAGR following the above equation using $exports_{c,p,t} + 1$ for all observations. Note that when studying the intensive margin the CAGR of export value in the dependent variable will always be defined, given that we limit the sample only to products which are being exported at the beginning of the period (that is, $exports_{c,p,t} > 0$). However, the CAGR in the previous period included as a control may have an undefined growth rate; therefore, to control for our own correction, we also add as an additional control a binary variable indicating whether $exports_{c,p,t-1} = 0$ (at the beginning of the previous period, i.e. 1985 or 1990), which correspond to the observations most likely to be distorted.

[12]The inverse hyperbolic sine ($asinh$) is defined as $log(y_i + \sqrt{(y_i^2 + 1)})$. Except for small values of y, $asinh(y_i) = log(2) + log(y_i)$. The results in this paper are robust to using a regular log-transformation (after the proper correction to allow for zero values).

binary variable $R_{c,',p,t}$ which is 1 if $RCA_{c',p,t} \geq 1$. That is, the dependent variables vary at the country, year and product level.

The upper panel of Table 4 uses country-product pairs which had zero exports in the baseline years (1990 and 2000), which corresponds to 83,100 observations (thus, baseline variables are not included because lack of variation).

[Table 4 about here.]

The results in column 1 of Panel A indicate that a country with 10% increase in its stock of total migrants –immigrants from plus emigrants to nations exporters of product p– is associated with an increase from 1.6% to 1.81% in the unconditional probability of exporting product p with an RCA above 1 in the next ten years. This corresponds to a 1.3% increase. This means, based on the average country figure in the sample, that about 65,000 more migrants from and in countries exporters of p is associated with an increase in the likelihood of exporting p of 13%.

Column 2 shows a slightly smaller coefficient for unskilled migration while Column 4 shows a slightly larger one. Note also the mean and standard deviation values for skilled migrants in the sample is considerably lower (see Table 1). Thus, the estimator in Column 4 indicates that a twofold increase in the stock of skilled migrants (about 15,000 individuals on average) from and to countries exporters of p is associated with approximately a 15% increase in the likelihood of adding p to a country's export basket.

The trade regressor has a negative estimated coefficient across all specifications. This intuitively means that a country is less likely to start exporting product p the more it trades with countries that export p. This makes sense, given that countries will tend to trade with other countries that have a complementary export basket.

The estimators for the FDI variable are positive though without statistical significance. However, the results suggest that, in terms of their ability of expanding a country's export basket, an unskilled migrant is worth USD \$16,519.46 of FDI (p-value=0.061), while a skilled migrant is worth USD \$82,352.52 (p-value =0.127, thus not significant), using the estimators from Table 4.[13]

Columns 3 and 5 disentangle between immigration and emigration. The above documented partial correlations hold for both across the sending and

[13]To compute this calculate $\frac{\beta_M}{\beta_{FDI}} \frac{\overline{FDI}}{\overline{Migrants}}$; where β_M is the estimator for migration in columns 1 or 3 and β_{FDI} is the estimator for FDI in columns 1 or 3. $\overline{FDI}$ and $\overline{Migrants}$ are the mean values of FDI and Migrants from Table 1.

receiving countries of the migrants. The larger estimated coefficient in skilled migration seems to be driven by skilled immigration, when comparing columns 3 to 5.

Panel B of Table 4 uses a product-level CAGR for a 10-year period as the dependent variable, in order to study the intensive margin of trade. The number of observations is different than the sample used for Panel A because we are using all country-product-year combinations with export value above zero in the baseline year. The results present evidence that both the presence of immigrants from and of emigrants in countries exporters of product p, is associated with a larger future rate of growth in export value of product p in the country under consideration. In particular, looking at Column 1 suggests that, for a given product p, a 10% increase in the stock of (total) migrants from and to countries exporting such product is associated with an increase in the future annual growth rate in export value for the receiving country of about 0.084 annual points. The coefficient for skilled migration in column 4 implies that a 10% increase in the stock of skilled migrants to and from countries exporters of p, is associated with an increase of 0.026 points in the CAGR for the next ten years, though it lacks statistical significance. This lack of significance seems to be driven by the poor explanatory power of skilled emigration which, judging by column 5, drives down the overall value of the coefficient reported in column 4. Interestingly, skilled immigration seems to correlate positively with CAGR with a higher coefficient by over 20% than unskilled immigration. In Section 5 we look into this issue and find that, in fact, the coefficient for unskilled emigration is also not robust to different cuts of the data, as opposed to immigration figures. In light of this, less can be said about emigrants, both skilled and unskilled, in explaining the documented productivity dynamics.

An interesting implication of the results is that FDI and trade figures seem not to correlate positively with the ability of countries to expand their the export baskets under the studied context. That is, trading with countries which are exporters of a particular product is not associated with the likelihood of gaining comparative advantage in that same product. However, when it comes to the intensive margin of trade (panel B), trading with countries that export a given product seem to positively correlate with the future annual growth of export value of such product. Precedents of this result tracks to Coe and Helpman (1995), where they find evidence on how trade leads to increases in aggregate productivity.

All the specifications presented above include product-by-year fixed effects and country-by-year fixed effects. The former set of fixed effects would control for global demand for all products. Given that we are looking at exports to the rest of the world, the shifts we identify must be related to the supply side. The country-by-year fixed effects would control for time variant countries' characteristics, such as country-level aggregate demand and supply shocks, which would rule out that the results are driven by a third factor that positively correlates with both migrant figures and overall productivity within countries.

4.2 Bilateral transaction costs and placebo test

A valid concern would be that the partial correlations we are observing are being driven by bilateral trade: the country is exporting more of the product to those countries where the migrants are from or in. This relates to the evidence presented by Gould (1994) and Aubry et. al. (2012), who find that migrants facilitate the creation of business networks which induces bilateral trade and capital flows. Under this possibility, it would be harder to attribute the results to a gain in productivity, but to a decrease in bilateral trade or transaction costs. In order to deal with this we estimate again the same specification, but we exclude from the dependent variable all exports to countries where migrants are in or from. That is, we reconstruct the dataset such that the export value to the rest of the world for each product and country combination, excludes exports to nations that send or receive that same country's migrants.

A critical caveat is that the exclusion requires defining a threshold on the number of migrants in or from the partner countries. If one migrant is enough to activate this rule, we will probably clean all world trade given that it is very rare not to have one alien citizen of every country in most developed nations, which generate the largest share of world trade. In this sense, we define a number of arbitrary thresholds which are 500, 1000, 2500 or 5000 migrants. For example, let's suppose we are looking at Canadian exports of television sets to the rest of the world in year 1990. We will exclude from that figure exports of TV sets from Canada to countries that (1) have a number X of Canadians migrants and (2) a number Y of their citizens are migrants in Canada, as long as X+Y is larger than 500, 1000, 2500 and 5000. The assumption is that an effective business network that can reduce bilateral transaction costs require more than 500, 1000, 2500 or 5000 migrants among the two countries.

In fact, Figure 3 shows the magnitude of the reduction of total trade figures after revising the exports figures as explained above. For instance, with the 500 threshold world trade figures are reduced by about 92.5%; while using the 5000 threshold reduces total trade figures by about 83%.

[Figure 3 about here.]

Nevertheless, despite the strong decline in the variation of the dependent variable, the results show consistent patterns with the previous results. For instance, Table 5 shows results using the 500 threshold (the most conservative one).

[Table 5 about here.]

Excluding bilateral trade amounts from the dependent variable allow us to rule out lower bilateral transaction costs as driving the results shown above. Moreover, all migration related estimators have positive and statistical significance when doing this exercise, as shown in Table 5 (besides skilled emigration in the intensive margin panel). For Panel A, the estimates are similar in magnitude to those in Table 4. For instance, according to column 1, a country with 10% increase in its stock of total migrants is associated with an increase of about 1.3% in the likelihood the receiving country will export product p with an RCA above 1 in the next ten years.[14] In the case of skilled migration, an increase of 10% in the stock of migrants in and from countries exporting p, is associated with an increase of 1.5% in the likelihood of the sending and/or receiving country to add p to its export basket.

The estimators in Panel B of Table 5 are larger in magnitude that those in Table 4. For instance, according to column 1, a 10% increase in the stock of migrants is associated with an increase of 0.24 points in the CAGR for the next ten years. When looking at skilled migration a 10% increase in the stock of migrants is associated with an increase in the CAGR of 0.09 points. This coefficient is statistically significant, as opposed to the analogous one in Table 4. However, we still see lack of significance for skilled emigration figure, what seems to lower the estimator for overall migration as compared to the unskilled figures. As mentioned above, Section 5 discusses this result in detail, and show that emigration figures are usually not robust to most cuts in the data, regardless of their skill level.

As an additional test, we present results of a "placebo test", in order to lower the concerns that the results are generated uncontrolled for trends in the

[14] In this case, as specified in Table 1, we use 1.5 as the unconditional probability of adding a new product as the baseline value for this calculation.

data. Thus, we replicate Specification (1), but this time the weighting parameter $R_{c',p,t} = 1$ if $RCA_{c',p,t} = 0$. That is, we exploit variation in the migrants in and from countries that are not exporters of product p, to understand how does that correlate with the ability of the sending/receiving country of those migrants to export good p in the future.

In practical terms, we are testing whether we see an average effect in the data of countries becoming better at products even when there are no migrants in or from other countries that do such product. Why? Because if the estimators for the migration variables are reduced in value, this will imply that the results of the previous section are not driven by the fact that those countries were already in a trend to add the products to their export basket, or increase their export value. The results are presented in Table 6.

[Table 6 about here.]

The upper panel of Table 6 shows that the estimators for migration figures across all specifications and disaggregations become statistically insignificant and often negative, as opposed to the results of the previous section. That is, when countries receive migrants from or send migrants to other nations that *do not* export a product at the beginning of the period, the likelihood of gaining comparative advantage on such product is unaffected or even lower. We see a similar pattern in the lower panel of the same table, where nations exporters of p with migrants from or to countries that *do not* export p, tend to experience a lower export value growth rate for p in the next ten years.

Therefore, based on the evidence of this section, we claim our results are not driven by bilateral migrant networks nor explained by an unobservable increasing productivity trend unrelated to migrants.

Yet, there is still room for endogeneity concerns, which keeps us from concluding anything causal on the relationships we have found so far. The next subsection deals with this issue and attempts to solve the remaining concerns.

4.3 Endogeneity

The documented correlations may be partly driven by endogeneity: migrants relocate themselves following potential growth in particular sectors they are familiar with. In order to reduce endogeneity concerns, we employ an instrumental variable approach that will serve as exogenous variation to migration figures.

To do this we follow the methodology devised by Frankel and Romer (1999) and employ a gravity model to create our instruments. Our gravity model, though, aims to estimate bilateral migration stocks (as opposed to trade figures) based on bilateral characteristics of the sending and receiving countries of the migrants. Some examples of other studies that use a gravity model to instrument for migration stocks are Felbemayr et. al. (2010), Ortega and Peri (2011) and Alesina et. al. (2013).

Biases arising in the estimation for gravity models are a matter of concern in the literature. In the trade literature, in particular, this concern has been approached Santos Silva and Tenreyro (2006), who suggest the application of a pseudo-poisson maximum likelihood estimator (PPML), given its better performance relative to linear models.[15] Additionally, Helpman et. al. (2008) estimate a trade gravity model in an heterogenous firms setting using a Heckman (1979) selection model, which allows them to estimate zero bilateral trade and asymmetric flows.

Taking this into account we first we estimate a gravity equation following the next specification:

$$migrants_{c,c',t} = \alpha + X_{c,c'} \times \beta_{c,c'} + \theta_c + \theta_{c'} + \gamma_t + v_{c,c',t} \qquad (2)$$

The left hand side, $migrants_{c,c',t}$, is the actual number of migrants in country c from country c' at time t. The vector $X_{c,c'}$ includes exogenous variables that are common to countries c and c': bilateral distance (in logs) as well as binary variables indicating border sharing, same geographic region, (former) colony-colonizer relationship, same colonizer and same language.[16] $X_{c,c'}$ also includes a continuos variable that measures the probability that two individuals in countries c and c' picked at random share the same religion beliefs.[17]

We also include receiving-country and sending-country fixed effects as multilateral resistance terms (Anderson and Van Wincoop, 2001; Bertoli and Fernández-Huertas Moraga 2013). It also includes year dummies, and in addition, includes interactions of the variables in $X_{c,c'}$ with these year dummies, to allow for differential effects of these exogenous variables in both periods of time. We purposely exclude GDP per capita terms for both receiving and sending countries in the

[15]The PPML estimator also solves the censoring problem generated by zeros in the data.
[16]This data comes from the GeoDist dataset (Mayer and Zignago 2011) from CEPII.
[17]This data was constructed using data from the Correlates of War Project at http://www.correlatesofwar.org (Zeev and Henderson, 2014).

equation to avoid further endogeneity concerns.[18].

Table 7 presents results using four different gravity models estimated with different methodologies: OLS in columns 1 and 2 (with the difference that the latter adds 1 to the left hand side before its log transformation), the Heckman (1979) selection model in column 3 and PPML in column 4.

Column 3 corresponds to the outcome of the second stage of the selection model. The exclusion variable for the first stage is the unemployment rate in the receiving country at the beginning of the period. The choice is based on the fact that the decision whether to migrate is partly explained by the ability of the migrant to find a job in the destination country. Therefore, following the intuition presented by Helpman et. al. (2008), one can argue that a higher unemployment rate is likely to result in a higher (fixed) search cost for employment. Thus, we believe this variable complies with the proper exclusion restriction.

[Table 7 about here.]

It can be seen how, as noted by Santos Silva and Tenreyro (2006), the non-linear estimators result are very different than the OLS ones. Among all results, however, we see some constant patterns. First, distance between the sending and receiving countries negatively correlate with migration stock figures. Other variables that positively correlate with migration stocks are sharing a border, being in the same region, having a current or former colony-colonizer relationship, having a common colonizer, speaking a common language and sharing the same religion beliefs with a higher likelihood. We can also see that there are no statistical differences between these relationships in years 1990 or 2000, as evidenced by the interacted variables, besides for common continent and region, which seems to explain about 30% less in migration stocks in year 2000.

Across all models we choose the PPML as our preferred one to construct the instruments, given that it points to have unbiased estimates and provides the best fit (R-squared of 0.80). Nevertheless, robustness tests using instruments generated by the Heckman selection model are presented in the Appendix Section A.2.

We use the same PPML model to estimate both total, unskilled and skilled migration stocks. The results for such estimation are presented in Table 8.

[18]The results, however, are robust to their inclusion.

[Table 8 about here.]

Column 1 of Table 8 presents the estimation of the gravity model for total migration stocks (thus, it replicates the same results as column 4 of Table 7). Column 2 replicates the gravity model using a PPML estimation for unskilled migration as the dependent variable and column 3 does so for skilled migration figures. Interesting results arise when comparing both estimations. First, the geographic components of the gravity model (distance, region and border) are reduced significantly when estimating skilled migration stocks. That is, geography is a less elastic determinant to skilled individuals when they choose where to migrate. Interestingly, cultural and institutional variables such as "Common Language", "Common Colonizer" and "Same Religion" positively correlates with skilled migration stocks with coefficients that are larger than in column 1 and 2; meaning that cultural variables seem to be a more elastic determinant of skilled migration. The variables are better explaining unskilled migration, with an R-squared of 0.82, as compared to the fit for skilled migration with an R-squared of 0.78. Overall, however, across all specifications all variables have the expected sign and a good fit.

After using this model to predict the expected migrant stock we reconstruct these variables to instrument for the actual migration stocks in the same weighted structured detailed in Section 3.2. That is, for each combination of country c, product p and year t, we compute the total sum of expected immigrants from and expected emigrants to all other countries that export p with an RCA above 1. We also estimate figures for skilled and unskilled migration. Thus, there will be always the same amount of instruments than of endogenous regressors. This construction provides variance at the country, product and year level.

The relevance of the instruments is fully testable. For intuition purposes, Figures 4 and 5 present the analogous of a first stage in a 2SLS regression, using South Africa and the United States as examples.[19] In both the figures each observation is a product labeled with its SITC 4-digit code, and the scales use the hyperbolic inverse sine transformation

For instance, Figure 4 uses only data from South Africa in 1990. The vertical axis measures the total migration stock (immigrants plus emigrants) for South Africa in year 2000, while the horizontal axis measures the *estimated* migration

[19]The IV regression pools across all countries and periods in the sample. This figure limits the observation to a country and a period only for the sake of a better understanding.

stock computed with the PPML gravity model. Each observation in the figure matches the actual total migrants stock vs. the estimated total migrant stocks from and in countries that export each product with an RCA above 1. It can be seen in the figure that there is an obvious positive correlation between the actual values and the expected ones based on the gravity model after the weighting procedure.

[Figure 4 about here.]

Similarly, Figure 5 shows different panels for immigrants and emigrants for the United States in Year 1990. The left panel shows, for each product, the actual vs. estimated total amount of immigrants from countries that export such product with an RCA above 1; while the right panel does so for emigrants.

[Figure 5 about here.]

For the instruments to be valid, the exclusion restriction must be that, *product specific* exports to the *whole world* are not correlated with common bilateral geographic, cultural or historical ties with its migrants' countries, once we control for country-year fixed effect. While it is a valid argument that the geographic position of the country, its particular language or culture, could be a source of comparative advantage for particular products; our country-by-year fixed effects would account for these concerns.

Furthermore, we assume that countries do not engage in *product specific* export-inducing agreements based on their cultural or historical ties, which are not captured via flows such as FDI or trade.

To avoid all possible remaining concerns on endogeneity, for all instrumental variable regressions, we exclude all exports to countries where there are over 500 combined immigrants and emigrants when constructing the dependent variables (see subsection 4.2).[20] Thus by excluding bilateral trade, which could be partly explained by the exogenous variables that we use to estimate migration stocks, we also eliminate the possibility that our instrument is correlated with the dependent variable through other, uncontrolled for, variables.

Since often the specification includes $n > 1$ endogenous regressors, we rely on Stock and Yogo (2002) to define whether the instruments are weak and use the Kleibergen-Paap F statistic. For the case of one endogenous regressor and one instrument the critical Kleibergen-Paap F value is 16.78, but for the case of two

[20] Appendix Section A.4 presents robust results with other less conservative thresholds.

endogenous and two instruments the critical value is 7.03. A Kleibergen-Paap F statistic above the critical value implies that in a 5% Wald test the coefficient of interest is not size-distorted over 10%. The Kleibergen-Paap F statistic will be reported in all regressions.

Results using the instrumental variables (estimated through GMM) are presented in Table 9.

[Table 9 about here.]

First, note that in all specifications the Kleibergen-Paap F statistics shows evidence of a strong instrument in all columns. Panel A, similarly to previous tables, presents results for the extensive margin while Panel B presents results for the intensive margin.

With regards to the extensive margin, note that the estimated coefficients are larger in magnitude by a factor of four or more than in Table 5, which present the OLS results. This is consistent with Frankel and Romer (1999) results who also find larger coefficients after their instrumentation. In particular, the results suggest that, for a given country, a 10% increase in the stock of migrants from and to countries that export a particular product translates into an increase of 0.08 percentage points, or about 6%, in the likelihood of such country adding that product to its export basket in the next ten year period, on average.[21] This corresponds to about 6,500 migrants for the average country.

In the case of skilled migration in Column 4, an increase of 10% in the stock of migrants, or for the average country about only 1,500 skilled migrants (from and to countries exporters of product p), translates into an increase of 0.068 percentage points, or 4.5%, in the likelihood of the country under consideration adding that product to its export basket in the next ten year period, on average.

Thus, for the average country, 65,000 more migrants from and to other nations exporters of p results on about a 60% increase in the likelihood of adding p to its export basket; while the same number for skilled migration is reduced to slightly over 20,000 individuals, on average.

Columns 2 and 3 uses unskilled migration figures as regressors. We find that, while overall unskilled migration seems to have a higher estimated coefficient than skilled migration, seems that this is driven by the fact that, consistently with previous results, we find no statistically significant effect of skilled emigration on the dependent variable. The estimator for skilled immigration, on

[21]Note from Table 1 that the unconditional probability of adding a new product is 1.5% when excluding exports to countries where migrants are in or from.

the other hand, is almost twice of that for unskilled immigration. It can be claimed that skilled immigration is driving an important part of the effect in the estimations.

Similarly to the OLS estimation, the coefficients for the FDI variable are positive though without statistical significance. However, a non-linear combination of the estimators reveal that with these new results, an unskilled migrant is worth about USD $90,000 of FDI (p-value = 0.027) and a skilled migrant is worth about $250,000 of FDI (p-value=0.025), when it comes to their ability to induce a new export for the average country.[22]

Panel B shows also results in which the coefficients are much larger than in the OLS regression of Table 5. A 10% increase in the stock of migrants from and to countries exporters of p translates into a higher average growth for such product by 0.51 points per annum in a ten year period, while the same number for skilled migrants is 0.15. Note that column 5 reveals, consistently with the upper panel, that most of the skilled migrants effect is driven by immigrants, and in this case the coefficient for skilled immigration is about 30% higher than for unskilled immigration in column 3.

If the exclusion restrictions presented before are valid, and the results cannot be attributed to a third uncontrolled for variable, then these results are particularly strong and a solid contribution to the literature. The presence of migrants from or in nations that export a particular good induce a productivity shift in the sending and receiving country of the migrants, which results in the diversification of their export baskets.[23]

5 Discussion and Interpretation

The results in the previous section show through a variety of ways that migration, in both directions, is a determinant of the evolution of the comparative advantage of nations. What stands behind such claim?

[22]To compute this calculate $\frac{\beta_M}{\beta_{FDI}} \frac{\overline{FDI}}{\overline{Migrants}}$; where β_M is the estimator for migration in columns 1 or 3 and β_{FDI} is the estimator for FDI in columns 1 or 3. $\overline{FDI}$ and $\overline{Migrants}$ are the mean values of FDI and Migrants from Table 1.

[23]In the Appendix there are robustness tests to these results, which include using a Heckman-based gravity model to construct the instruments (Appendix Section A.2); using Hausmann and Klingler (2007) density variable as a control (Appendix Section A.3) and varying the thresholds used to clean the left hand side from bilateral trade (Appendix Section A.4). It also presents results that uses $RCA_{c',p,t} = 2$ to weight the right hand side variables (Appendix Section A8).

If knowledge is tacit, and thus it requires human interaction for its transmission and diffusion, then we could expect that migrants are a driver of such process, which results in increased productivity of the particular sectors that are especially productive in the sending and receiving countries of the migrants. The results are consistent with such hypothesis.

In particular, the results using the instrumental variable approach are suggestive of immigrants as the main source of this effect. The mechanisms are clear: immigrants are physically present in their receiving country, and thus they interact with the local population in ways that could lead to the diffusion of knowledge in the receiving country. This knowledge translate into productivity shifts in industries typical of the home country of the migrant, and is able to shape the export basket of the receiving country. These new exports, though, are not going to the migrants' home country; but rather to the rest of the world.

We are unable to find robust evidence that emigration plays a role in these dynamics.[24] In most of our regressions skilled emigration figures were statistically insignificant, as opposed to unskilled emigration regressors. In order to study these phenomenon of the data in more detail, we reestimate Table 9 across different periods and types of products. We do this to understand whether there are differential effects across any of these dimensions and which sets of observations in the sample are driving the observed overall results.

This time, we standardize the immigrants and emigrants figures to have zero mean and unit standard deviation, to be able to compare them properly. That is, the reported beta coefficients are standardized. Table 10 summarizes this exercise.

[Table 10 about here.]

The left panel of Table 10 reports estimators of β_{im} (immigration) while the right panel reports the estimators for β_{em} (emigration) based on specification (1), focusing on the extensive margin (thus, observations are limited to having an initial RCA equal to zero). In particular, the re-estimation uses on the

[24] However, it could theoretically still be a relevant channel. Knowledge diffusion could happen through return migration or through links and open communication between the emigrants and their co-nationals back home. With regards to the first channel, estimates show that about 30% of emigrants return to their home countries after some period of time (e.g. Borjas and Bratsberg, 1996). These migrants spend enough time in the foreign country to be part of the labor force, which eventually could lead to generate industry-specific productivity shifts back home. More recently, Choudhury (2014) shows how Indian return migrants induce productivity improvements in their firm back home, after spending time in the multinational corporation headquarters abroad.

right hand side figures for both unskilled migrants (estimators reported under $\beta^{Unskilled}$) and skilled migrants (estimators reported under $\beta^{Skilled}$).

The first row uses all 83,100 observations (the same sample presented in the upper panel of Table 1). $\beta_{im}^{Unskilled}$ is estimated to be 0.014 while $\beta_{im}^{Skilled}$ is estimated to be 0.020. Both estimates are statistically significant. This actually means that one standard deviation above the mean for (un)skilled immigration translates into an increase of (0.014) 0.020 percentage points in the probability of exporting product p in the next ten year period. The table also reports that the estimator for skilled immigration is 1.44 times that of unskilled immigration.[25]

As the table reports, the effects for immigration documented are present in both developed (OECD) and developing (non-OECD) countries, as well as during different time periods. Across almost all cuts of the sample the estimated coefficient for skilled immigration is larger than the one for unskilled immigration (though not always statistically significant).

Alternatively, we find that the results for emigration are not robust to the standardization of the right hand side variables (i.e. in the first row) or to using different cuts of the dataset. This could explain the fact that in all previous tables, the figures for emigration were seldom statistically significant. Thus, we limit of concluding anything on emigration in particular.

Back to immigration on the left panel, the table also divides the sample into ten product groups based on the first digit SITC code. Note that in industries that are more knowledge intensive, such as Machinery and Transport Equipment, the ratio of the skilled vs. unskilled immigration coefficient estimators is higher.

We also present results dividing the sample in goods above and below the median in terms of their capital intensity, using the measures by Shirotori (2010) . The results hold for all goods in the capital intensity scale, ruling out the results being driven by the forces suggested by Rybczynski (1955). In particular, skilled immigration has a similar effect on both non-capital and capital intensive goods.

Finally, we also divide the sample into differentiated goods and homogenous/reference-priced goods, using Rauch's (1999) definition.[26] The results suggest that the effect is present among both categories. This provides further evidence that migrant networks (by generating markets for differentiated products) are not

[25] In the cases when one of the estimator is negative the ratio is not reported. In all the cases where the estimators are negative, they also lack statistical significance.

[26] In particular, we use the "conservative" definition.

explaining our results.

In general, we see that the documented effect is robust to many different types of products. While the magnituted of the effect might vary with the knowledge intensity or other characteristics of the good, migrants can still play a role in the export of "easier-to-produce" goods. Why? Because when exporting a good, one not only needs to be able to produce it efficiently, but also firms need industry-specific knowledge to efficiently perform post-production processes fundamental to exports such as packaging, managing inventory, distributing to airports or seaports with the proper transportation and many other activities that directly affect productivity, and consequently, export levels. In this sense, our evidence suggests that migrants play an important role in improving productivity in the overall sequence of export activities for all industries.

6 Concluding Remarks

This paper presents evidence suggesting that migrants are a source of evolution for the comparative advantage of nations; a relationship that has not been documented in the literature thus far. The results contribute to the growing literature that aims to explain the evolution of industry-specific productivity of countries, and to the literature of international trade that aims to understand, in a Ricardian framework, dynamics of the comparative advantage of nations. It also contributes to the literature of international knowledge diffusion by studying the possible drivers of knowledge across borders, using the setting suggested by Bahar et. al. 2014, which uses product-level exports figures as a measure of knowledge acquisition, after controlling for global demand.

The main result in all these settings is that people, serving as international drivers of productive-knowledge, can shape the comparative advantage of nations. In all of the specifications we include controls for a set of variables that leave us with empirical evidence suggestive that this is the mechanism in place. The instrumental variables approach also reduces possible remaining endogeneity concerns.

This finding is particularly important to understand some known characteristics of knowledge diffusion. First, the short-ranged character of knowledge diffusion can be explained by the fact that part of knowledge is embedded in people, that tend to move in a more localized manner than goods or capital. Second, the fact that diffusion of knowledge and technology is more widespread today than decades ago (i.e. the diffusion process has accelerated over time) can be explained by the fact that people flows, such as migration or short term travel, have also increased rapidly.

All in all, we should expect industry-specific knowledge diffusion to be existent through channels other than migration in which people are at the center of the story: short-term travel, internet interactions, etc. The study of these channels and the exact mechanisms are part of our future research agenda.

The importance of these results, however, go beyond the pure relationship between migration and productivity. It serves to understand the ways and means through which knowledge diffuses around the globe. After all, the limitations of knowledge diffusion stand at the center of the discussion on convergence, productivity and even inequality. As Thomas Piketty (2014) in his book "Capital in the Twenty-First Century" puts it "*knowledge and skill diffusion is the key of the overall productivity growth as well as the reduction of inequality both within and between countries.*"

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Figure 1: Cartogram Share of Migrants, Year 2000

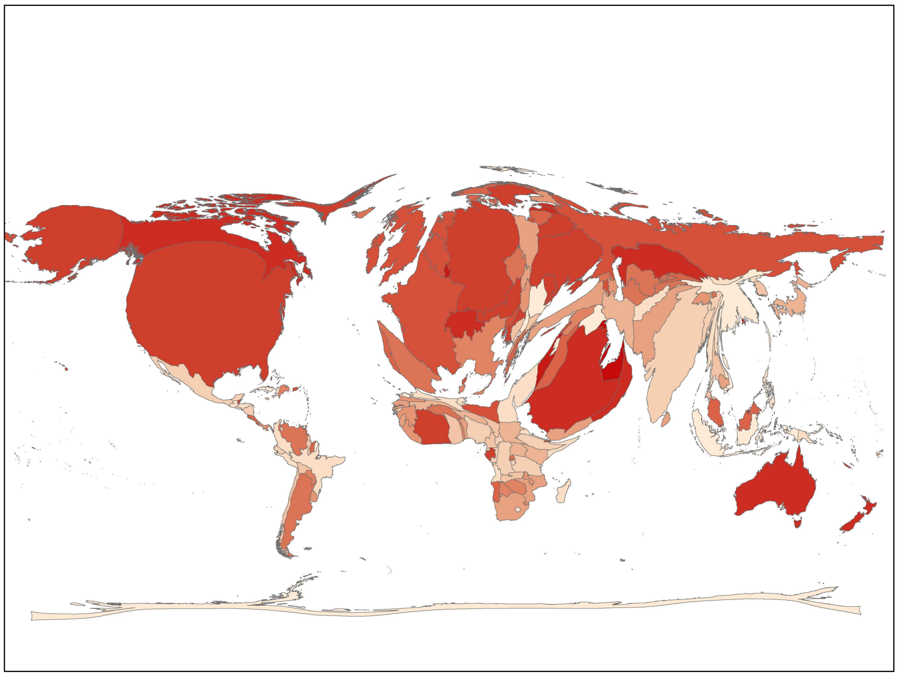

Figure 2: Cartogram of Migrants Per Capita, Year 2000

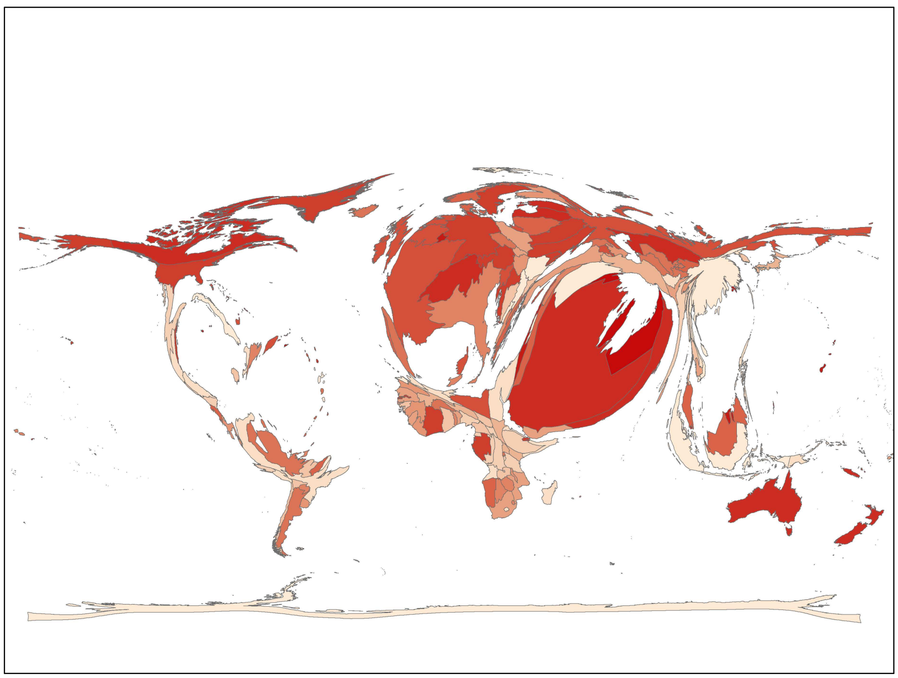

Figure 3: Proportion of World Trade Left

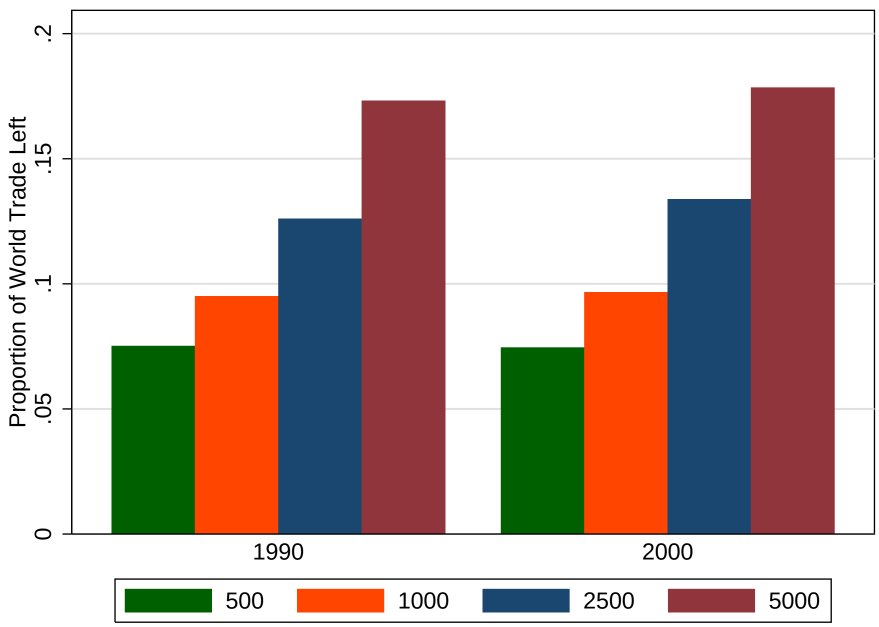

Figure 4: First stage, common language

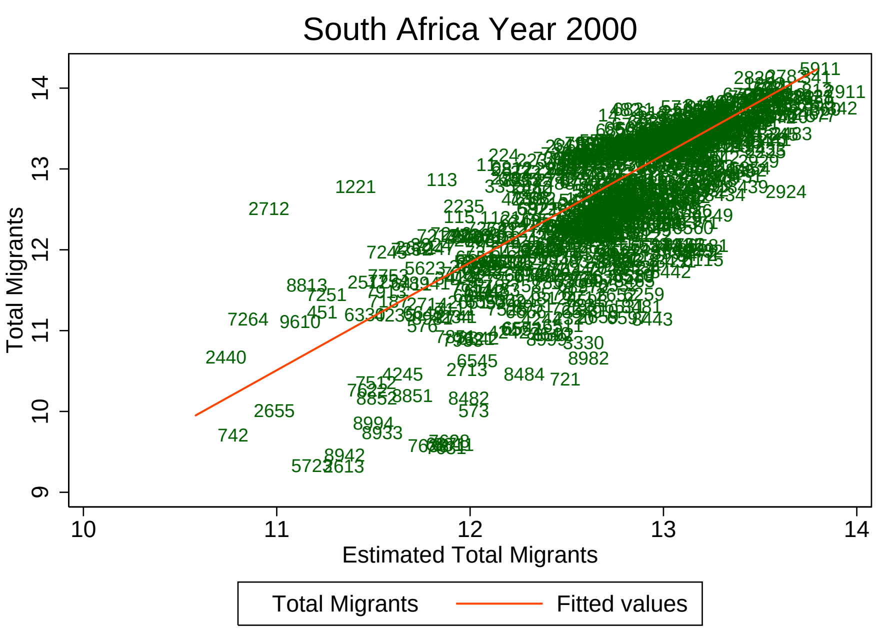

Figure 5: First stage, common language

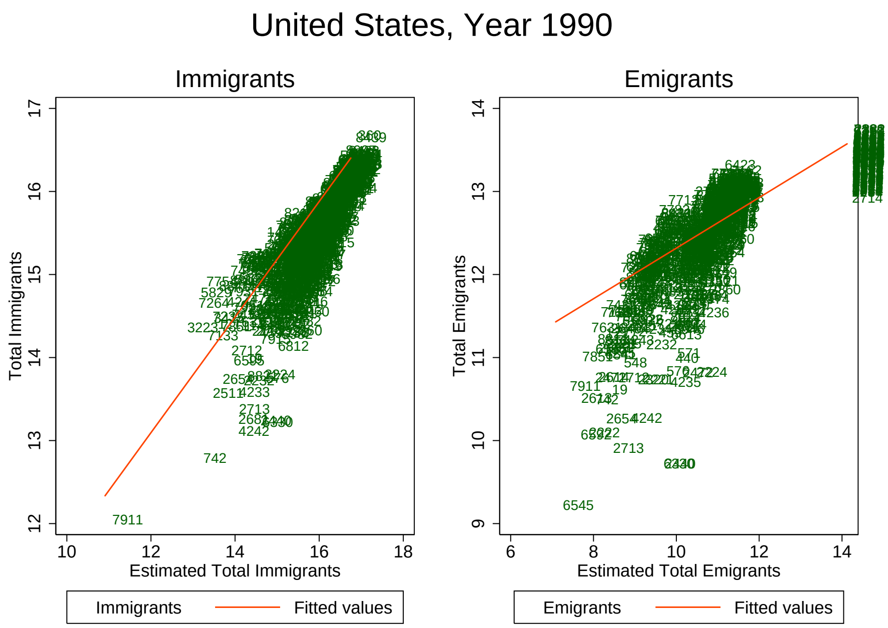

Table 1: Summary Statistics

Variable	**N**	**Mean**	**sd**	**Min**	**Max**
Panel A: Extensive Margin Sample ($RCA_{c,p,t} = 0$)					
New Product (RCA>1)	83,100	0.016	0.13	0.0	1.0
New Product (RCA>1, Exc. Bilateral)	83,100	0.015	0.12	0.0	1.0
Migrants, total	83,100	64,281.9	171,431.6	0.0	6,475,689.0
Immigrants	83,100	14,284.6	69,813.4	0.0	3,141,585.0
Emigrants	83,100	49,997.3	139,620.6	0.0	6,398,312.0
Migrants (Unskilled), total	83,100	49,549.0	146,947.0	0.0	5,519,892.0
Immigrants (Unskilled)	83,100	12,415.7	62,648.9	0.0	3,128,850.0
Emigrants (Unskilled)	83,100	37,133.3	116,694.3	0.0	5,473,783.0
Migrants (Skilled), total	83,100	14,732.9	39,517.1	0.0	1,100,395.0
Immigrants (Skilled)	83,100	1,869.0	9,728.5	0.0	441,937.0
Emigrants (Skilled)	83,100	12,864.0	37,028.3	0.0	1,078,071.0
FDI (total, mn USD)	83,100	508.1	15,174.1	0.0	2,239,724.0
Trade (total, mn USD)	83,100	9,542.2	33,089.9	0.0	3,043,429.2
Panel B: Intensive Margin Sample ($exports_{c,p,t} > 0$)					
Growth Exports	127,770	0.048	0.30	-0.9	4.4
Growth Exports (Exc. Bilateral)	127,770	0.291	0.75	-0.8	6.8
Baseline Exports	127,770	13.951	3.73	0.9	25.4
Migrants, total	127,770	362,313.4	766,143.4	0.0	16,381,010.0
Immigrants	127,770	171,004.1	585,556.2	0.0	16,196,984.0
Emigrants	127,770	191,309.4	447,325.1	0.0	6,467,568.0
Migrants (Unskilled), total	127,770	257,023.6	551,693.8	0.0	10,635,011.0
Immigrants (Unskilled)	127,770	121,784.9	393,248.4	0.0	10,529,596.0
Emigrants (Unskilled)	127,770	135,238.7	362,121.0	0.0	5,522,274.0
Migrants (Skilled), total	127,770	105,289.8	268,256.5	0.0	5,798,469.0
Immigrants (Skilled)	127,770	49,219.2	221,873.6	0.0	5,667,388.0
Emigrants (Skilled)	127,770	56,070.6	120,796.6	0.0	1,466,219.0
FDI (total, mn USD)	127,770	128,033.7	577,972.5	0.0	11,705,466.0
Trade (total, mn USD)	127,770	248,415.3	608,942.6	0.0	9,570,523.0

Table 2: Correlation Matrix International Flows (log)

Variables	Migrants (asinh)	FDI (asinh)	Trade (asinh)
Migrants (asinh)	1.000		
FDI (asinh)	0.332	1.000	
Trade (asinh)	0.528	0.722	1.000

Table 3: Correlation Matrix International Flows (per capita)

Variables	Migrants PerCap	FDI PerCap	Trade PerCap
Migrants PerCap	1.000		
FDI PerCap	0.152	1.000	
Trade PerCap	0.409	0.539	1.000

Table 4: Ordinary Least Squares

Panel A: Extensive Margin					
	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0021	0.0020		0.0024	
	(0.001)***	(0.001)***		(0.001)***	
Immigrants			0.0007		0.0013
			(0.000)***		(0.000)***
Emigrants			0.0019		0.0018
			(0.001)***		(0.001)**
Total FDI	0.0010	0.0010	0.0010	0.0010	0.0009
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0064	-0.0064	-0.0069	-0.0066	-0.0072
	(0.003)*	(0.003)*	(0.003)**	(0.003)**	(0.003)**
N	83100	83100	83100	83100	83100
r2	0.15	0.15	0.15	0.15	0.15
Panel B: Intensive Margin					
	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0084	0.0084		0.0026	
	(0.002)***	(0.001)***		(0.002)	
Immigrants			0.0045		0.0057
			(0.001)***		(0.001)***
Emigrants			0.0076		0.0011
			(0.001)***		(0.002)
Total FDI	-0.0005	-0.0005	-0.0006	-0.0004	-0.0005
	(0.000)*	(0.000)*	(0.000)**	(0.000)	(0.000)**
Total Trade	0.0114	0.0107	0.0050	0.0179	0.0115
	(0.004)**	(0.005)**	(0.004)	(0.004)***	(0.004)***
Baseline Exports	-0.0418	-0.0418	-0.0424	-0.0414	-0.0420
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Log-Growth	-0.0058	-0.0058	-0.0058	-0.0059	-0.0058
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Zero Exports in t-1	-0.0873	-0.0874	-0.0863	-0.0874	-0.0867
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
N	127770	127770	127770	127770	127770
r2	0.34	0.34	0.34	0.34	0.34

All specifications include country-by-year and product-by-year fixed effects. SE clustered at the country level presented in parenthesis

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table 5: OLS, excluding bilateral exports (500 migrants threshold)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0020	0.0020		0.0022	
	(0.001)***	(0.001)***		(0.001)***	
Immigrants			0.0006		0.0014
			(0.000)**		(0.000)***
Emigrants			0.0016		0.0012
			(0.001)***		(0.001)*
Total FDI	0.0010	0.0010	0.0010	0.0010	0.0010
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0070	-0.0070	-0.0073	-0.0070	-0.0076
	(0.004)*	(0.004)*	(0.004)**	(0.004)*	(0.004)**
N	83100	83100	83100	83100	83100
r2	0.12	0.12	0.12	0.12	0.12

Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0236	0.0238		0.0093	
	(0.004)***	(0.003)***		(0.003)***	
Immigrants			0.0110		0.0142
			(0.002)***		(0.002)***
Emigrants			0.0190		0.0052
			(0.003)***		(0.004)
Total FDI	-0.0013	-0.0013	-0.0015	-0.0011	-0.0015
	(0.001)***	(0.001)**	(0.001)***	(0.000)**	(0.001)***
Total Trade	0.0212	0.0192	0.0083	0.0378	0.0219
	(0.009)**	(0.009)**	(0.009)	(0.008)***	(0.009)***
Baseline Exports (Exc. Bilateral)	-0.0955	-0.0955	-0.0959	-0.0952	-0.0956
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0015	-0.0014	-0.0014	-0.0016	-0.0015
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1678	-0.1676	-0.1649	-0.1690	-0.1662
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.46	0.46	0.46	0.46	0.46

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people.

$^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 6: OLS, Placebo Test

Panel A: Extensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	-0.0009	-0.0009		-0.0006	
	(0.001)*	(0.001)		(0.000)*	
Immigrants			-0.0003		-0.0007
			(0.000)		(0.000)**
Emigrants			-0.0008		0.0003
			(0.000)**		(0.000)
Total FDI	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total Trade	0.0018	0.0018	0.0018	0.0017	0.0017
	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**
N	83100	83100	83100	83100	83100
r2	0.12	0.12	0.12	0.12	0.12

Panel B: Intensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	-0.0115	-0.0115		-0.0121	
	(0.002)***	(0.002)***		(0.002)***	
Immigrants			-0.0055		-0.0054
			(0.002)***		(0.002)***
Emigrants			-0.0087		-0.0080
			(0.001)***		(0.002)***
Total FDI	-0.0014	-0.0014	-0.0011	-0.0014	-0.0010
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0051	-0.0051	-0.0047	-0.0056	-0.0058
	(0.002)***	(0.002)***	(0.002)***	(0.001)***	(0.001)***
Baseline Exports (Exc. Bilateral)	-0.0949	-0.0949	-0.0949	-0.0948	-0.0949
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0020	-0.0020	-0.0020	-0.0020	-0.0019
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1676	-0.1676	-0.1670	-0.1673	-0.1673
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.46	0.46	0.46	0.46	0.46

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world. The migration independent variables sum all migrants from and in countries with no exports for product p

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table 7: Gravity Models Results

Dependent Variable: Bilateral Migrants Stocks				
	OLS ln(x)	OLS ln(x+1)	Heckman	PPML
Distance (log)	-0.8989	-0.8130	-0.3695	-0.7596
	(0.075)***	(0.076)***	(0.084)***	(0.117)***
Share Border	1.1262	3.4311	0.5031	1.3413
	(0.163)***	(0.293)***	(0.151)***	(0.240)***
Same Continent/Region	1.1199	1.0540	1.0946	1.0869
	(0.118)***	(0.115)***	(0.072)***	(0.194)***
Colony-Colonizer Relationship	1.8456	2.8853	0.4185	1.9555
	(0.212)***	(0.296)***	(0.250)*	(0.204)***
Common Colonizer	1.1260	0.7854	1.5246	1.0443
	(0.293)***	(0.147)***	(0.111)***	(0.260)***
Common Language	0.7468	0.4457	0.2954	0.7065
	(0.139)***	(0.106)***	(0.095)***	(0.157)***
Same Religion	0.6880	0.7406	0.3519	0.6692
	(0.349)*	(0.284)**	(0.161)**	(0.274)**
Distance (log) X Yr2000	-0.0112	-0.1318	-0.0185	-0.0078
	(0.057)	(0.044)***	(0.038)	(0.039)
Share Border X Yr2000	-0.0888	0.0473	-0.1027	-0.0559
	(0.094)	(0.134)	(0.153)	(0.126)
Same Continent/Region X Yr2000	-0.2379	-0.0194	-0.2297	-0.2853
	(0.091)***	(0.076)	(0.085)***	(0.086)***
Colony-Colonizer Relationship X Yr2000	-0.1544	0.1304	-0.1453	-0.3276
	(0.088)*	(0.103)	(0.184)	(0.084)***
Common Colonizer X Yr2000	-0.0085	-0.1089	0.0034	-0.1554
	(0.109)	(0.074)	(0.109)	(0.112)
Common Language X Yr2000	-0.0623	0.0740	-0.0845	0.1760
	(0.073)	(0.077)	(0.082)	(0.070)**
Same Religion X Yr2000	0.0534	-0.0997	0.0639	-0.2523
	(0.206)	(0.235)	(0.183)	(0.126)**
Constant	14.1277	8.6394	11.4382	11.5991
	(0.720)***	(0.741)***	(0.666)***	(0.898)***
N	12937	44700	44700	44104
r2	0.72	0.41	0.41	0.80

All specifications include sending country, receiving country and year fixed effects. All models use a log transformation for the dependend variable except for the PPML model, which uses untransformed levels. SE clustered at the receiving country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table 8: PPML Gravity Models Results

Dependent Variable: Bilateral Migrants Stocks			
	Total	Unskilled	Skilled
Distance (log)	-0.7596	-0.8610	-0.4079
	(0.117)***	(0.121)***	(0.100)***
Share Border	1.3413	1.3939	0.7979
	(0.240)***	(0.233)***	(0.241)***
Same Continent/Region	1.0869	1.1460	0.7876
	(0.194)***	(0.198)***	(0.190)***
Colony-Colonizer Relationship	1.9555	2.0536	1.8268
	(0.204)***	(0.222)***	(0.178)***
Common Colonizer	1.0443	0.9564	1.4494
	(0.260)***	(0.253)***	(0.354)***
Common Language	0.7065	0.6838	0.8950
	(0.157)***	(0.166)***	(0.147)***
Same Religion	0.6692	0.6213	0.9325
	(0.274)**	(0.294)**	(0.176)***
Distance (log) X Yr2000	-0.0078	-0.0175	-0.0284
	(0.039)	(0.039)	(0.067)
Share Border X Yr2000	-0.0559	-0.0237	-0.1060
	(0.126)	(0.125)	(0.189)
Same Continent/Region X Yr2000	-0.2853	-0.3015	-0.1630
	(0.086)***	(0.106)***	(0.070)**
Colony-Colonizer Relationship X Yr2000	-0.3276	-0.3671	-0.2329
	(0.084)***	(0.102)***	(0.074)***
Common Colonizer X Yr2000	-0.1554	-0.1052	-0.3257
	(0.112)	(0.116)	(0.151)**
Common Language X Yr2000	0.1760	0.1553	0.1609
	(0.070)**	(0.083)*	(0.043)***
Same Religion X Yr2000	-0.2523	-0.2322	-0.2962
	(0.126)**	(0.144)	(0.100)***
Constant	11.1263	11.7079	6.3518
	(0.958)***	(0.983)***	(0.778)***
N	44104	43808	42328
r2	0.80	0.82	0.78

All specifications include sending country, receiving country and year fixed effects. SE clustered at the receiving country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table 9: Instrumental Variables Estimation (GMM)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0084	0.0080		0.0068	
	(0.003)***	(0.003)***		(0.003)**	
Immigrants			0.0036		0.0063
			(0.001)***		(0.003)**
Emigrants			0.0047		0.0014
			(0.002)**		(0.001)
Total FDI	0.0009	0.0009	0.0008	0.0009	0.0007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0114	-0.0114	-0.0126	-0.0102	-0.0124
	(0.005)**	(0.005)**	(0.005)**	(0.005)**	(0.006)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.12	0.11
KP F Stat	341.22	311.28	80.45	331.18	55.21

Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0515	0.0527		0.0146	
	(0.007)***	(0.007)***		(0.007)*	
Immigrants			0.0357		0.0579
			(0.005)***		(0.008)***
Emigrants			0.0433		-0.0041
			(0.009)***		(0.009)
Total FDI	-0.0018	-0.0018	-0.0024	-0.0012	-0.0026
	(0.001)***	(0.001)***	(0.001)***	(0.001)**	(0.001)***
Total Trade	-0.0082	-0.0136	-0.0553	0.0331	-0.0296
	(0.012)	(0.012)	(0.014)***	(0.010)***	(0.014)**
Baseline Exports (Exc. Bilateral)	-0.0960	-0.0961	-0.0973	-0.0952	-0.0971
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0013	-0.0012	-0.0009	-0.0016	-0.0011
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1662	-0.1657	-0.1572	-0.1689	-0.1582
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.46	0.46	0.45	0.46	0.45
KP F Stat	254.97	284.80	49.82	249.51	55.36

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. The instrumental variables are based on the estimation of a gravity model using the PPML methodology. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table 10: Skilled vs. Unskilled Migration on the Extensive Margin

		Immigrants			**Emmigrants**		
	N	$\beta_{im}^{Unskilled}$	$\beta_{im}^{Skilled}$	Ratio	$\beta_{em}^{Unskilled}$	$\beta_{em}^{Skilled}$	Ratio
All Observations	83100	0.014***	0.020**	**1.44**	0.008	-0.002	**.**
Non OECD	79504	0.010***	0.011*	**1.06**	0.004	-0.000	**.**
OECD	3596	0.053***	0.217	**4.12**	0.058*	-0.188	**.**
Period 1990-2000	50143	0.017**	0.031**	**1.85**	0.017*	-0.003	**.**
Period 2000-2010	32957	0.007***	0.004	**0.52**	-0.002	-0.003	**.**
Animal and vegetable oils, fats & waxes	2600	-0.009	0.001	**.**	0.013	0.001	**0.05**
Beverages & tobacco	1153	0.016	0.024*	**1.48**	-0.006	-0.010	**.**
Chemical and related products, n.e.s.	11119	0.001	0.009	**13.54**	0.015	0.003	**0.21**
Commodities & transactions not classified	514	0.047*	0.038*	**0.82**	-0.030	-0.071	**.**
Crude materials, inedible, except fuels	13969	0.012***	0.013***	**1.09**	-0.001	-0.004	**.**
Food & live animals	10103	0.014***	0.015***	**1.08**	0.003	-0.005	**.**
Machinery & transport equipment	15126	0.015	0.029*	**1.92**	-0.001	-0.020	**.**
Manufactured goods classified by material	19979	0.022**	0.025**	**1.12**	-0.000	-0.005	**.**
Mineral fuels, lubricants & related materials	2470	0.022**	0.018	**0.82**	-0.014	-0.008	**.**
Miscellaneous manufactured articles	6067	0.026	0.030	**1.18**	0.015	0.011	**0.71**
Above Median Capital Intensity	30378	0.007	0.018*	**2.71**	0.012	-0.004	**.**
Below Median Capital Intensity	33778	0.015***	0.020***	**1.35**	0.002	-0.004	**.**
Differentiated Goods	37759	0.017**	0.021*	**1.29**	0.006	-0.002	**.**
Homogenous and Reference-Priced Goods	34653	0.011***	0.017***	**1.46**	0.006	-0.003	**.**

This table summarizes IV regressions for different cuts of the sample. The reported beta coefficients are standardized. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. Significance levels reported based on SE clustered at the country level.

A Appendix

A.1 Substituting CAGR with log-growth as the dependent variable

Throughout the paper, when studying the intensive margin, we define the dependent variable as the ten year CAGR for a given product, as defined in Section 3.2. Table A1 shows the results are robust to constructing the dependent variable using log-growth, such that:

$$Y_{c,p,t\to T} = \frac{ln(exports_{c,p,T}) - ln(exports_{c,p,t})}{T-t} \text{ if } exports_{c,p,t} > 0$$

[Table A1 about here.]

Note that the results of Table A1 estimates the instrumental variables model, and excludes from the constructed dependent variable all bilateral trade to the countries where migrants are in or from, whenever immigrants plus emigrants exceeds 500 people.

A.2 Instruments using Heckman's (1979) Selection model

Following Helpman et. al. (2008), we construct instruments that are based on a migration gravity equation that uses the Heckman selection model. The model uses the same structure discussed in Section 4.3. However, for the first stage of the selection model, we use the unemployment rate in the receiving country as our exclusion variable.

The use of this variable aims to capture the some fix cost of adaptation to a new country for the migrant. The assumption is that working age immigrants will be less likely to emigrate to a country with a higher unemployment rate given the difficulties they will face in finding a job. However, this variable proxies for a fix cost of entry to the job market, which is in the spirit of the exclusion variables used by Helpman et. al. (2008).

Table A2 presents results of the gravity model using the Heckman selection estimation.

[Table A2 about here.]

The table presents results for estimating both total and skilled migrants stock. The odd columns present the second stage of the selection model while the even columns present the first stage maximum likelihood estimators for the selection equation.

Notice first that the signs of the exclusion variable, the unemployment rate, is negative. This implies that the likelihood of migrating is lower when the unemployment rate is higher, as expected. Interestingly, the second-stage coefficients for both total and skilled migration are similar, as opposed to Table 8, where the estimates differ substantially in most variables. Nevertheless, in both specifications (all and skilled), we can see that the reported λ is statistically significant, implying that the inverse Mills ratio is statistically significant in the second stage.

We use these results to create an alternative instrument by computing the expected bilateral migration stocks and following the procedure described in Section 4.3. The results of the IV regressions using the Heckman-based instruments are presented in Table A3 and are similar in magnitude to those in Table 9 which uses instead as an instrument the expected migration stocks based on the PPML estimator.

[Table A3 about here.]

A.3 Including Hausmann and Klinger (2007) Density Variable

Table A4 presents results which include as control the "density" of the country in the product at the beginning of the period. The variable "density", which distributes between 0 and 1, was developed by Hausmann and Klinger (2006) and used in Hidalgo et. al. (2007). It measures the intensity with which a country exports products that are strongly co-exported by other countries who also export the product under consideration. In other words, the density of a product proxies for the existence of other exports that share similar technologies or inputs (as measured by their co-occurrence across countries). Density strongly affects the likelihood that a country adds the product to its export basket (Hausmann & Klinger, 2007; C. A. Hidalgo et al. 2007). We use density to control for the likelihood that a country would export a new good given the initial composition of its export basket.

[Table A4 about here.]

A.4 Excluding Bilateral Exports

To clear any doubt of endogeneity in our instrumental variables implementation, which estimates bilateral migration stocks through a gravity model, our dependent variable $Y_{c,p,t\to T}$ excludes all exports to countries when migrants are in or from. This methodology also allow us to rule out a story in which our results are driven by lower bilateral trade transaction costs induced by the presence of migrants, as Aubry et. al. (2012) suggest.

This constraint, as explained above, requires from us to define an arbitrary threshold on the amount of migrants above for which bilateral exports should be excluded from exports to the rest of the world to construct $Y_{c,p,t\to T}$. In the main body of the paper we choose to exclude all bilateral exports to countries for which there are over 500 combined immigrants and emigrants. This reduces world trade by about 93% (see Figure 3).

Tables A5 to A7 present results using as thresholds 1000, 2500 and 5000 migrants, to complement the result in the main body of the paper that uses the 500 threshold.

[Table A5 about here.]

[Table A6 about here.]

[Table A7 about here.]

A.5 Modifying Weights in Right Hand Side

Specification (1) suggests using $RCA_{c',p,t} = 1$ to define $R_{c',p,t}$, in order to produce weights for the sum of migration, trade and FDI figures. Table A8 presents results that use $RCA_{c',p,t} = 2$ for robustness purposes.

[Table A8 about here.]

Table A1: IV Estimation GMM (Intensive Margin Using Log-Growth)

Dependent Variable: 10 Year Average Log-Growth, Excluding Bilateral Trade					
	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0343	0.0351		0.0088	
	(0.006)***	(0.005)***		(0.006)	
Immigrants			0.0250		0.0408
			(0.003)***		(0.006)***
Emigrants			0.0305		-0.0021
			(0.007)***		(0.006)
Total FDI	-0.0011	-0.0011	-0.0016	-0.0008	-0.0018
	(0.000)***	(0.000)***	(0.000)***	(0.000)**	(0.001)***
Total Trade	-0.0020	-0.0056	-0.0370	0.0263	-0.0200
	(0.008)	(0.008)	(0.010)***	(0.007)***	(0.010)**
Baseline Exports (Exc. Bilateral)	-0.0638	-0.0639	-0.0648	-0.0633	-0.0646
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Previous Exports Growth (Exc. Bilateral)	-0.0106	-0.0105	-0.0103	-0.0108	-0.0104
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Zero Exports in t-1 (Exc. Bilateral)	-0.1204	-0.1201	-0.1139	-0.1222	-0.1146
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
N	127770	127770	127770	127770	127770
r2	0.49	0.49	0.49	0.49	0.48
KP F Stat	254.97	284.80	49.82	249.51	55.36

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A2: Heckman Selection Gravity Models Results

Dependent Variable: Bilateral Migrants Stocks	All		Unskilled		Skilled	
	2nd Stage	Select	2nd Stage	Select	2nd Stage	Select
Distance (log)	-0.3695	-0.4018	-0.4291	-0.4199	-0.0161	-0.3884
	(0.084)***	(0.010)***	(0.081)***	(0.010)***	(0.117)	(0.010)***
Share Border	0.5031	0.8462	0.7205	0.8338	0.1527	0.4426
	(0.151)***	(0.054)***	(0.141)***	(0.054)***	(0.159)	(0.047)***
Same Continent/Region	1.0946	-0.0075	1.0534	-0.0010	1.2299	-0.1224
	(0.072)***	(0.021)	(0.071)***	(0.021)	(0.082)***	(0.021)***
Colony-Colonizer Relationship	0.4185	1.4625	0.6587	1.4691	0.2302	1.1743
	(0.250)*	(0.070)***	(0.234)***	(0.069)***	(0.312)	(0.060)***
Common Colonizer	1.5246	-0.3143	1.4441	-0.3033	2.3109	-0.5117
	(0.111)***	(0.026)***	(0.108)***	(0.026)***	(0.180)***	(0.028)***
Common Language	0.2954	0.3287	0.3217	0.3283	0.3625	0.3154
	(0.095)***	(0.021)***	(0.092)***	(0.021)***	(0.117)***	(0.022)***
Same Religion	0.3519	0.2152	0.3792	0.2401	0.1039	0.2570
	(0.161)**	(0.047)***	(0.160)**	(0.047)***	(0.180)	(0.047)***
Distance (log) X Yr2000	-0.0185		-0.0465		-0.0507	
	(0.038)		(0.039)		(0.037)	
Share Border X Yr2000	-0.1027		-0.0834		-0.1186	
	(0.153)		(0.149)		(0.160)	
Same Continent/Region X Yr2000	-0.2297		-0.2231		-0.2306	
	(0.085)***		(0.086)***		(0.084)***	
Colony-Colonizer Relationship X Yr2000	-0.1453		-0.1087		-0.0641	
	(0.184)		(0.177)		(0.188)	
Common Colonizer X Yr2000	0.0034		0.0751		-0.1545	
	(0.109)		(0.111)		(0.114)	
Common Language X Yr2000	-0.0845		-0.1400		-0.1121	
	(0.082)		(0.083)*		(0.082)	
Same Religion X Yr2000	0.0639		0.0673		-0.0259	
	(0.183)		(0.184)		(0.181)	
Unemployment Rate		-0.0185		-0.0210		-0.0204
		(0.001)***		(0.001)***		(0.001)***
Constant	11.4382	3.0074	11.5652	3.1515	7.5288	2.8061
	(0.666)***	(0.092)***	(0.667)***	(0.093)***	(0.737)***	(0.093)***
N	44700		44700		44700	
λ	-2.05***		-1.72***		-2.48***	

Columns 1 and 3 include sending country, receiving country and year fixed effects. Columns 2 and 4 represent the Maximum Likelihood Estimator for the first stage of the Heckman selection model, which uses the unemployment rate in the destination country as the exclusion variable.
$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A3: IV Estimation GMM (Heckman-based Instruments)

Panel A: Extensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0092	0.0105		0.0138	
	(0.003)***	(0.003)***		(0.005)***	
Immigrants			0.0054		0.0059
			(0.002)***		(0.003)**
Emigrants			-0.0004		0.0035
			(0.003)		(0.003)
Total FDI	0.0009	0.0009	0.0008	0.0008	0.0007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0120	-0.0133	-0.0112	-0.0150	-0.0132
	(0.005)**	(0.006)**	(0.005)**	(0.007)**	(0.006)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.10	0.11
KP F Stat	173.45	104.13	19.44	102.59	23.01

Panel B: Intensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.1140	0.1034		0.1469	
	(0.015)***	(0.012)***		(0.023)***	
Immigrants			0.0331		0.0455
			(0.007)***		(0.010)***
Emigrants			0.0521		0.0701
			(0.015)***		(0.028)**
Total FDI	-0.0028	-0.0026	-0.0025	-0.0038	-0.0037
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Total Trade	-0.0742	-0.0709	-0.0618	-0.0855	-0.0803
	(0.019)***	(0.018)***	(0.015)***	(0.024)***	(0.022)***
Baseline Exports (Exc. Bilateral)	-0.0971	-0.0971	-0.0974	-0.0964	-0.0971
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0008	-0.0007	-0.0009	-0.0012	-0.0012
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1626	-0.1625	-0.1569	-0.1669	-0.1578
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.45	0.45	0.45	0.43	0.45
KP F Stat	61.92	74.92	21.84	34.66	15.93

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. The instrumental variables are based on the estimation of a gravity model using the Heckman selection model. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A4: IV Estimation GMM (Adding Density as a Control)

Panel A: Extensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0082	0.0078		0.0066	
	(0.003)***	(0.003)***		(0.003)**	
Immigrants			0.0033		0.0059
			(0.001)***		(0.002)**
Emigrants			0.0047		0.0015
			(0.002)**		(0.001)
Total FDI	0.0009	0.0009	0.0008	0.0009	0.0007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0111	-0.0111	-0.0121	-0.0099	-0.0119
	(0.005)**	(0.005)**	(0.005)**	(0.005)**	(0.006)**
Baseline Density	0.2865	0.2841	0.2284	0.2815	0.1946
	(0.114)**	(0.113)**	(0.104)**	(0.114)**	(0.087)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.12	0.11
KP F Stat	339.76	309.22	81.58	332.38	53.14

Panel B: Intensive Margin

	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0378	0.0392		0.0110	
	(0.007)***	(0.006)***		(0.007)*	
Immigrants			0.0204		0.0288
			(0.004)***		(0.006)***
Emigrants			0.0275		-0.0036
			(0.008)***		(0.008)
Total FDI	-0.0003	-0.0003	-0.0006	0.0002	-0.0005
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Total Trade	-0.0174	-0.0218	-0.0372	0.0125	-0.0126
	(0.011)*	(0.011)**	(0.011)***	(0.009)	(0.011)
Baseline Exports (Exc. Bilateral)	-0.1009	-0.1010	-0.1012	-0.1003	-0.1009
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	0.0027	0.0028	0.0026	0.0025	0.0025
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1598	-0.1595	-0.1554	-0.1618	-0.1570
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
Baseline Density	1.8841	1.8747	1.7542	1.8895	1.7788
	(0.188)***	(0.188)***	(0.183)***	(0.188)***	(0.188)***
N	127770	127770	127770	127770	127770
r2	0.47	0.47	0.47	0.47	0.47
KP F Stat	267.44	294.74	50.97	256.24	56.50

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. The instrumental variables are based on the estimation of a gravity model using the Heckman selection model. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A5: IV Estimation GMM (Max 1000 Migrants Threshold)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0084	0.0081		0.0067	
	(0.003)***	(0.003)***		(0.003)**	
Immigrants			0.0033		0.0061
			(0.001)***		(0.003)**
Emigrants			0.0052		0.0017
			(0.003)**		(0.001)
Total FDI	0.0008	0.0008	0.0007	0.0009	0.0006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0109	-0.0109	-0.0120	-0.0096	-0.0118
	(0.005)**	(0.005)**	(0.005)**	(0.005)**	(0.006)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.11	0.10
KP F Stat	341.22	311.28	80.45	331.18	55.21

Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0461	0.0476		0.0103	
	(0.007)***	(0.007)***		(0.007)	
Immigrants			0.0354		0.0566
			(0.005)***		(0.007)***
Emigrants			0.0370		-0.0112
			(0.009)***		(0.009)
Total FDI	-0.0018	-0.0018	-0.0024	-0.0013	-0.0025
	(0.000)***	(0.001)***	(0.001)***	(0.000)***	(0.001)***
Total Trade	-0.0021	-0.0074	-0.0470	0.0373	-0.0210
	(0.011)	(0.012)	(0.013)***	(0.009)***	(0.013)
Baseline Exports (Exc. Bilateral)	-0.0951	-0.0952	-0.0964	-0.0943	-0.0962
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0033	-0.0032	-0.0029	-0.0037	-0.0030
	(0.002)*	(0.002)*	(0.002)	(0.002)*	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1624	-0.1622	-0.1543	-0.1640	-0.1559
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***
N	127770	127770	127770	127770	127770
r2	0.46	0.46	0.46	0.46	0.45
KP F Stat	255.21	285.17	49.73	249.57	55.67

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 1000 people. The instrumental variables are based on the estimation of a gravity model using the PPML methodology. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A6: IV Estimation GMM (Max 2500 Migrants Threshold)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0090	0.0086		0.0070	
	(0.003)***	(0.003)***		(0.003)**	
Immigrants			0.0032		0.0064
			(0.001)***		(0.003)**
Emigrants			0.0064		0.0022
			(0.003)**		(0.001)*
Total FDI	0.0008	0.0008	0.0007	0.0009	0.0006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0112	-0.0112	-0.0126	-0.0097	-0.0123
	(0.005)**	(0.005)**	(0.005)**	(0.005)*	(0.006)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.12	0.11
KP F Stat	341.22	311.28	80.45	331.18	55.21
Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0468	0.0482		0.0111	
	(0.007)***	(0.006)***		(0.007)	
Immigrants			0.0333		0.0546
			(0.005)***		(0.007)***
Emigrants			0.0399		-0.0069
			(0.009)***		(0.008)
Total FDI	-0.0017	-0.0017	-0.0023	-0.0011	-0.0024
	(0.001)***	(0.001)***	(0.001)***	(0.000)**	(0.001)***
Total Trade	-0.0022	-0.0073	-0.0467	0.0372	-0.0214
	(0.011)	(0.011)	(0.013)***	(0.009)***	(0.013)
Baseline Exports (Exc. Bilateral)	-0.0947	-0.0949	-0.0962	-0.0939	-0.0959
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0056	-0.0055	-0.0050	-0.0061	-0.0052
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Zero Exports in t-1 (Exc. Bilateral)	-0.1468	-0.1467	-0.1394	-0.1479	-0.1403
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.47	0.47	0.47	0.47	0.46
KP F Stat	255.03	284.93	49.86	249.77	55.45

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 2500 people. The instrumental variables are based on the estimation of a gravity model using the PPML methodology. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A7: IV Estimation GMM (Max 5000 Migrants Threshold)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0090	0.0086		0.0069	
	(0.003)***	(0.003)***		(0.003)**	
Immigrants			0.0037		0.0068
			(0.001)***		(0.003)**
Emigrants			0.0060		0.0017
			(0.003)**		(0.001)
Total FDI	0.0007	0.0007	0.0006	0.0008	0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total Trade	-0.0110	-0.0110	-0.0127	-0.0095	-0.0123
	(0.005)**	(0.005)**	(0.005)**	(0.005)*	(0.006)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.12	0.11
KP F Stat	341.22	311.28	80.45	331.18	55.21

Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0420	0.0434		0.0076	
	(0.006)***	(0.006)***		(0.006)	
Immigrants			0.0317		0.0508
			(0.005)***		(0.007)***
Emigrants			0.0367		-0.0089
			(0.008)***		(0.008)
Total FDI	-0.0016	-0.0015	-0.0021	-0.0010	-0.0022
	(0.000)***	(0.000)***	(0.001)***	(0.000)**	(0.001)***
Total Trade	0.0010	-0.0038	-0.0426	0.0386	-0.0161
	(0.010)	(0.010)	(0.013)***	(0.009)***	(0.013)
Baseline Exports (Exc. Bilateral)	-0.0941	-0.0942	-0.0957	-0.0932	-0.0954
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0081	-0.0080	-0.0074	-0.0085	-0.0075
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Zero Exports in t-1 (Exc. Bilateral)	-0.1286	-0.1286	-0.1217	-0.1296	-0.1227
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.48	0.48	0.48	0.48	0.47
KP F Stat	254.38	284.27	49.93	249.32	55.27

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 5000 people. The instrumental variables are based on the estimation of a gravity model using the PPML methodology. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

Table A8: IV Estimation GMM (RCA=2 on RHS)

Panel A: Extensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0061	0.0058		0.0058	
	(0.002)**	(0.002)**		(0.003)**	
Immigrants			0.0027		0.0035
			(0.001)**		(0.002)*
Emigrants			0.0037		0.0035
			(0.002)*		(0.002)*
Total FDI	0.0005	0.0005	0.0004	0.0005	0.0004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total Trade	-0.0023	-0.0023	-0.0027	-0.0020	-0.0024
	(0.001)**	(0.001)**	(0.001)**	(0.001)*	(0.001)**
N	83099	83099	83099	83099	83099
r2	0.11	0.11	0.11	0.11	0.11
KP F Stat	533.08	538.86	97.37	475.51	60.31

Panel B: Intensive Margin	All	Unskilled		Skilled	
	(1)	(2)	(3)	(4)	(5)
Total Migrants	0.0362	0.0364		0.0189	
	(0.004)***	(0.004)***		(0.005)***	
Immigrants			0.0224		0.0413
			(0.003)***		(0.005)***
Emigrants			0.0256		-0.0076
			(0.005)***		(0.006)
Total FDI	0.0005	0.0005	-0.0004	0.0007	-0.0004
	(0.000)	(0.000)	(0.000)	(0.000)**	(0.000)
Total Trade	-0.0073	-0.0085	-0.0202	0.0071	-0.0089
	(0.004)*	(0.004)**	(0.004)***	(0.004)	(0.004)**
Baseline Exports (Exc. Bilateral)	-0.0960	-0.0961	-0.0970	-0.0953	-0.0966
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Previous Exports Growth (Exc. Bilateral)	-0.0011	-0.0011	-0.0009	-0.0015	-0.0012
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Zero Exports in t-1 (Exc. Bilateral)	-0.1665	-0.1662	-0.1608	-0.1688	-0.1626
	(0.012)***	(0.012)***	(0.012)***	(0.012)***	(0.012)***
N	127770	127770	127770	127770	127770
r2	0.46	0.46	0.46	0.46	0.45
KP F Stat	385.13	433.54	83.29	357.65	125.81

All specifications include country-by-year and product-by-year fixed effects. The dependent variable in all specifications is constructed using exports of country c to the whole world excluding to countries c' where total migration between c and c' exceeds 500 people. SE clustered at the country level presented in parenthesis.

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$