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Immigration and International Trade: A Semiparametric Empirical Investigation

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ABSTRACT *This paper examines the effect of immigration on the US trade flows. The model hypothesizes that immigration facilitates international trade with home countries by lowering transaction costs. Immigrants also demand products from their country of origin and thus stimulate trade. Using a panel data set we estimate a dynamic semiparametric fixed-effect model. The immigrant stock, a proxy for transaction costs, enters the model non-parametrically, whereas other variables enter the model log-linearly, as implied by the gravity model of international trade. To estimate this semiparametric model, we develop a new instrumental variable estimator with desirable asymptotic properties. The results indicate that the immigration effect on imports is positive for both finished and intermediate goods, but the effect on exports is positive only for finished goods. The findings supports the hypothesis that for finished goods where country specific information is crucial for trading, immigrants have a pro trade effect for both US imports and US exports. This pro trade effect of the information and knowledge carried by the immigrants is not observed for the US exports in the intermediate goods. Immigrants also have a strong demand effect both for the consumer and intermediate imports.*

KEY WORDS: International trade, immigration, semiparametric dynamic panel, instrumental variable

1. Introduction

A dramatic increase in the size of the immigration flow has rekindled the debate on the global effect of immigration. Major changes in the national origin and skill levels of the immigrants have made immigration very controversial for the US. Two questions often come up in recent debates regarding immigration. First, how does immigration affect trade patterns? And conversely, how does the trade policy affect immigration patterns?[1]

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Using a new semiparametric (SP) dynamic panel data framework, this paper studies the effect of immigration into the US on the trade flows between the US and the country of origin of the immigrants. At the same time, this research also analyses an important question in international trade: whether the flow of labour encourages the flow of goods or the flow of goods discourages the flow of labour: in other words whether immigration and trade flows are complements or substitutes. This is an unresolved question in international trade and makes an excellent case for an empirical work.

There are several reasons as to why one expects migration of people from one country to another will affect the trade flows between the two countries. First, immigration affects the factor supply in the two countries under consideration. This, in turn, affects the production patterns.[2] Secondly, immigrants lower the transactions cost involved in trade. Immigrants carry information on trading contacts and element of trust for better trading enforcements with their home country.[3] In addition, immigrants bring with them knowledge of language, institutions, and culture of their country of origin. All of the above over time may lower the transactions costs involved in trade.[4] In particular, the lowering of transactions cost becomes important for immigrants because there is evidence on immigrant groups being active entrepreneurs and immigrants are keen on finding new and better trading channels between their country of origin and the US. Immigrants have a higher propensity for risk taking: the Jews of New York, the Japanese from San Francisco, the Cubans of Miami and the Chinese of New York are a few examples one can think of in this context. Thirdly, immigrants demand goods from their home country, which opens trade in new channels.[5] Immigrants may introduce the natives in their host country and the people in their country of origin to new products, stimulating bilateral trade between the two countries.

A general review of trade and immigration shows that, at least in the case of the US, the magnitude of immigration and the volume of trade have moved in the same direction in the last few decades. During 1966–1988, the average annual influx of immigrants into the US was to the extent of 481,513 persons and, in 1990, it had increased to about 700,000, an increase of 45 per cent. Also, US exports of goods as a percentage of Gross Domestic Product (GDP) increased from 3.89 in 1960 to 8.03 in 1995, an increase of 135 per cent and US imports of goods as a percentage of GDP increased from 2.89 in 1960 to 10.42 in 1995, an increase of 261 per cent.[6] Immigration from the Asian and Latin American countries has increased dramatically after the passing of the Immigration Act of 1965 that did away with the earlier immigration quotas with these countries (see Figure 1). It is of interest that the share of the US trade with the major Asian, North American and South American newly industrialized countries is also on the rise; see Figures 2 and 3.[7] The question here is, do the immigrants play any role in the goods trade between their home-countries and their host country, US?

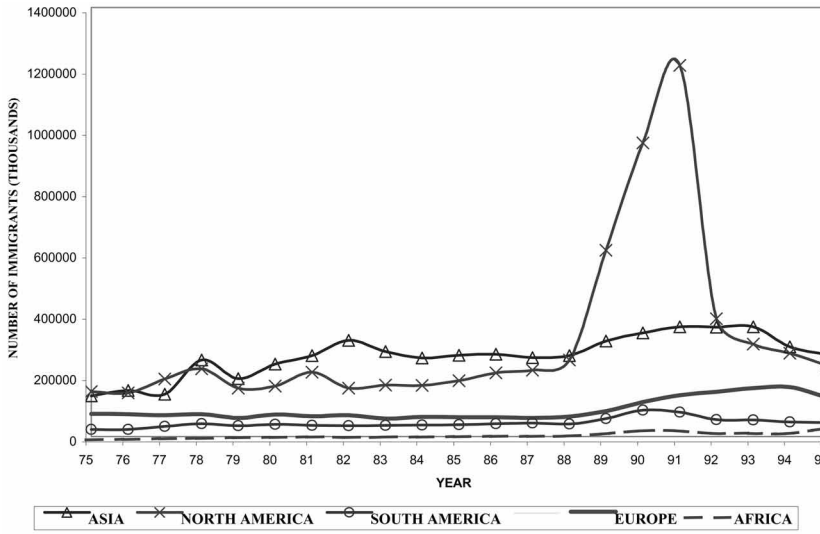

Figure 1. Immigration into the US by region, 1975 – 1995

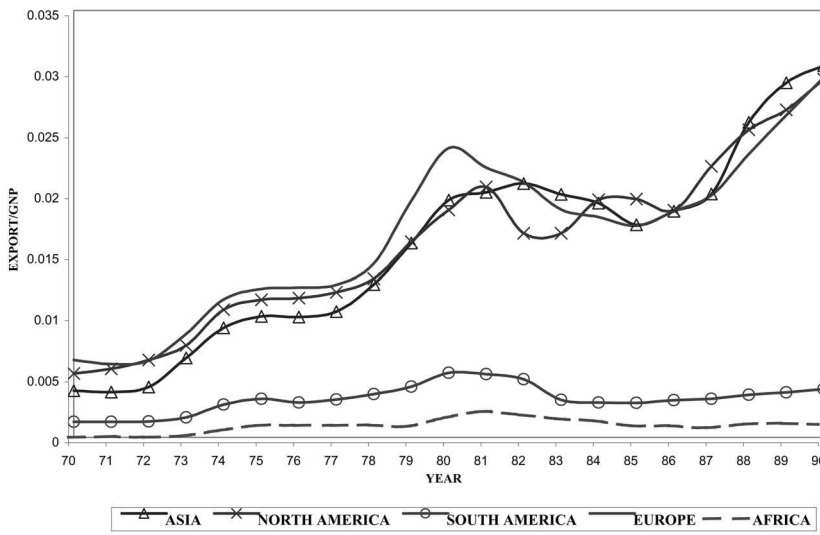

Figure 2. US Exports to different regions as a proportion of US GNP

In this paper, we concentrate on the effects of immigration on trade flows through the following channels. First, immigrants carry home-country information or form networks (social and trade links) that lowers

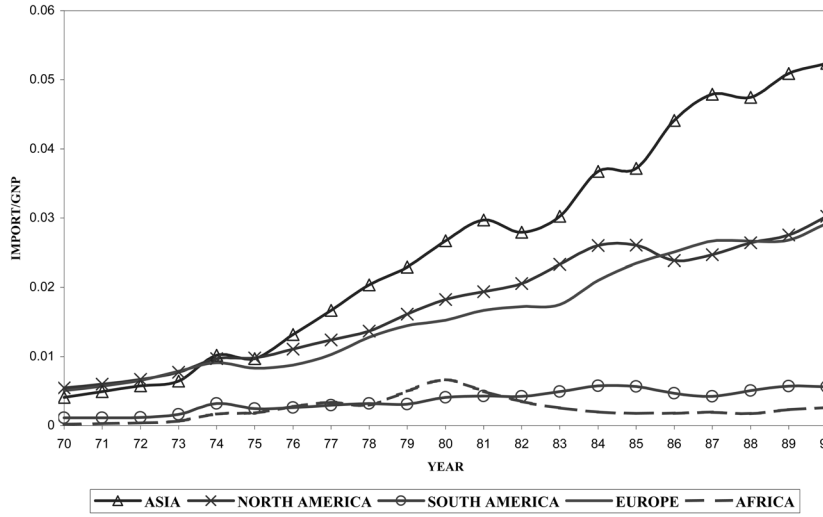

Figure 3. US Imports from different regions as a proportion of US GNP

transactions cost and leads to better trading contacts. Immigrants also affect the factor supply in production both in the receiving country and in the country of their origin. Likewise immigrants affect the demand for goods in their host country and their country of origin. In this paper, we empirically estimate the effect of immigration on the US trade flows in a semiparametric (SP) dynamic panel data model. The results show that the direct effect of immigration in terms of lowering transactions cost to trade is more positive (pro trade) for finished goods than for intermediate products.

The paper is structured as follows. Section 2 talks about the econometric model, in Section 3 we present a conceptual discussion of the various links that may exist between immigration and trade flows. Section 4 describes the estimation strategy and the data used in the study. In Section 5, we discuss the estimated results and we conclude in Section 6.

2. The Econometric Model

The SP dynamic panel data model is given as follows,

$$y_{it} = \alpha_i + y_{it-1}\gamma + x'_{it}\beta + m(z_{it}) + u_{it} \tag{1}$$

$$i = 1, ..., n \; t = 1, ..., T$$

In the above model, i = 1, …, n denotes the cross-section and t = 1, …, T stands for the time period, x_{it} and z_{it} are of dimension p and 1 respectively, β

is a $p \times 1$ unknown parameter vector and α_i is the cross-sectional fixed-effect. In the fixed-effect dynamic SP model given by equation (1), x_{it} and $y_{it\text{-}1}$ enter the model linearly and it is not known how z_{it} effects y_{it}, making the model non-parametric in z.

Taking a Taylor's expansion of the model in equation (1) around a point z, equation (1) can be rewritten as follows,

$$y_{it} = \alpha_i + y_{it-1}\gamma + x'_{it}\beta + m(z) + (z_{it} - z)m'(z) + u_{it} + R \tag{2}$$

where R includes the higher order terms of the expansion that asymptotically goes to zero, see Appendix (A). The model given by equation (2) can be demeaned by taking deviations of the variables across the cross-sectional mean and we get:

$$Y_{it} = Y_{it-1}\gamma + X'_{it}\beta + Z_{it}\delta(z) + U_{it} \tag{3}$$

where $Y_{it} = y_{it} - \bar{y}_{i\cdot}$, $Y_{it-1} = y_{it-1} - \bar{y}_{i(-1)\cdot}$, $X_{it} = x_{it} - \bar{x}_{i\cdot}$, $Z_{it} = z_{it} - \bar{z}_{i\cdot}$, $U_{it} = u_{it} - \bar{u}_{i\cdot}$, $\bar{y}_{i\cdot} = \sum_t^T y_{it}/T$, $\bar{y}_{i(-1)\cdot} = \sum_t y_{it-1}/T$, $\bar{x}_{i\cdot} = \sum_t^T x_{it}/T$, $\bar{z}_{i\cdot} = \sum_t^T z_{it}/T$, $\bar{u}_{i\cdot} = \sum_t^T u_{it}/T$, $m'(z) = \delta(z)$. Taking conditional expectation of equation (3) with respect to Z_{it} we get

$$E(Y_{it}|Z_{it}) = E(Y_{it-1}|Z_{it})\gamma + E(X_{it}|Z_{it})'\beta + Z_{it}\delta(z) \tag{4}$$

and subtracting equation (4) from equation (3) we get

$$Y_{it} - E(Y_{it}|Z_{it}) = (Y_{it-1} - E(Y_{it-1}|Z_{it}))\gamma + (X_{it} - E(X_{it}|Z_{it}))'\beta + U_{it} \tag{5}$$

$$\begin{aligned} \bar{Y}_{it} &= \bar{Y}_{it-1}\gamma + \bar{X}_{it}\beta + U_{it} \\ \bar{Y}_{it} &= \tilde{X}_{it}\rho + U_{it} \end{aligned} \tag{6}$$

where $\tilde{X}_{it} = (\bar{Y}_{it-1}\ \bar{X}_{it})$ and $\rho = (\gamma\ \beta)$. To get a consistent estimate for p given in equation (6), we assume that there exists instrumental variables $\bar{X}^1_{it-1}$ (a one-period lag of the explanatory variable X^1) for $\bar{Y}_{it-1}$ such that $E(U_{it}|\bar{X}^1_{it=1}) = 0$

Let, $W_{it} = (\bar{X}^1_{it-1},\ \bar{X}_{it})$

where, $\bar{X}^1_{it-1} = X^1_{it-1} - E(X^1_{it-1}|Z_{it})$

thus, $\bar{W} = (\bar{X}^1 \quad \bar{X})$

The feasible OLS instrumental variable estimator for ρ is given by

$$\hat{\rho} = (\bar{W}'\bar{X})^{-1} \ (\bar{W}'\bar{Y}) \tag{7}$$

To estimate ρ we need to know the unknown conditional expectations $E(A_{it} \mid Z_{it})$ in equation (5) where A_{it} is Y_{it}, $Y_{it\text{-}1}$, X^1_{it-1}, and X_{it}. Following Robinson (1988), these can however be estimated by the non-parametric kernel estimators given as follows

$$\hat{A}_{it} = \sum_j \sum_s A_{js} K_{it,js} / \sum_j \sum_s K_{it,js} \tag{8}$$

$$j = 1, ..., n; \ s = 1, ..., T$$

where $K_{it,\,js} = K\left(\frac{z_{it} - z_{js}}{a}\right)$ is the kernel function and a is the window width. Replacing the unknown conditional expectations in equation (5) by equation (8) gives $\hat{\rho}$ and its $\sqrt{N}$ consistent estimator. For the consistency and normality results see Appendix (A).

To get the semiparametric estimator of $\delta(z)$ we substitute $\hat{\rho}$ in equation (3) and get

$$\hat{Y}_{it} = Y_{it} - \hat{X}_{it}\hat{\rho} = Z_{it}\delta(z) + U_{it}$$

where $\hat{X}_{it} = (Y_{it-1}, \ X'_{it})$ the Kernel weighted semiparametric estimator of $\delta(z)$ is given by

$$\delta(z) = \sum \sum \frac{\hat{Y}_{it} Z_{it} k\left(\frac{z_{it} - z}{h}\right)}{\sum \sum Z^2_{it} k\left(\frac{z_{it} - z}{h}\right)} \tag{9}$$

where $k_{it,\,js} = k\left(\frac{z_{it} - z_{js}}{h}\right)$ is the kernel function and h is the window width. The estimate, $\hat{\delta}(z)$ is $(nTh^{q+1})^{-1}$ consistent, see Appendix (A).

3. Immigration and International Trade: Conceptual Frameworks

In this section, we outline some of the ways in which immigration may affect the volume and the pattern of trade.

3.1 Transactions Cost

Immigrants in the US tend to settle where there already are big immigrant populations. The initial economic pull of labour markets and the subsequent reinforcement of migrant concentration through migrant networks (chain migration) causes this concentration of immigrant population (Massey, 1988). International migration forges innovative social networks (ethnic enclaves or immigrant economies), that then reinforce the very migration that produced them according to Light and Rosenstein (1995). Emergence of enclaves is facilitated by the concentration of immigrants of the same origin with business expertise and on the availability of effective labour and on capital. These networks facilitate new immigrants to learn different trades and help them to make a place for themselves in the new country, which builds a stronger contact with the immigrants' home-country. Immigrants involved in retail trade have first-hand information about the markets of their home countries, the demand patterns of people in their home country, and have contacts with big wholesale traders in their home country and the US. For the immigrants, foreign market information becomes cheaper to obtain in the US and immigrant contacts lead to trust building that makes trade negotiations easier to conduct.[8] All these factors greatly reduce the transactions cost to trade and thus facilitates bilateral trade between the US and their country of origin.

It is argued by Gould (1994) that the trade links are formed due to the presence of immigrant population in the US , as is the case in Head and Reis (2002) for Canada. In both the above studies, immigrants are the link between their country of origin and their host country and have a significant pro effect on both exports and imports of their host countries. There is also increasing evidences that proximity and pre-existing ties between nations significantly facilitate bilateral trade between countries. For example, Rauch (1999) discusses the importance of the links formed by geographical proximity (sharing a border), common language and colonial ties between countries in matching international buyers and sellers. In particular he finds that the above links are statistically significant in differentiated goods where brand names are important for trading.[9]

Immigrants bring with them knowledge of the language of their home country, which helps in trade with the US. Immigrants also adapt to their new country, assimilating into the foreign society, and often the second generation immigrants are more fluent in English (often bilingual) than the first. This language assimilation might eliminate the 'language distance' of the immigrant communities (Chiswick and Miller, 1994, 1996) and might have a pro-trade effect on trade with their home country by reducing the communication problems and better enforcement of trading contacts.[10] Dunlevy (2004) finds that the greater the 'language distance' of the foreign-born group from English, the greater is the pro-trade effect of that immigrant group for US exports to their country of origin. The extent of

market information use, better trading contacts and the pro-trade effect of immigrants on trade, depend on the skill level and the nationality of the migrants. Immigrants with higher skill are in a better position to take advantage of the information they possess.[11]

There might also be some return migration with immigrants moving to their home country with information on the possibility of new products that can be imported to their home country from the US. On the other hand, return migrants might be involved in new production in their home country with information on new products and technologies from the US.[12] If the immigrants start production of goods (that could be imported from the US) in their home countries there is a possibility that exports from the US to their home country, will fall. In addition, if there is outsourcing of production to the home countries of the immigrants because of better information due to the immigrant links with their home country, this might have a differential effect on the US exports and US imports. One might guess that US exports to the home countries will fall and imports from the home countries into the US will rise.

3.2 Factor Supply

Immigration changes the population and the labour supply in the sending and the receiving countries. The population and the labour supply rises in the receiving country, and that of the sending country falls. According to the traditional role of labour mobility in international trade, an increase in the labour supply will increase the production and demand for goods in the receiving country, and the opposite happens in the immigrant sending country. Often, the role of goods trade has been emphasized as an alternative to labour migration.[13] For example, in the traditional Heckscher–Ohlin (HO) framework, if the two countries have different factor endowments, then goods and factor flows are substitutes. But if the factor endowments are same and the technologies in the two countries are different, then the goods and the factor flows are complements.[14] In trade theory, there is no consensus on whether the goods and labour flows are substitutes or complements. International migration is motivated by a combination of different factors: differences in factor endowments, technologies across countries, and political reasons to mention a few. International trade theory is ambiguous about the relationship between the goods trade and immigration across countries, whether they are substitutes or complements.

3.3 Demand Effect

Different immigrant groups with different occupations and settlement patterns come to the US not simply as labourers affecting the labour

market but they come as human beings with diverse cultures, cuisines and lifestyles, comprising 'Immigrant America'. Immigrant populations have different demand patterns than natives and demand products from their home countries, which influence US imports. Over time, immigrants might introduce natives to products from their home country. What is the effect of demand patterns on trade flows is an empirical question, investigating the connection between the trade and goods mobility for the Atlantic economy between 1870 and 1940. Collins *et al.* (1997) have found evidence supporting complementary flows of imports of goods and labour. In another work, Dunlevy and Hutchinson (1999) have found empirical support for the pro-trade effect of immigration on the US imports for the period 1870–1910.

Immigrants from some countries might be involved in manufacturing and exporting products from the US to their countries of origin, effectively reversing the movement of goods.[15] The immigrants also assimilate into the host country society over time. The longer the immigrants live in the US, the more likely they are to adapt to US society, changing their preferences and life styles, and weakening their contacts with their country of origin. Over time, immigrants are introduced to new products of the host country and their demand patterns are influenced by those of the natives.[16] As a result, the immigrants' demand for finished products from their home country might fall.

3.4 Other Factors

There is evidence that the population in countries (trading partners) who do not immigrate are influenced by the population who migrate to the US. Money (1998) has shown that the immigrant type and quality brings varying short-term adjustment costs and loss of resources for their countries of origin, but on the other hand there are long-term benefits because of the flow of resources from the scarce to the abundant and more productive regions.[17] By investigating the impact of immigration on the bilateral trade between the US and the home countries of the immigrants, we are accounting for both the effect of migration on the US and on the immigrants' home countries.

How immigration from different trading partners will effect the bilateral trade of the US with those countries will also depend on institutional and political factors. For example, what type of government institutions exist in the immigrants' home countries and how good are the international relations of the US with these countries. In Dunlevy (2004) it is shown that the foreign-born population from countries that are corrupt have a larger pro-trade effect on exports from different states in the US, where the foreign-born resides.

In the US, networks established by the migrants become stronger as immigration continues. Immigration increases further due to widening of

the trade gap with various countries, and its effect is enhanced further by the immigrant networking, which goes a long way in forming trade links between the US and the immigrants' countries of origin.

4. Empirical Model and Data

4.1 Estimation Strategy

We study the effect of immigration using a semiparametric fixed effect instrumental variable (SPFEIV) in a panel data model where the cross-section is the immigrants home-country, which is also the US trading partner. The theory behind the empirical model is derived from the gravity equation. The Gravity equation has been very successful in empirical trade analysis, but the theory behind the gravity equation is ambiguous.[18] At the heart of the gravity equation is the idea that the volume of trade between two countries will be directly proportional to the Gross National Product (GNP) or the GDP of the two countries and inversely proportional to the geographical distance between the two.[19] For empirical use of the gravity equation in order to test the trade theories, see Helpman (1987), Frankel *et al.* (1997), Rauch (1999).

In the empirical model for bilateral trade the dependent variable is US exports and US imports. We estimate the model for three kinds of goods – aggregate, intermediate, and finished products – to look into the differential effect of immigration on the type of goods.[20] In the SP (or partially linear) case, some variables enter the model linearly and there is no functional form assumed for others. The variables that will enter the model linearly are the GDP, population, price deflators, and others, both for the US and the immigrant home country. The model has a non-parametric transactions cost; in other words, no parametric functional form of how the immigrant stock affects the trade flows is specified.

The variable used in the study is immigrant stock rather than immigration flow and the non-parametric transaction cost is dependent on immigrant stock.[21] This is crucial because the effect of immigration on the transactions cost is influenced not only by the current immigration flow but also by the past immigrant population. When the immigrants enter the US, they carry new information with them and there is a possibility of information not shared by the old and the new immigrants. Thus, the effect on trade due to a change in the immigrant stock may be larger from a country that already has a vast pool of immigrant population than from a country with a smaller pool of immigrant population. In addition, the demand for products from their home country and the influence on the demand for goods of the natives hold for the immigrant stock over time, hence immigrant stock captures the effect better than immigrant flow.

The time invariant cross-sectional fixed effect for different immigrant sending countries captures the country specific effects, such as language and cultural differences, infrastructure, and institutional character. The fixed-effect controlling for cross-sectional heterogeneity also captures the missing variables from the study, making the estimates from the panel data more efficient (see Hsiao, 2003; Baltagi, 2002). These country-specific effects may affect bilateral trade flows and influence the trade from different countries in various ways.[22]

The empirical model is dynamic in nature, implying that one-period lagged US exports and US imports flows affect current trade flows. A dynamic model enables the past income and price levels to affect the current trade flows. This is important for the analysis because it takes into account the lags and the adjustment in the international trade market. In the dynamic panel model with fixed-effect, the mean deviation transformation used to control for the cross-sectional heterogeneity introduces the problem of endogeneity, requiring an instrumental variable for the lag of the dependent variable for consistent estimates when N is large and T is finite (Matyas and Sevestre, 1996). In the earlier literature looking at the effect of immigration on trade, Gould (1994) is the only work that looks at a dynamic model over time, but the estimates from the study are inconsistent. In order to estimate the semiparametric dynamic model with fixed effect we will use instrumental variable estimation.

4.2 Data

Semiparametric fixed effect dynamic models with instrumental variables are used to estimate the effect of immigrants' links to their home countries. The balanced pooled panel is estimated for 47 US trading partners over eight years from 1973 – 1980. The models are estimated for aggregate goods, intermediate products and finished goods. Annual data on immigration stock, skill levels and length of stay is from the US census and Immigration and Naturalization public-use data. Data on aggregate trade flows are taken from the International Monetary Fund's (IMF) Direction of Trade Statistics and other variables from IMF International Financial Statistics. For details on the data see Appendix B.

4.3 Non-parametric Transactions Cost

A partial model is used to study the effect of immigrant stock on the US trade flows for aggregate goods. The model is estimated both parametrically and non-parametrically. Based on the parametric functional form for the transaction cost given by Gould (1994),[23] the non-linear parametric model for exports and imports is as follows:

Exports:

$$\log EX_{US,i} = \alpha_1(M_{i,US}/(\alpha_2 + M_{i,US})) + \varepsilon_{ex} \tag{10}$$

Imports:

$$\log IM_{i,US} = \beta_1(M_{i,US}/(\beta_2 + M_{i,US})) + \varepsilon_{im} \tag{11}$$

The non-parametric partial model is given by

$$y_{it} = m(z_{it}) + u_{it} \tag{12}$$

$$i = 1, ...N \quad t = 1, ..., T$$

Based on equation (10) and equation (12), $y = \log EX_{US,i}$: log of exports of goods from the US to the home country; *i*, $z = M_{i,US}$: immigrant stock from the *i*th country into the US. In contrast to equation (10) no parametric functional form is assumed for the transaction cost as a function of the immigrant stock. Based on equations (11) and (12), $y_{it} = \log IM_{i,US}$: log of imports of goods from the home country *i* to the US. The models 10 – 13 are estimated as balanced-panel models for 47 trading partners of the US, for the time period 1973 – 1980. The non-linear estimation of equations (10) and (11) is given in Table 1.[24]

The parametric partial model based on the parametric functional assumption of decreasing transaction cost due to immigrants carrying the home country information shows that the immigrants effect on bilateral trade flows is effective only when immigrant stock is small, see Figures 4 and 5. If we plot the data on US exports and imports against immigrant stock, one sees that the immigrants' effect is strong and steady at high immigrant stock level. This is also very intuitive because the transactions cost and the demand effect will be increasing with the immigration levels. There is also no uniform positive change in the trade flows at all levels of immigration from different 47 countries to the US, as assumed in the parametric partial model.

Table 1. Parametric non-linear estimation of immigrant stock on the US aggregate exports and imports

	Aggregate exports	Aggregate imports
Immigrant information variable	3.1 (0.04)	3 (0.06)
Immigration sensitivity variable	2290 (212)	3034 (356)

*Standard error in parentheses

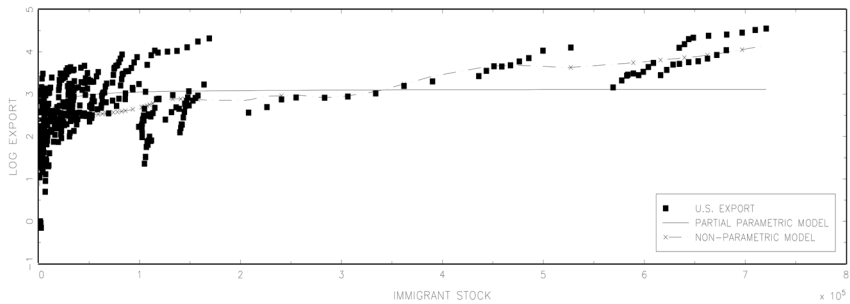

Figure 4. Comparison of data with partial parametric and non-parametric estimator

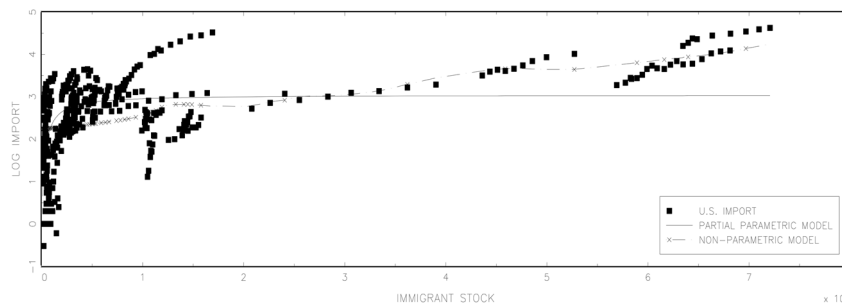

Figure 5. Comparison of data with partial parametric and non-parametric estimator

In the non-parametric estimator of equation (12), no functional form is assumed for the transaction cost, and $m(z_{it})$ is estimated by a kernel weighted local constant estimator, (see Pagan and Ullah, 1999). This is a local averaging or smoothing estimator that fairly captures the movement in the trade flows. The non-parametric methodology enables us to capture the effect of immigration stock on the trade flows at every level of the immigrant stock for every country. Non-parametric estimation shows that migrants do not always have a positive effect on trade. The transactions cost and the demand effect do not always hold, but when they do, they are greater for aggregate US imports than for aggregate US exports. This shows that the parametric functional form used for the transactions cost does not hold and it is well known that if the wrong functional form is used estimates are biased.

The immigrants have effects other than the transactions cost effect on the host and home countries' trade. For example, the US bilateral trade flows may be affected by the augmentation of labour supply resulting from immigration. Moreover, there are also other economic factors, such as income, prices, and population in the US and the trading partners. The ratio

of skilled to unskilled workers in different immigrant populations and their average length of stay needs to be accounted for in the empirical study. We assume that these other variables enter the empirical model based on the gravity equation linearly, making the model semiparametric.

4.4. Semiparametric Model

The SP full model is given by the econometric model discussed in Section 2 as follows,

$$y_{it} = \alpha_i + y_{it-1}\gamma + x_{it}\beta + m(z_{it}) + u_{it} \tag{13}$$

$$(i = 1, ..., n;\ t = 1, ..., T)$$

where in equation (13) for US exports, $y = \log EX_{us,i}$, $y\text{-}_1 = \log EX_{t-1}$, x is a vector of: Y_{us}, Y_i, POP_{us}, POP_i, P_{us}, P_i, PX_{us}, PI_i, $SKUK_{us,i}$, $STAY_{us,i}$, $STAY^2_{us,i}$. For US imports in equation (13), $y = \log IM_{i.us}$, $y - _1 = \log IM_{t-1}$, x is a vector of: Y_{us}, Y_i, POP_{us}, POP_i, P_{us}, P_i, PX_i, PI_{us}, $SKUK_{us,i}$, $STAY_{us,i}$, $STAY^2_{us,i}$, where:

log $EX_{us,i}$	Log of export of US to the ith country
log EX_{t-1}	Log of export lagged one year
log $IM_{i,us}$	Log of import of US from the ith country
log IM_{t-1}	Log of import lagged one year
Y_{us} and Y_i	the US and home-country GDP
POP_{us} and POP_i	the US and home country population
P_{us} and P_i	the US and home country GDP deflators
PX_{us} and PI_i	the US export unit value index and the home country import unit value index
PI_{us} and PX_i	the US import unit value index and home country export unit value index
$SKUK_{us,i}$	the ratio of skilled immigrants to unskilled immigrants from home country i into the US
$STAY_{us,i}$	the average length of stay of the immigrants in the US
z_i	Immigrant stock from country i
α_i	the country specific or the fixed cross-sectional effect.

The choice of instruments for the lag of the dependent variable in the empirical study was USGDP for the US imports, and for US exports the

instrument for the lagged dependent variable is the home country GDP.[25] In the model given by equation (13) $m(z_{it})$ is not assumed to have any parametric functional form and the country specific characteristics such as infrastructure, or culture, that are omitted from the study but nonetheless affect the export and import flows are a part of the fixed effect. These omitted variables captured by the fixed-effect αi, are also correlated with the other independent variables, which is not the case if one assumes a random effect model.[26] A normal kernel is chosen for both $K\left(\frac{Z_{it}-Z}{a}\right)$ and $k\left(\frac{z_{it}-z}{h}\right)$ where a and h are the window-width respectively.[27] The model given in equation (13) is estimated by the methodology given in Section 2 for aggregate goods, intermediate goods and the finished products.

5. Estimated Results

To study the effect of changes in the immigrant stock on the US exports and imports, elasticity estimate $\hat{\delta}(z)$ at different immigrant stock level for all types of goods – aggregate, intermediate and finished goods – is calculated. An advantage of using non-parametric methodology is that the elasticity can be estimated at every data point. This shows the US bilateral trade with the *i*th country brought about by an additional immigrant from that country. On this basis we calculate the average dollar value change (averaged over eight years) in the value of the US bilateral trade flows as: $ave(\hat{\delta}_i(z)) \times \bar{z}_i$ where, $ave(\hat{\delta}_i(z)) = \sum_t \hat{\delta}_i(z)/T$ and $\bar{z}_i = \sum_t z_{it}/T$ is the average immigrant stock into the US from the *i*th country.[28] These values are presented in Table 2, where we see that the immigrant effect is positive for US imports across all goods, but that is not the case for US exports. The immigrant effect is positive for finished exports but not for intermediate goods. This result is in contrast to earlier studies for the US in particular by Gould (1994) where the immigrant effect is positive for all US bilateral trade.

The estimated results show that the immigrant-networking effect on trade was strong for finished products. Finished products are differentiated goods, where brand names are important for trading, and for finished products the country specific information carried by immigrants encourages trade.[29] It is in the finished goods industries that immigrants are actively involved in business and trading. In 1975, in Koreatown in Los Angeles, 31.3 per cent of Korean firms were involved in retail trade. Small businesses have been very prevalent among the immigrant groups and immigrants are more hard working with a higher propensity towards self-employment (see Light, 1990). Thus, we see that the direct effect of immigrants in terms of lowering the transactions cost to trade supports trade flows in finished goods, both for exports and imports.

Finished goods are differentiated products with inelastic demand, and country specific information is crucial in the trading of finished products. There are products from their home countries for which the immigrants

Table 2. Average dollar value change in the US bilateral trade 1973–1980

Country	Aggregate exports	Aggregate imports	Producer exports	Producer imports	Consumer exports	Consumer imports
Australia	– 17787.3	131087	– 32509.9	221791.4	104974.9	125384.9
Austria	– 131899	495155	– 107550	888320.4	379468.1	452770.6
Brazil	– 17819.8	132411	– 32307.2	222660.9	106546.4	127026.9
Canada	– 638207	1070635	– 434914	1538429	187431	354642.1
Colombia	– 36678.1	174569	– 38789.1	301829.3	137278.9	163329.7
Cyprus	– 3661.39	30926	– 8122.5	52577.1	24666.8	29581.6
Denmark	– 30782.8	202225	– 50091.3	346592.4	160339.6	191870.7
El Salvador	– 16740.9	110900	– 27159	188930.9	88255.6	105441
Ethiopia	– 3525.42	30345	– 7907.29	51364.2	24288.3	29094.3
Finland	– 21181.5	150459	– 38014.1	257169.7	119529.9	143147.3
France	– 80291	344810	– 74928.2	603547.7	269218.9	320314.3
Greece	– 117599	369866	– 59096	634359	293528.2	341527.5
Hungary	– 131816	493284	– 100547	869802.1	383590	454721.3
Iceland	– 2618.31	22090.8	– 5851.2	37664.7	17578.6	21101.1
India	– 39110.8	133198	– 30404.4	245517.7	98706.6	118633.3
Ireland	– 191142	560241	– 106130	1019169	425664.1	503278.6
Israel	– 23534.8	150998	– 36632.3	257629.3	120091.3	143427.5
Italy	– 993344	1408478	– 576858	2467604	221486.2	462836.1
Japan	– 71059.3	210956	– 46314.2	396748.9	154323.2	185304
Jordan	– 8154.2	68334.7	– 17173.8	114588.3	55099.5	65772.7
Kenya	– 2541.5	22310.2	– 5805.4	37676.7	17889.7	21419.9
Malaysia	– 3425.5	28926.9	– 7602.49	49185.3	23068	27665.9
Malta	– 5981.4	48898.8	– 12821.7	83351.9	38920.5	46691.2
Morocco	– 4578.5	38542.8	– 10065.4	65425.128	30781	36892.4
Netherlands	– 78920.8	371186	– 81581.4	642411.5	292461.4	347765.7
New Zealand	– 5857.2	49090.6	– 12706.2	83121.3	39283.1	47040.8
Nicaragua	– 15194.2	101402	– 26836.2	1177076.8	79102	95323.8
Norway	– 53093.3	297133	– 71006.9	514030.1	233962.8	279720.9
Pakistan	– 9950	76851.9	– 19702.5	130732.9	61258	73369.1
Philippines	– 129175	173694	– 41984.4	403570.1	88784.3	112145.3

(*continued*)

Table 2. (*continued*)

Country	Aggregate exports	Aggregate imports	Producer exports	Producer imports	Consumer exports	Consumer imports
S. Africa	− 5864.5	50410	− 12814	584640	40605.3	48511.1
S. Korea	− 20434.4	137854	− 32124.5	230839.2	111248.8	132200.4
Singapore	− 1916.3	16639.7	− 4373.2	28221.1	13297.2	15941
Spain	− 44778.1	258755	− 60010.1	441513	205970	245319.9
Sri Lanka	− 2192.7	18951.2	− 4980.64	32155.5	15139.1	18150.4
Sweden	− 67115.3	343831	− 79293.1	595827	270493.5	322721.9
Switzerland	− 27355	184924	− 45493	315165.2	147271.2	176012.3
Syria	− 9447.1	77077.9	− 19610.8	130125.7	61826.6	73930.9
Tanzania	− 1139.8	9817.7	− 2605.04	16716	7820.9	9386.9
Thailand	− 18438.5	114208	− 30928.1	202750.6	87852.5	106319.7
Trinidad	− 23395.7	162019	− 35346.2	265160.8	133060.3	157063.7
Tunisia	− 1791	15143.1	− 4031.8	25857.5	12035.2	14454.8
Turkey	− 26119.4	174552	− 42714.5	297336.3	139052.4	166123.7
U.K.	− 574596	593933	− 264442	1480497	93202.3	202102.9
W. Germany	− 831465	1340906	− 541845	2024962	232718.7	447964.9
Yugoslavia	− 106827	419197	− 76586.3	711211.6	335818.7	393743.4
Zimbabwe	− 1376.32	11898.8	− 3146.3	20229.2	9490.1	11385.3

have strong inelastic demand and we see a significant effect of immigrants stock these kinds of goods, supporting the demand effect for the products.[30] Also, some of the products are like footwear or apparels, where foot size and body structure are important, and goods produced in their home country are demanded by the immigrants in the US. The empirical finding supports the linder hypothesis.

The immigrants affect intermediate imports positively, but not intermediate exports. In fact, for intermediate exports, the immigrants are lowering the US exports to the immigrants' home countries. This is an interesting result, in contrast to the earlier finding of immigration affecting both US exports and US imports positively across all types of goods (Gould, 1994). This shows that immigration is lowering the income of the home countries, in turn adversely affecting their imports.[31] The US immigration policy during the 1970s was tilted towards the immigration of skilled and professional immigrants (popularly called the 'brain drain') from less developed countries to the US. High-skilled immigration stock must more adversely affect the national income of the home country than unskilled immigration.[32] This exodus of highly skilled populations might be hampering the growth of the immigrant homecountries, adversely affecting its imports, and hence US exports.[33] The skilled immigrants are able to assimilate into the US society faster by simply breaking their ties or links with their home countries, rather than networking for trade links. In addition, there is evidence on return migration and a possibility that immigrants might be involved in import substitution activities in intermediate products, hence lowering US exports to their home countries for these types of goods. This is not seen for finished exports because the transaction cost effect of immigrants is increasing the trade flow and the demand for the finished products is more inelastic than the intermediate goods.[34]

The estimated coefficient of other variables (included in the linear part of the model) in equation (13) is reported in Table 3 for aggregate, intermediate and finished goods. The higher the skilled – unskilled ratio of the immigrants, the greater the effect of the immigrants on the trade flows between the US and the immigrant sending countries. With higher skill levels (here measured in terms of the level of education), immigrants have the human capital to carry better information about their country and to use the information effectively. This increases the flow of goods between the US and their home-countries. One can argue that higher skilled immigrants might have more entrepreneurial zeal and more access to social capital. Immigrants earning higher incomes prefer goods from their home countries, thus opening trade in new channels through the demand effect. Also, skilled workers are likely to be involved in import substituting production activities, because they carry the technology and the know-how to start production in the US; this is reflected in the negative coefficients for the US aggregate imports.

Table 3. Bilateral aggregate trade flows between the US and the immigrant home countries – SPFEIV estimates

Dependent variable	Aggregate exports	Aggregate imports	Producer exports	Producer imports	Consumer exports	Consumer imports
Lag dependent variable	− 0.42 (0.28)	0.29 (1.06)	0.56 **(0.31)**	− 0.46 (0.62)	0.17 (0.46)	0.17(0.21)
U.S export unit value index	1.01 (0.65)		1.96 **(0.35)** [a]		0.46 (1.05)	
Home-country import unit	0.13 (0.12)		0.26 **(0.10)** [a]		0.19 (0.17)	
US import unit value index		− 0.33 (0.32)		0.76 (0.66)		0.46 (1.20)
Home-country export unit value index		− 0.04 (0.15)		0.32 (0.21)		0.19 **(0.03)a**
Immigrant stay	0.04 (0.05)	− 0.14 (0.10)	− 0.04 (0.04)	− 0.20 **(0.08)** [a]	− 0.11 (0.09)	− 0.11 **(0.008)** [a]
Immigrant stay (squared)	− 0.003 (0.003)	0.006 **(0.002)**[a]	0.004 **(0.002)**[c]	0.009 **(0.005)** [c]	0.005 (0.006)	0.005 **(0.00003)**[a]
Immigrant skilled – unskilled ratio	0.007 (0.02)	− 0.008 (0.02)	0.008 (0.01)	0.04 (0.04)	0.004 (0.03)	0.004 **(0.0007)**[a]
U.S GDP deflator	− 0.26 (5.24)	10.19 **(2.46)**[a]	− 10.51 (3.21)	6.79 (6.08)	4.82 (9.18)	4.82 (84.24)
Home-country GDP deflator	− 0.35 **(0.07)** [a]	0.03 (0.12)	− 0.10 (0.08)	− 0.20 (0.17)	− 0.29 **(0.09)** [a]	− 0.29 **(0.008)**[a]
U.S GDP	− 5.14 **(2.15)** [a]	5.33 **(3.18)** [c]	− 2.13 (1.48)	7.01 (4.54)	− 2.57 (3.12) -	2.571 (9.74)
Home-country GDP	0.78 **(0.20)**[a]	0.26 **(0.13)**[b]	0.12 **(0.07)** [c]	0.07 (0.24)	0.29 (0.22)	0.29 **(0.05)**[a]
US population	58.12 (44.61)	− 116.47 **(55.43)**[a]	76.63 **(18.35)**[a]	− 108.42 (83.58)	− 3.46 (71.95)	− 3.46 (5177)
Home-country population	− 0.03 (0.59)	− 0.85 (0.20)	0.99 **(0.35)**[a]	− 1.55 (1.16)	− 1.55 (0.81)	− 1.55 **(0.66)**[a]

Standard error in parentheses. [a]Significant at one percent level. [b]Significant at five percent level. [c]Significant at ten percent level

The estimated results show that the length of the immigrants' stay in the US does not favour trade. As the length of stay increases, trade with the country of origin falls and this fall is significant at 1 per cent level for the import of finished goods. This might be because the country-specific information that immigrants carry becomes obsolete over time. New waves of immigrants enter their country with fresh information and better contacts with their countries of origin, but as they stay longer in the US, their contacts and information about the trading country decline. In addition, as immigrants stay longer in the US they assimilate into US society, weakening their demand for products from their home countries.

The effect of the price and income variables depends on the relative magnitudes of demand and supply elasticities between the two countries, the US and its trading partner or the immigrant home country.[35] For example, the USGDP deflator affects the intermediate and aggregate exports negatively, but affects the finished exports positively. These are interpreted as the demand elasticities of substitution for the immigrant country of origin exceeding one for intermediate imports but not for the finished goods, supporting the fact that the imports of finished goods are more dependent on the country of origin than the imports of intermediate goods.

The home-country import unit value index affects the trade positively; this implies that the elasticity of substitution among importable products exceeds that between domestic and imported products for the home-country. This contention has been supported by earlier works demonstrating that importable products substitute more closely with each other than they do with domestic output. Also, in the manufacturing sector for US imports in both intermediate goods and finished goods, the US import unit value index affects the imports positively; this also holds for the trading partners. The demand elasticity of substitution among imports exceeds the overall elasticity between domestic and imported products for all the countries.

From the results of the income and price variables, the findings are: first both for the US and all the trading partners included in the study, the substitutability across countries in imports is restricted, especially for finished imports where country-specific information plays an important part. Second, for all the countries, importable products are closer substitutes to each other than they are with domestic output.

6. Conclusion

Using the new semiparametric instrumental variable technique in this empirical study, we see that the presence of immigrants in the US has an effect on US bilateral trade flows with the immigrants' home-countries. This dynamic fixed effect panel data study shows that immigrants from different

countries bring different magnitudes of effects on the value of trade. There is a positive effect on *all* US imports (aggregate, intermediate and finished). For exports though, the effect on the finished goods exports is *positive*. This work shows that, during the period 1973 – 1980, the immigrants, by bringing better information and trading contacts with their home country, are supporting US bilateral trade in finished goods. The demand effect brought about by immigrants is also strong for finished goods.

The networking effect is strong for finished goods where country-specific information is important in trading, but that is not the case with intermediate goods supporting the strong effect of 'links' found by Rauch (1999) for differentiated products rather than homogeneous products. The result from the study is in contrast to the earlier parametric empirical work by Gould (1994). Gould assumed a parametric functional form for the transaction cost as a function of the immigrant stock with the results showing that the immigrants' networking had a positive effect on the trade across all types goods and that the 'immigrant-link effect' was stronger for US exports than imports. In this semiparametric data driven methodology, there is a strong immigrant effect on the differentiated finished products but not on the homogeneous intermediate goods.

The ratio of skilled to unskilled workers significantly increases trade in final goods. Together with the other effects of immigration, the effect of immigrants on trade flows needs to be considered when formulating immigration policies. Further studies with bigger time periods to look at the effect of immigration on trade flows at business cycles is required. In addition, intensive studies focusing on the big immigrant sending countries like Mexico and China will be very interesting and crucial for US immigration policy with these countries.

Appendix

A. Asymptotics for the Estimators in the SP Model

The assumptions that are needed for the consistency and asymptotic normality of $\hat{\rho}$ and $\hat{\delta}(z)$ are as follows. Following Robinson (1988) let G_{μ}^{λ} denote the class of functions such that if $g \in G_{\mu}^{\lambda}$, then g is μ times differentiable; g and its derivatives (up to order μ) are all bounded by some function that has λth order finite moments. Also, K_2 denotes the class of non-negative kernel functions k: satisfying $\int k(v)\, v^m \, \mathrm{d}v = \delta om$ for $m = 0$, $1(\delta om$ is the Kronecker delta), $\int k(v)vv'\mathrm{d}v = C_k I\,(I > 0)$, and $k(u) = \mathrm{O}((1 + |\mathrm{u}^{3+\eta})^{-1})$ for some $\eta > 0$. Further, we denote $\int k_2(v)vv'\, \mathrm{d}v = D_k I$. We now state the following assumptions:

(A1) (*i*) for all t $(y_{it}, x_{it}, z_{it}, w_{it})$ are i.i.d. across i and z_{it} admits a density function $f \in G_{\mu-1}^{\infty}$, $E(x|z)$, $E(y|z)$ and $E(w|z) \in G_{\mu}^{4}$ for some positive integer $\mu > 2$

(*ii*) $E(u_{it} \mid x_{it}, z_{it}, w_{it}) = 0$, $E(u_{it}^2 | x_{it}, z_{it}) = \delta^2(x_{it}, z_{it})$ is continuous in x_{it} and z_{it}, and u_{it}, $\eta_{it} = x_{it} - E(x_{it} \mid z_{it})$, $\xi_{it} = (w_{it} - E(w_{it} \mid x_{it})$ have a finite $(4 + \delta)$th moment for some $\delta > 0$.
(A2) $K \in K_\lambda$; as $n \to \infty$, $a \to 0$, $na^{4\lambda} \to 0$ and $na^{\max(2q-4,\, q)} \to \infty$.
(A3) $k \in K_2$ and $k(v) \geq 0$; as $n \to \infty$, $h \to 0$, $nh^{q+2} \to \infty$ and $nh^{q+4} \to 0$.

Under Assumptions (A1) and (A2), the asymptotic distributions of the semiparametric estimator $\hat{\rho}$ follow from Li and Stengos (1996), Li (1996) and Li and Ullah (1998). This is given by

$$\sqrt{nT}(\hat{\rho} - \rho) \sim N(0,\ \sigma^2 \sum{}^{-1})$$

where $\sum = E(\xi_1' \eta_1 / T)\ \eta_i' = (\eta_{i1}, ..., \eta_{iT})$. A consistent estimator for Σ^{-1} is $\hat{\sum}^{-1}$ where $\hat{\sum} = \frac{1}{nT} \sum_i \sum_T (W_{it} - \hat{W}_{it})(X_{it} - \hat{X}_{it})' = \frac{1}{nT} \sum_i (W_i - \hat{W}_i)'(X_i - \hat{X}_i)$. The semiparametric estimators $\hat{\rho}$ depend upon the kernel estimators, which may have a random denominator problem. This can be avoided by weighting (8) by the kernel density estimator $\hat{f}_{it} = \hat{f}(Z_{it}) = \frac{1}{nTa^q} \sum_j \sum_s K_{it,js}$. This gives $\hat{\rho}_{sp} = S^{-1}_{(W-\hat{W})\hat{f}, (X-\hat{X})\hat{f}, (W-\hat{W})\hat{f}, (Y-\hat{Y})\hat{f}}$. Finally under Assumptions (A1) to (A3) and noting that $(nTh^{q+2})^{1/2}(\hat{\rho} - \rho) = o_p(1)$, it follows from Kneisner and Li (1996) that for $n \to \infty$

$$(nTh^{q+2})^{-1}(\hat{\delta}(z) - \delta(z)) \sim N(0,\ \sum{}_1)$$

where $\sum_1 = \frac{\sigma^2(z)}{f(z)} C_k^{-1} D_k C_k^{-1}$, C_k and D_k are defined above.

B. Data Details

Aggregate Trade Data on Exports and imports are constructed from the International Monetary Fund (IMF), Direction of Trade Statistics. Trade data on finished and intermediate manufactured imports and exports are derived from the Organization for Economic Cooperation and Development (OECD) statistics on trade in manufactured goods. The 1980 US census and the Immigration and Naturalization Service (INS) public-use data on early immigration provides annual information on the stock of immigrants in the US and their skill levels and length of stay. INS excludes the undocumented immigrants and only permanent residents are included.[36] Skilled workers are defined as immigrants whose occupation is classified as 'professional, technical, and kindred workers'. Unskilled workers are those whose occupation is classified as 'general machine operators, labourers, farm workers or service workers'. Income, prices, and population are extracted from the IMF's International Financial Statistics.

The list of countries included in the study are: Australia, Brazil, Canada, Colombia, Cyprus, Denmark, El Salvador, Ethiopia, Finland, France,

Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Jordan, Kenya, Malaysia, Malta, Morocco, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Philippines, South Africa, South Korea, Singapore, Spain, Sri Lanka, Sweden, Switzerland, Syria, Tanzania, Thailand, Trinidad, Tunisia, Turkey, United Kingdom, West Germany, Yugoslavia, Zimbabwe.

For details on the ISIC code and different product categories for the finished and intermediate products please contact the author.

Notes

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[1] The effect of trade on the domestic labour market is examined in Borjas *et al*. (1997). Trefler (1997) shows that trade policy changes affect wage inequality.

[2] This is the effect in the traditional literature on trade and immigration. See among others, Bhagwati and Srinivasan (1983), Wong (1986), Ethier (1986), Razin and Sadka (1992), and Trefler (1997).

[3] What Dunlevy and Hutchinson (1999) call 'information bridge'.

[4] See, empirical works by Gould (1994), Rauch (1999, 2002), Head and Ries (2002).

[5] Immigrants demand food from their country of origin and there are studies identifying that food is central to an individual's sense of identity. Food choices are determined by individual, cultural, social, economical and historical factors (Fischler, 1988; Warde, 1997).

[6] The percentage increase is calculated from the value of imports and exports (billions of 1982 dollars) taken from the Survey of Current Business.

[7] North America includes Mexico and the Caribbean countries. The data for U S exports and imports are from the Canadian World Trade Data Statistics.

[8] Korean exports to the US have substantially increased since the early 1970s, when a massive influx of Koreans to the US began. By virtue of the advantages associated with their language and ethnic background, many Korean immigrants have been able to establish businesses importing merchandise from Korea, see Min (1989). Dunlevy (2004) calls the trust and culture information carried by the immigrants as a 'cultural bridge' for a pro trade link between immigrants and bilateral trade.

[9] Rauch (1999) discusses that trade in differentiated products like footwear, which are not listed in any organized exchange (instead of a homogeneous product like lead that is listed in almost all organized exchanges), is where the different links are significant, although the finding is on the bilateral trade volume and no distinction is made between the differential effect of immigrants on the exports and the imports.

[10] There might also be a language assimilation where people from different countries become fluent in each others' language and that lowers the cost of trading, see Light and Rosenstein (1995), Light and Bonaich (1988).

[11] 'For modern immigrants ... the homeland is no longer something to be forsaken, released into a mist of memory or nostalgia. As the world has grown smaller, the immigrant experience has inevitably changed. Unlike the Europeans, who fled persecution and war in the first half of this century, few modern immigrants abandon their motherlands forever, shutting one door, opening another and never looking back. Instead, they straddle between

two worlds, in varying degrees, depending on where they come from and what they can afford'. *New York Times* (19 July, 1998).

[12] In the 1980s there was evidence of return migration of Japanese migrants from Brazil (Tsuda, 2003).

[13] 'Given the difficulties posed by the prospect of large-scale migration from East to West, and the risk that such large-scale migration would actually leave worse-off the remaining population in the East, we need to ask what alternatives are available. Ideal policy should try to bring good jobs to the East rather than Eastern workers to the West. International trade ... can act as a substitute for migration', Layard *et al.* (1992).

[14] See Bhagwati and Srinivasan (1983), Bhagwati (1987)

[15] Diaz-Alejandro (1970) provides evidence on immigrants involved in import businesses becoming manufacturers in import-substituting activities in Argentina in the pre 1914 period.

[16] This might stimulate trade based on Linder (1961) hypothesis.

[17] Yang (2004) looked into the impact of the immigrant population in the Phillipines on the local entrepreneurship rates. In another work, Woodruff and Zenteno (2004) looked at the impact of remittances by migrants on the capital invested in micro-enterprises in urban Mexico.

[18] For the theory behind the gravity equation see Bergstrand (1989, 1990), Deardorff. (1995), and Harrigan (1994). Deardorff (1995) has pointed out that gravity type equations are supported by many trade models and hence their empirical success is a 'mere fact of life'. Different theoretical models support the empirical form of the gravity equation and, since we do not know which type of model holds between US and the *i*th trading partner or the immigrant home-country, the gravity equation works.

[19] The traditional HO models were not able to explain the intra-industry trade, empirical features of the world, like non-relocation of factors and similar size countries not trading the same export shares. Tinbergen (1962) and Poyhonen (1963) independently developed the first gravity-type econometric models of bilateral trade to explain the above phenomenon not being explained by HO models.

[20] Aggregate goods include both intermediate and final goods.

[21] In Gould (1994) the transaction costs as a function of the stock of immigrants from country i into the US is given by

$$Z_{US,i} = A\mathrm{e}^{-\phi[M_{i,US}/(\theta+M_{i,US})]}\phi > 0, \theta > 0, A > 0$$

where $Z_{US,i}$ represents the transaction costs of trade associated with obtaining foreign market information about country i in the US, and $M_{i,US}$ represents the immigrant stock from country i into the US The hypothesis Gould maintains is that immigrants bring with them information about the markets of their origin, which decreases transaction costs.

[22] Common language has a significant pro-trade effect in bilateral trade in earlier studies (Rauch, 1999, 2002; Dunlevy, 1999). In this analysis we use the cross sectional time invariant effect, capturing variables like language to get efficient estimates for the key variable of interest, immigration.

[23] In the parametric transaction cost given by $Z_{US,i} = A\mathrm{e}^{-\phi[M_{i,US}/(\theta+M_{i,US})]}\phi > 0, \theta > 0, A > 0$, Gould (1994) calls ϕ the immigrant information variable and θ the sensitivity variable.

[24] The consistent test for a parametric regression model, in Li and Wang (1998) rejected the null, of the parametric functional form given in equations (10) and (11).

[25] The choice of instrument is tricky and many times there is some question about what is a good instrument. Here, my choice is dictated both by theory and statistics. Theory tells us that the imports of any country would depend on the income of that country. The correlation between the US imports and the US. GDP in the given data is 0.86, the correlation between the US exports and the home-country GDP is 0.83 (one can say reasonably high) for the real data.

[26] The Hausman Test rejected the null, favouring the fixed effect model (Hausman, 1978). In a cross-country study, the individual, unobservable invariant cross-sectional effects are mostly assumed as fixed effects, often broadly interpreted as culture and the country specific institutions.

[27] The kernel functions are as follows: $K(\frac{Z_{it}-Z}{a}) = \frac{1}{\sqrt{2\pi}} \exp\{-\frac{1}{2}(\frac{Z_{it}-Z}{a})^2\}$ and $k(\frac{z_{it}-z}{h}) = \frac{1}{\sqrt{2\pi}} \exp\{-\frac{1}{2}(\frac{z_{it}-z}{h})^2\}$. The window widths are chosen by the cross-validation method. For more on the choice of window width and smoothing parameter see Härdle (1990), Pagan and Ullah (1999)

[28] We also estimated the elasticity for every cross-section or country at the average immigrant stock level, the results are similar.

[29] For example, in 1978, South Korea accounted for 2.2 per cent of total US imports, an increase from almost zero in the 1970s. The most important products from South Korea were clothing, veneers, footwear, and electrical machinery, and each of these exceeded $100 million. During this period South Korea was the biggest supplier of travel goods, handbags, fur goods, plastic articles and miscellaneous manufactures, see Light and Bonacich (1988).

[30] To name a few food categories in the finished products we have ISIC: 3111 (Preserved meat products), 3112 (Diary Products), 3113 (Canned fruits and vegetables), 3114 (Canned and preserved fish), and 3117 (Bakery products).

[31] To provide a more rigorous support to this argument, a detailed analysis of the effect of immigration on the home country is required.

[32] The decline of the home-country imports and hence US exports depends on past immigration from the home-country to the US, thus this argument holds despite many empirical studies showing that the skills and wages of immigrants into the US has been declining for the period 1960–1990 (Borjas, 1999).

[33] Immense work has been done in analysing the role of immigration in the host country of the immigrants, although very little has been done in terms of analysing the effect of immigration on the home country of the immigrants.

[34] During the energy price hike of the 1970s, US export prices increased, making the US exports less competitive in the world market. This is captured by the US GDP deflator and US export unit value index in the empirical analysis.

[35] For the discussion on different elasticities explaining the price and income coefficients for the trading partners, under the CES utility functions and the transformation function in production see Bergstrand (1984). The primary objective of this study is not to analyse the effect of price and income variables.

[36] We do not account for how many immigrants from different countries become naturalized in the US How naturalized immigrants bring a differential effect on trade compared with permanent residents is a topic for future research.

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