Immigration, Information, and Trade Margins

Shan Jiang[*]

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Abstract

Recent theories suggest that better information in destination countries could reduce firm's fixed export costs, lower uncertainty of trade policy responses, and improve policy making processes. To identify the relation between information and fixed export costs, I investigate how information, measured by immigration, affects extensive and intensive margins. The theoretical model predicts that higher fixed export costs reduce trade along the extensive margin, and higher variable export costs lower trade along both margins. Using a gravity model of Canada's trade data with 125 partners over 1988-2004, I find immigrant stocks residing in Canada mainly affect the extensive margin rather than the intensive margin. This is evidence that information primarily affects fixed export costs.

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1 Introduction

The gains from trade are well known: countries gain from trade through specialization; through exploiting firm level economies of scale; and trade may also facilitate the transfer of advanced foreign technologies. While the benefits of trade are many, successful government policies designed to enhance or stimulate trade are few. Part of the problem seems to be that the response to trade enhancing policies differs across countries and time periods, and a new but growing empirical literature suggests that diverse policy responses are likely when there are substantial fixed costs of exporting.[1] One of the main sources of export costs is overcoming the lack of information about export markets. For example, fixed costs are incurred to obtain information on foreign demand or to advertise a new domestic product in foreign markets. Information costs may play an important role in the determination of fixed export costs and therefore in the success of any trade enhancing policy. Unfortunately, at present, there is little empirical evidence of the link between foreign market information and the fixed costs of exporting. In particular, does the provision of market information lower fixed export costs or variable export costs or both?

To answer these questions, I develop a simple model of monopolistic competition that shows how I can distinguish between the impact of better information on fixed and variable export costs. The model is used to create theory based measures of the value of bilateral exports and imports per product (the intensive margin of trade) and the number of products traded in bilateral markets (the extensive margin of trade). Then, with these definitions in hand, I show how information flows affect both margins. The model's main conclusions are then evaluated using Canadian bilateral export and import data for 125 of Canada's trading partners over 1988-2004.

The theory delivers two main results. When better information on foreign markets only lowers fixed export costs, exports expand on the extensive margin but not on the intensive margin. In this case, better information about foreign markets creates new entry into export markets, but it has no effect on firm level marginal revenue and marginal cost. As a result, it does not affect any single firms' decision on the quantity of exports and bilateral exports per product remain unchanged. In contrast when better information on foreign markets lowers variable export costs both margins expand. When variable export costs decrease, export values per firm rise and trade on the intensive margin rises. As well, with lower costs of exporting more firms can profitably export, and the extensive margin also expands.

Since the theory predicts that a change in fixed export costs does not alter the intensive margin, but a change in variable export costs does, it provides us with a simple (but partial) test of whether greater market information reduces fixed or variable export costs. If greater information flows only raise trade on the extensive margin, then their impact is primarily on reducing the fixed costs of exporting; if they raise trade flows on both margins they must lower variable export costs as well. To investigate this result empirically, I exploit the fact that my model fits into a traditional gravity model framework. Using Canadian bilateral export and import data for 125 Canada's trading partners over 1988-2004, I then estimate separate Ordinary Least Square (OLS) regressions to determine how information flows affect

[1] Roberts and Tybout (2001) highlight that large fixed export costs, which are sunk in nature, give rise to different policy impacts.

both the intensive and extensive margins. The intensive margin is measured as bilateral exports/imports per product, while the extensive margin is the number of bilaterally traded products measured by Harmonized System six-digit codes.

A key empirical problem is that information flows are largely unobservable. Since a direct measure of information flows is not available, I follow prior literature and use information on the flows and stocks of immigrants as a proxy. In this regard my Canadian data is perfect: Canada has a large number of immigrants from Canada's major trading partners, and immigrants in Canada are thought to have significant effects on trade. The immigrant stock in Canada is also large - it accounted for about one-sixth of Canadian total population in 1996, and the net immigrant stock growth between 1988 and 2004 constituted about 38 percent of the total population increase. Moreover, the largest number of immigrants are from Europe, the U.S., and East and Southeast Asia, which are Canada's major trading partners.

In principle, the flows of information coming from greater immigration could affect both fixed and variable export costs. Immigrant knowledge of their original countries can typically reduce firms' fixed export costs, since immigrants have at least a rudimentary knowledge of the market regulatory environment, shipping rules, laws and business practice in immigrant's original countries. In addition, immigrant knowledge of culture and languages in their original countries may also lower communication costs, which could be linked to variable export costs. Therefore, a priori it is unclear which of these two effects may be dominant in the data.

Overall, my results indicate that information flows primarily affect trade via the extensive margin. Greater information about foreign markets creates new entry and I take this as evidence that new information lowers fixed export costs. The magnitude of these effects is also significant. I find that a 10 percent increase in the immigrant stock from a foreign country is associated with a 0.8 percent increase in the number of products exported from Canada to a foreign country. In addition, a 10 percent increase in the immigrant stock from a foreign country is associated with a 2.7 percent increase in the number of products imported from a foreign country to Canada.

Since my proxy for information flow is not perfect, I conduct numerous sensitivity tests to assure the reader of the robustness of my findings. For example, I alter the classification of my margins and provide empirical results using the Harmonized System four-digit (HS4), eight-digit (HS8) and 10-digit (HS10). To take into account inertia in the trade data, I include lagged dependent variables in the regressions. To control for country specific factors like factor endowments, I include foreign country dummies. I also take into account other trade related variables including GDP per capita and the share of trade in GDP. Since immigration and trade may be simultaneously determined I investigate an Instrumental variable estimation. While the precise results differ across these many specifications, the overall result remains much the same: information flows are tied tightly to fixed costs of exporting and greater information about foreign countries raises entry into export markets.

To some extent the result that immigration is a significant determinant of trade should not be surprising. On the import side it is clear that if immigrants prefer certain goods from their countries of origin, this preference should raise imports. The strength of this effect may well be small empirically. Perhaps more importantly, immigrants also have information about market demand and supply information in their original countries. They are typically

familiar with culture, languages, and institutions in their country of origin, and are likely to be well acquainted with original countries' laws, regulatory systems, and business practices. Immigrant knowledge of their countries of origin could promote both exports and imports.

While my findings may in some ways be not be surprising, they are novel to the literature. Although researchers have found evidence of substantial fixed export costs, and often argue that information costs are the main source of these costs, at present there are no empirical findings directly supporting the link between greater market information and lower fixed export costs. Previous empirical studies typically assume information costs are linked to variable export costs rather than fixed export costs. Gould (1994) analyzes U.S trade with forty-seven partners and finds that immigration has a positive impact on trade. Rauch and Trindade (1999) find that ethnic Chinese networks raises bilateral trade more for differentiated goods than for homogeneous goods, which implies business and social networks can facilitate trade by overcoming information barriers.[2] Therefore, this paper is, to my knowledge, the first empirical research to investigate information effects on firms' fixed export costs rather than firms' variable export costs.

The rest of the paper is organized as follows. In section 2, a simple model is set out to provide the intuition of how immigration affects trade on both margins. Section 3 develops an empirical model, and section 4 analyzes data. In section 5, and 6, benchmark and sensitivity test results are laid out. Section 7 contains concluding remarks. The data appendix involves the Harmonized System limitation, the calculation of immigrant stock data, and three statistic tables.

2 Model

The model demonstrates how improved market information could influence trade on both the extensive and intensive margins of trade by lowering domestic firm costs. Information about export markets could reduce domestic firm's variable export costs, fixed export costs, or both. I develop a simple illustrative monopolistic-competition trade model, where each firm produces a unique differentiated product. I assume that all firms in a country i have the same variable export costs for shipments to country j, but each firm incurs different fixed export costs.[3] These fixed export costs could include information related costs, such as fixed investments in obtaining destination-market information, and fixed advertising expenses for brand recognition. Fixed export costs could also include payments for establishing distribution channels in the destination country, and the fixed cost of adapting a product to foreign markets.

[2]Other studies, such as Portes and Rey (2002), Head and Ries (1995), and Dunlevy and Hutchinson (1999, 2001) find that information variables influence trade considerably.

[3]Several studies, such as Roberts and Tybout (1997) describe sources for these fixed export costs. In addition, Evans (2006) suggests that the discrepancy in fixed export costs could result from different knowledge of foreign markets or different accesses to information.

2.1 Production

Suppose that there are J countries, and that there is only one production factor, labor, which is inelastically supplied in country i at the aggregate level L_i. Country i indicates an exporting country, while country j represents an importing country. When $i = j$, products are supplied and demanded domestically. For the most part, it is not necessary to distinguish the case where $i = j$ from the case where $i \neq j$, but when it is important, the difference will be mentioned.

Production by firm N_i in country i requires a firm-specific fixed labor input $f_{ii}(N_i)$ to sell in the domestic market and a firm-specific fixed labor input $f_{ij}(N_i)$ to export from country i to country j. Since each firm produces a single product, N_i indexes country i's goods as well as its firms. Firms in each country are ranked in an increasing order of fixed labor inputs for their domestic markets. For simplicity, we assume the orderings of firms are the same for all country pairs. This means the firm in country i that has the lowest fixed cost for selling in the domestic market also has the lowest fixed cost to sell in all country i's export markets; the firm that has the second lowest fixed cost to sell in the domestic market also has the second lowest fixed cost to sell in all export markets; etc. Later, when we determine the number of firms that participate in the domestic market, $\overline{N}_{ii}$, and the number of firms that sell in each export market, $\overline{N}_{ij}$, we will follow convention by assuming that the index N_i is continuous. Whereas N_i denotes a ranking of firms for country i that is actually a whole number, we assume that it is a non-negative real number in the range from zero to positive infinity.

Firm-specific fixed export costs, $f_{ij}(N_i)$, are assumed to be a power function of N_i:

$$f_{ij}(N_i) = \beta_i \theta_{ij} [\frac{N_i}{L_i}]^{\alpha}, \qquad \beta_i > 0 \quad \alpha > 0 \qquad i, j = 1, ..., J \tag{1}$$

where β_i is a country-specific efficiency parameter; and θ_{ij} is a positive fixed cost parameter, which allows fixed export costs to vary across country pairs as well as firms. An increase in the fixed cost parameter θ_{ij} raises fixed costs of all the firms in country i that export to country j. In this specification of fixed export costs, the product index N_i in country i is normalized by the labor force L_i, since more populous countries will typically have larger numbers of firms and products at any level of fixed costs. This implies that α represents a positive elasticity of the fixed labor requirement with respect to the normalized index of goods. While the assumption that $\alpha > 0$ assures that fixed costs are increasing in N_i, fixed costs could increase at an increasing or decreasing rate depending on whether α is greater than or less than one. Of course, when $i = j$, equation (1) represents the fixed labor input of selling in the domestic market.

Production by each firm requires a constant variable labor input that is common across all firms in country i and given by the efficiency parameter, β_i. In addition, if a firm exports from country i to country j, it incurs a variable export cost, which is modeled as an "iceberg-type" export cost, $\tau_{ij} > 1$. This export cost is country-pair specific, but common across all firms that export from country i to country j. If an exporter ships τ_{ij} units of a product from country i to country j, only one unit of the product is ultimately available to be sold. It can be assumed that variable selling costs for domestic shipments are subsumed in production costs such that $\tau_{ii} = 1$. Variable trade costs include but are

not restricted to transportation costs. As discussed previously, information about a foreign country may be linked to immigration. A larger stock of immigrants from country j in country i could lower communication costs and, thereby, affect the variable export cost τ_{ij}. Moreover, better information on foreign country could also lower fixed costs of seeking foreign market information, and reduce the fixed export cost parameter θ_{ij}.

2.2 Demand

We assume that utility in the importing country j is symmetric for all goods originating in the exporting country i. Moreover, all the firms in country i that sell to country j face the same marginal cost given by $\beta_i \tau_{ij} w_i$. Thus, all firms in country i that export to country j will sell a common quantity, $q_{ij}(N_i) = q_{ij}$, at a common price, $p_{ij}(N_i) = p_{ij}$. Similarly, all the domestic firms in country i, which participate in the domestic market, will sell the same quantity, $q_{ii}(N_i) = q_{ii}$, at the same price, $p_{ii}(N_i) = p_{ii}$. Consequently, we can write the constant elasticity substitution (CES) utility function for a representative consumer in country j in the following simple manner:

$$U_j = [\sum_{i=1}^{J} \phi_{ij} \overline{N}_{ij} q_{ij}^{\frac{\delta-1}{\delta}}]^{\frac{\delta}{\delta-1}} \qquad \delta > 1 \qquad\qquad j = 1, ..., J \tag{2}$$

Here, δ is the elasticity of substitution that is common across products and countries and ϕ_{ij} is a positive preference parameter, which is common across all the products produced in country i and sold in country j. The endogenous variable $\overline{N}_{ij}$ is the equilibrium number of goods produced in country i and sold in country j, which will be pinned down shortly.

From the constrained maximization problem for the representative consumer, we obtain conventional CES demand functions that, when aggregated across the population, can be written as:

$$q_{ij} = \frac{\phi_{ij}^{\delta} p_{ij}^{-\delta} Y_j}{P_j^{1-\delta}} \qquad\qquad i, j = 1, ..., J \tag{3}$$

where Y_j is the total income in country j and the standard CES aggregate price index is:

$$P_j = [\sum_{i=1}^{J} \overline{N}_{ij} \phi_{ij}^{\delta} p_{ij}^{1-\delta}]^{\frac{1}{1-\delta}} \qquad\qquad j = 1, ..., J \tag{4}$$

Firms are assumed to be small relative to the market and, thus, do not perceive that their behavior affects either the number of firms participating in a market, $\overline{N}_{ij}$, or the aggregate price index, P_j.

2.3 Equilibrium under monopolistic competition

If a firm in country i exports $\tau_{ij} q_{ij}$ units of a differentiated product, only q_{ij} arrives in country j. Consequently, the overall labor input required for firm N_i located in country i to deliver goods to country j, which includes both fixed and variable labor requirements, is a linear function of output:

$$l_{ij}(N_i) = f_{ij}(N_i) + \tau_{ij} q_{ij} \beta_i = \beta_i [\theta_{ij} [\frac{N_i}{L_i}]^{\alpha} + \tau_{ij} q_{ij}] \qquad i, j = 1, ..., J \tag{5}$$

When $i = j$, equation (5) represents the labor input required for domestic sales.

The potential profits of firm N_i on sales in market j are given by:

$$\pi_{ij}(N_i) = p_{ij} q_{ij} - w_i \beta_i \tau_{ij} q_{ij} - w_i f_{ij}(N_i) \qquad i, j = 1, ..., J \tag{6}$$

The first order condition for profit maximization can be rearranged to obtain a standard markup pricing equation:

$$p_{ij} = m w_i \beta_i \tau_{ij} = p_{ii} \tau_{ij} \qquad i, j = 1, ..., J \tag{7}$$

where w_i is the wage rate in country i and $m = \frac{\delta}{\delta - 1}$ is the constant markup, which arises with CES demand. The second equality follows because $\tau_{ii} = 1$, and the price of a product in country j is τ_{ij} times larger than the price of the product in the domestic market.

On the one hand, if a firm would earn negative profits in an export market under monopolistic competition, it will elect to stay out of the market. On the other hand, if a firm would earn positive profits in exports, it will choose to participate in the export market. Consequently, when there is a continuum of firms ranked by fixed export costs, there will be a marginal firm that makes zero profit through exports and produces a cutoff product $\overline{N}_{ij}$.[4]

$$\begin{aligned} 0 = \pi_{ij}(\overline{N}_{ij}) &= p_{ij} q_{ij} - w_i \beta_i \tau_{ij} q_{ij} - w_i f_{ij}(\overline{N}_{ij}) \\ &= \frac{p_{ii} \tau_{ij} q_{ij}}{\delta} - \frac{p_{ii}[\delta - 1]\theta_{ij}}{\delta} [\frac{\overline{N}_{ij}}{L_i}]^{\alpha} \qquad i, j = 1, ..., J \end{aligned} \tag{8}$$

This formulation of the zero profit equation for a cutoff good produced in country i and sold in country j makes use of equation (1) and equation (7). Notice that country i has a distinct cutoff product for its domestic market and for each of its export market. Cost side considerations suggest that the number of country i's firms participating in its own domestic market will typically exceed the number of its firms participating in any foreign market such that $\overline{N}_{ii} > \overline{N}_{ij}$ for all $j \neq i$.[5]

2.4 The extensive and intensive margins of trade

We can now define the intensive margin of trade to be the value of bilateral exports per product and the extensive margin of trade to be the number of products exported from country i to country j.

Since each firm in country i exports the same quantity to country j at the same price, the average value of bilateral exports per product is equal to the value of bilateral exports for any product. Consequently, from equation (3), the value of bilateral exports per product, which gives the intensive margin, is:

[4] When $i = j$, equation (10) provides the expression for $\overline{N}_{ii}$.

[5] If the foreign demand for country i's goods exceeds the domestic demand to a sufficient extent, the model allows for the theoretical possibility that this typical pattern could be reversed. The key conclusions of the model concerning the extensive margins of trade do not depend on the magnitude of $\overline{N}_{ii}$ or $\overline{N}_{ij}$.

$$\frac{X_{ij}}{\overline{N}_{ij}} = p_{ij}q_{ij} = \tau_{ij}^{1-\delta}\phi_{ij}^{\delta}Y_j P_j^{\delta-1}p_{ii}^{1-\delta}$$
$$\delta > 1 \qquad i,j = 1,...,J \tag{9}$$

where X_{ij} is the total value of bilateral exports (f.o.b.) from country i to country j.[6]

By rearranging equation (8), we can obtain the number of products exported from country i to country j, which gives the extensive margin:

$$\overline{N}_{ij} = \gamma\tau_{ij}^{[1-\delta]/\alpha}\theta_{ij}^{-1/\alpha}\phi_{ij}^{\delta/\alpha}L_i[Y_j]^{1/\alpha}P_j^{[\delta-1]/\alpha}p_{ii}^{-\delta/\alpha}$$
$$\alpha > 0 \;\; and \;\; \delta > 1 \quad i,j = 1,...,J \tag{10}$$

where $\gamma = [\delta - 1]^{-1/\alpha} > 0$. While equations (9) and (10), which determine the intensive and extensive margins of trade, are central to the subsequent empirical modeling, it is straightforward to note how the theoretical model can be closed.

Since labor is required to produce both domestic goods and exports, the labor requirements must be aggregated across both firms and markets to obtain market clearing conditions for each country:

$$L_i \;\; = \sum_{j=1}^{J}\int_0^{\overline{N}_{ij}} l_{ij}(N_i)dN_i \qquad i = 1,...,J \tag{11}$$

Aggregate income in a country consists of labor income, and the profits on both domestic and export sales for intra-marginal firms:

$$Y_i = w_i L_i + \sum_{j=1}^{J}\int_0^{\overline{N}_{ij}} \pi_{ij}(N_i)dN_i \qquad i = 1,...,J \tag{12}$$

In principle, the equilibrium can now be solved, since equations (3), (4), (7), (9), (10), (11), and (12) create a general equilibrium model with $4J^2 + 3J$ equations and the same number of endogenous variables.[7]

Equations (9) and (10) point toward "gravity-equation" analysis. The extensive and intensive margins of trade depend on economic sizes and trade barriers. I focus on the impact that changes in variable export costs given by τ_{ij} and fixed export costs given by θ_{ij} have on the extensive and intensive margins.

The theoretical model delivers two main results. When better information on foreign markets lowers only fixed export costs given by θ_{ij}, then exports expand on the extensive margin but there is no direct effect on the intensive margin. A decrease in the fixed export cost θ_{ij} does not influence the value of bilateral exports per products in equation (9) but raises the number of bilateral exported goods in equation (10). Better information about a particular foreign market raises profits and induces additional firms to export into

[6]While a free-on-board or f.o.b. value excludes transport and insurance costs, here we are technically excluding all variable trade costs.

[7]One equation is redundant according to the Walras' Law, and one price can be chosen as a numeraire.

that foreign market. There is, however, no direct effect on firm-level marginal revenues or marginal costs. Thus, there is no direct effect on the profit-maximizing quantities that any intra-marginal firm chooses to export. As a result, a reduction in fixed export costs does not have a direct effect on the value of bilateral exports per product.

In contrast, when better information on foreign markets lowers variable export costs given by τ_{ij}, there are direct effects that increase both margins, as indicated by equations (9) and (10). When variable export costs decrease, the value of exports per firm rises due to lower marginal costs and the number of exporting firms increases because of higher profits.

The theory also predicts that consumer preferences influence both intensive and extensive margins. When consumers in country j have a stronger preference for products from country i such that ϕ_{ij} is larger, both the intensive and extensive margins determined by equations (9) and (10) will be larger. This is because, a larger preference parameter ϕ_{ij} increases demand for products exported from country i to country j, and this elevated demand influences both the value of bilateral exports and the profitability of bilateral exports. A larger stock of immigrants from country i in country j may be associated with a higher value of ϕ_{ij} if immigrants prefer certain goods from their original countries. In such a case, there would be an additional channel through which immigration may influence trade on both margins on the import side. For example, a larger number of immigrants from country i residing in country j may increase the extensive and intensive margins of country i's bilateral exports and country j's bilateral imports.

Of course, other gravity-type variables also matter. For instance, an increase in the economic size of a foreign country Y_j or the foreign price P_j and a decrease in the domestic price p_i raises both margins. It is important to observe that an increase in the size of country i, measured by its labor endowment, L_i, only raises the extensive margin of trade.

The theoretical model demonstrates how better market information could influence trade on both the extensive and intensive margins by lowering the costs of domestic firms. Since a change in fixed export costs does not directly alter the intensive margin but a change in variable export costs does alter this margin, there is a natural springboard for empirical analysis. By examining whether information costs affect the intensive margin as well as the extensive margin, we can begin to determine whether information on foreign countries influences variable export costs as well as fixed export costs.

3 Empirical Methodology

The theoretical model shows that information could potentially affect trade along both the extensive and intensive margins depending on whether information barriers act as fixed or variable costs. The key empirical question is how market information, which can be proxied by stocks of immigrants, affects the intensive margin as well as the extensive margin of trade. To answer this question, we analyze the extensive and intensive margins of Canadian exports and imports. The empirical model can be obtained by adopting a small-open-economy assumption, which implies that the foreign price index P_j, the foreign income Y_j, and the domestic price index p_{ii} can be treated as exogenous variables in equations (10) and (9). Then, these two equations form the basis of the regression model.

The regression equations for the extensive and intensive margins of Canadian exports can

be derived by taking logs of both sides in equations (10) and (9), where Canada is country i. It is convenient to exclude the constant term and Canadian specific factors including the size of Canadian labor endowment L_i and Canadian price index p_{ii}, since these factors will be captured by time dummies. Then, replacing subscript i with ca in equations (10) and (9), and rearranging equations (10) and (9) yield the expressions for the extensive and intensive margins of Canadian exports destined for country j:

$$LnN_{ca,j} = \frac{1}{\alpha} LnY_j + \frac{\delta - 1}{\alpha} LnP_j + \frac{\delta}{\alpha} Ln\phi_{ca,j} + \frac{1-\delta}{\alpha} Ln\tau_{ca,j} + \frac{-1}{\alpha} Ln\theta_{ca,j} \tag{13}$$

$$Ln\frac{X_{ca,j}}{N_{ca,j}} = \quad LnY_j + [\delta - 1]LnP_j + \delta Ln\phi_{ca,j} + [1-\delta]Ln\tau_{ca,j} \tag{14}$$

Since the difference in the right-hand-side variables between equations (13) and (14) is only the fixed export cost $\theta_{ca,j}$, it provides us with a simple test of whether greater information on foreign markets reduces fixed or variable export costs. For Canadian export equations, if immigrant knowledge of their original countries only raises trade along the extensive margin, then its impact is primarily on reducing the fixed costs of exporting; if it raises trade flows on both margins, it could lower only variable export costs or both variable and fixed export costs.

To obtain the regression equations for the extensive and intensive margins of Canadian imports, we switch i and j in equations (10) and (9), because Canadian imports from country j can be considered as country j's exports to Canada. Then, taking logs of both sides in equations (10) and (9), and excluding the constant term and Canadian specific factors, Y_i and P_i, yield the expressions for the extensive and intensive margins of Canadian imports originating in country j:

$$LnN_{j,ca} = LnL_j + \frac{-\delta}{\alpha} Lnp_{jj} + \frac{\delta}{\alpha} Ln\phi_{j,ca} + \frac{1-\delta}{\alpha} Ln\tau_{j,ca} + \frac{-1}{\alpha} Ln\theta_{j,ca} \tag{15}$$

$$Ln\frac{X_{j,ca}}{N_{j,ca}} = \quad [1-\delta]\ Lnp_{jj} + \ \delta Ln\phi_{j,ca} + \ [1-\delta]Ln\tau_{j,ca} \tag{16}$$

Whether immigrant knowledge of their original countries has an impact on fixed export costs or variable export costs can not be examined in Canadian import regressions, since the knowledge effect is confounded by the immigrant preference effect.[8] However, Canadian import regressions provide us a window to investigate the preference effect. In Canadian import regressions, immigrant preference for certain goods from their original countries raises the preference parameter $\phi_{j,ca}$ in equations (15) and (16) and raise both margins for Canadian

[8]Since immigrant knowledge of their original countries could reduce fixed export costs or variable export costs of foreign firms in immigrant original countries, the regression equations for the extensive and intensive margins of Canadian exports should include immigrant stocks from Canada residing in a foreign country. However, I exclude immigrant stocks from Canada residing in a foreign country from my empirical research, because the data of these immigrants are not available to me. Moreover, because the number of immigrants from Canada residing in a foreign country is typically small, these immigrants seem to have an insignificant effect on Canadian export margins.

imports. Thus, if we assume that immigrant knowledge of their original countries have the same effect on Canadian exports and imports, we expect the effect of immigration on both margins for Canadian imports are larger and more significant than the effect for Canadian exports due to the preference effect.

We can combine equations (13), (14), (15), and (16), because these four equations have the similar right-hand-side variables.[9] Regressors should include the variables capturing Canadian specific factors, the sizes of economy, the price indices, the variable export costs, the fixed export costs, and the preference parameters.

To capture the above factors, I add time dummies to equations (13)-(16) to take into account time specific factors, such as the size of Canadian economy and Canadian price index.[10] The size of foreign economy Y_j or the total number of foreign labor endowment L_j are measured by foreign country's nominal GDP.[11] The foreign country's GDP deflator represents the price index P_j or p_{jj}. Distance between Canada and a foreign country could affect the variable export cost $\tau_{ca,j}$ or $\tau_{j,ca}$ like transport costs, and distance could influence the fixed export cost $\theta_{ca,j}$ or $\theta_{j,ca}$ since longer distance between Canada and a foreign country raises information barriers and fixed export costs. The coefficient on distance captures the combined effect of changes of these costs. Since immigrant preference does not affect exports, the preference parameter $\phi_{ca,j}$ is absorbed by the error term in the export regressions. In Canadian import regressions, the effect of the preference $\phi_{j,ca}$ is captured by the immigration effect. [12]

For simplicity, the subscript ca is dropped, because Canada is the only exporting country or the importing country. Country j indicates 125 Canada's trading partners. With my panel data, the time period is over 1988-2004. I combine equations (13), (14),(15), and (16) and describe my benchmark empirical model as follows:

$$\underbrace{LnN_{jt}}_{the\ extensive\ margin} = \beta_0' + \beta_1' LnMIG_{jt} + \beta_2' LnY_{jt} + \beta_3' LnD_j + \beta_4' LnP_{jt} + \mu_t' + \epsilon_{jt}' \quad (17)$$

$$\underbrace{Ln\frac{X_{jt}}{N_{jt}}}_{the\ intensive\ margin} = \beta_0'' + \beta_1'' LnMIG_{jt} + \beta_2'' LnY_{jt} + \beta_3'' LnD_j + \beta_4'' LnP_{jt} + \mu_t'' + \epsilon_{jt}'' \quad (18)$$

where
the subscript j is the Canada's trading partner, and t is the year;
X_{jt} is the nominal value of Canadian exports to country j at t (or imports from j at t);
N_{jt} is the number of Harmonized System (HS) codes in Canadian exports to country j at t (or Canadian imports from j at t);
MIG_{jt} is the stock of immigrants from country j to Canada at t;

[9]For convenience, although independent variables in equation (16) do not include the size of the foreign economy, I still add the foreign GDP in this regression and expect the coefficient on foreign GDP is not statistically significant in the regression of the intensive margin for Canadian imports.

[10]Time dummies also capture macroeconomic factors influencing Canadian trade.

[11]We do not use the real GDP since the prices are included in our regressions.

[12]I consider the non-linear effect of immigration on trade by adding the square of the log of the immigrant stock. However, this non-linearity is not statistically significant so I exclude it here.

D_j is the great circle distance between Toronto and a major city in a foreign country;
Y_{jt} is the nominal GDP in country j at t;
P_{jt} is a country j's GDP deflator at t (the base year is 2000);
μ'_t, μ''_t are time dummies;
$\epsilon'_{jt}, \epsilon''_{jt}$ are assumed to be well-behaved error terms.

Since there are two margins for Canadian exports and two for Canadian imports, I conduct four OLS regressions separately, using a robust covariance estimator to deal with heteroskedasticity.[13] My main interests are parameters, β'_1, and β''_1, which represent the effect of immigration on the extensive margin of Canadian trade and the intensive margin of Canadian trade, respectively.

In Canadian export regressions, if immigrant knowledge of their original countries only affect fixed export costs, then we expect immigrant stocks only affect the extensive margin of Canadian exports, that is, only β'_1 is significantly greater than zero. If immigrant knowledge of their original countries affect variable export costs as well, we expect both intensive and extensive margins are altered by immigrant stocks, that is, both β'_1, and β''_1 are significantly greater than zero. In Canadian import regressions, we expect that coefficients on immigrant stocks are greater and more significant than those in the export regressions due to the preference effect.

The definition of the immigrant stock is people who are, or who have been, landed immigrants in Canada. The immigrant stocks instead of immigrant flows are used because immigrants could have an effect on trade after they arrived in Canada for many years. In addition, since immigrants promote trade partially through knowledge of their original country languages, common language dummies are excluded.[14]

In benchmark regressions, the number of products are measured by the number of Harmonized System 6-digit (HS6) codes, since they can apply to both imports and exports, and the codes at this level are not updated frequently (see data appendix). Furthermore, HS6 codes including 5,241 products in 2004 seems to be at a disaggregated level. HS6 codes seem to be an appropriate measure of the number of products, because the differences among code descriptions are very subtle. For instance, the HS6 code 8703.32 denotes "Autos, new with diesel engine displacing between 1500 *cc* and 2500 *cc* " and the next code 8703.33 indicates "Autos, new with diesel engine displacing more than 2500 *cc*". The only difference between these two codes is the size of the engine.

[13] I also use a Tobit method developed by Eaton and Tamura (1994) to include zeros in the regressions. Results are qualitatively similar to the benchmark results. Since my data do not contain many zeros, I do not report estimates in this paper. In addition, I do not adopt a Poisson Pseudo Maximum Likelihood method developed by Santos Silva and Tenreyro (2006) to take into account the inconsistency in log linear models, because the goodness-of-fit χ^2 test rejects the null hypothesis that these data follow the Poisson distribution.

[14] When I add common language dummies, which take one if two countries share the same official languages, otherwise zero, the effect of immigration on trade becomes smaller, but results are qualitatively similar.

4 Data

The World Trade Analyser provides the data of Canadian trade and the number of traded products at the HS4, HS6, HS8 and HS10 levels. The data cover Canada's 125 trading partners (see Table A1 in the appendix) over 17 years from 1988 to 2004.[15] I combine immigrant stock data from Census Canada and immigrant flow data from Citizenship and Immigration Canada to calculate annual immigrant stocks (see data appendix). The data of GDP, GDP deflators, GDP per capita and openness are from World Development Indicators. CENTRE D'ETUDES PROSPECTIVES ET D'INFORMATIONS INTERNATIONALES provides distance and contiguity data. Data of *landlock* and *island* are from Rose (2005). The data appendix provides a descriptive statistics table and a correlation table. The descriptive statistics table shows the most missing data is from GDP, and the correlation table presents there is no significant correlation among regressors.

Trade volume with these 125 countries accounted for more than ninety percent of total Canadian trade in any year between 1988 and 2004. Moreover, the immigrant stock from these 125 countries in 2001 included more than 90 percent of the total immigrant stock in Canada. Since many observations for GDP and the GDP deflator are missing, and data of exports and imports contain zeros, observations decrease from $125 * 17 = 2125$ to 2051 for exports and to 2037 for imports in my benchmark OLS regressions.

The number of Canadian export and import products varies across countries. In 1995, the U.S. was Canada's main trading partner in terms of the number of export and import goods. The number of exported products from Canada to the U.S. accounted for 91 percent of the HS6 codes, and the number of imported products from the U.S. to Canada constituted 98 percent of the HS6 codes in 1995.

The immigrant stock varies across countries. Based on my data, in 2001, the top ten immigrant countries of origin in terms of the size of the immigrant stock were the United Kingdom, China, Italy, India, the United States, Hong Kong, Philippines, Poland, Germany, and Portugal. The immigrant stock in these ten countries accounted for 56 percent of the total immigrant stock, and the immigrant stock from the U.K. alone consisted of 12 percent in 2001. Most immigrants from European countries and the U.S. arrived before 1988, whereas a large number of immigrants from several Asian countries came to Canada after 1988.[16] For instance, the immigrant stock from China, India, Hong Kong, and Philippines more than doubled over the period of 1988-2004, while the immigrant stock from the European countries and the U.S. stabilized. In addition, the immigrant stock changes over time. In my dataset, the immigrant stock had grown steadily at an average 2.3 percent per year from 3.7 million in 1988 to 5.3 million in 2004.

[15] My trade data from World Trade Analyser are available over the period of 1988-2004, and 125 countries are obtained by combining three datasets: immigration, GDP, and trade data. Furthermore the Belgium-Luxembourg economic union is treated as one foreign country, and Germany includes East and West Germany.

[16] The large influx of immigrants from Europe occurred in the immediate postwar period.

5 Regression Results

Four OLS regressions for two margins of Canadian exports and two margins of Canadian imports are conducted. Table 1 shows benchmark results of equations (17) and (18). My empirical model fits the data well, and it can explain 31 percent - 77 percent of the variation in the data.

The first row of Table 1 shows the coefficient on immigrant stocks and reveals that the effects of immigration on the extensive margin are larger and more significant than those on the intensive margin. The first and second columns present the results for exports and reveal that a 10 percent increase in the immigrant stock from a foreign country is associated with a 0.8 percent increase in the number of goods exported from Canadian to a foreign country, but a 0.1 percent decrease in the value of Canadian exports per product to a foreign country. The effect of the immigrant stock on the extensive margin of Canadian exports is statistically significant at the 1 % level, but the effect on the intensive margin of Canadian exports is statistically insignificant. In the third and fourth columns of Table 1, a 10 percent increase in the immigrant stock from a foreign country is associated with a 2.7 percent increase in the number of goods imported from a foreign country to Canada, and a 0.7 percent increase in the value of Canadian imports per product from a foreign country. The effects of the immigrant stock on both margins of Canadian imports are statistically significant at least at the 5 % level.

Table 1: Benchmark Results

	Exports		**Imports**	
Variables (in logarithms)	Extensive Margin # of exported goods	Intensive Margin exports per good	Extensive Margin # of imported goods	Intensive Margin imports per good
MigrantStock	0.079	-0.013	0.273	0.071
	$(0.011)^a$	(0.01)	$(0.013)^a$	$(0.029)^b$
GDP	0.459	0.5	0.57	0.394
	$(0.011)^a$	$(0.010)^a$	$(0.012)^a$	$(0.021)^a$
Distance	-0.667	-0.236	-0.282	-0.733
	$(0.043)^a$	$(0.039)^a$	$(0.044)^a$	$(0.046)^a$
Pj	0.061	-0.024	0.104	-0.131
	$(0.012)^a$	$(0.009)^a$	$(0.018)^a$	$(0.028)^a$
Observations	2051	2051	2037	2037
R-square	0.76	0.69	0.77	0.31

The extensive margin of exports is the log of the number of products in Canadian bilateral export markets, which is measured by the HS 6-digit codes. The intensive margin of exports is Canadian bilateral exports per product, which are the ratio of the total bilateral exports to the number of exported products. Measures of two margins for imports are similar to those for exports. Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level ; a constant and time dummies are included but not reported.

Results in Table 1 provide evidence that immigrant knowledge of their original countries only affects fixed export costs, since the immigrant stock from a foreign country only has a

significant effect on the extensive margin rather than on the intensive margin for Canadian exports. Based on the theory, a decrease in the fixed export cost does not change the intensive margin because firm's decision on the export volume does not rely on fixed export costs. This decrease does raise the extensive margin, because fixed export costs affect the firm's profitability of exports and firm's decision on participation in bilateral export markets.

If we assume immigrant knowledge of their original countries has the same impact on both exports and imports, the immigrant preference effect has also been found. The reason is that effects of immigration on both margins for Canadian imports are greater and more significant than those effects for Canadian exports. In this case, immigrant preference raises demand for products from immigrant original countries, and both margins expand. [17]

To assess the economic importance of immigration effects, I use these benchmark results to conduct a counter-factual analysis. If 200,000 immigrants in 2004 had not arrived in Canada, on average, the number of goods exported from Canada to a foreign country would have decreased by 2, and the number of goods imported from a foreign country to Canada would have decreased by 9. Moreover, if 200,000 immigrants in 2004 had not arrived in Canada, on average, exports per product from Canada to a foreign country would have increased by US $ 304, and imports per product from a foreign country to Canada would have decreased by US $ 5,316. In 2004, on average, the number of goods exported from Canada to a foreign country was 667, the number of goods imported from a foreign country was 869, exports per product to a foreign country were about 0.7 million US dollars, and imports per product from a foreign country were about 1.5 million US dollars. Perhaps not surprisingly the economic magnitude of the impact of immigration on trade is small. Clearly immigration would not be an effective instrument of trade promotion. However, we are using immigration stocks as a proxy for information on foreign markets and are interested in the relative impact on the extensive and intensive margins.

Since the product of the extensive margin and the intensive margin equals the total volume of trade, the summation of coefficients in the first column and the second column of Table 1 equals the total effect of these variables on Canadian exports, and the summation of coefficients in the third column and the fourth column of Table 1 equals the total effect of these variables on Canadian imports. In other words, changes in Canadian trade can be explained by changes in the extensive margin and the intensive margin.

The findings show that immigration mostly affects the extensive margin rather than the intensive margin. In the first row of Table 1, a 10 percent increase in the immigrant stock from a foreign country is associated with a 0.7 percent increase in overall volume of Canadian exports ($0.079 - 0.013 = 0.066 \approx 0.07$) and a 3.4 percent increase in imports ($0.273 + 0.071 = 0.344 \approx 0.34$).[18] We find that immigrant-related increase in Canadian exports can be completely interpreted by the expansion of exports on the extensive margin, since the effect of immigration on the intensive margin of exports is insignificant. The 79 percent immigrant-related increase in Canadian imports reflects the growth of imports on

[17] I estimate seemly unrelated regressions and test the cross regression restrictions. Differences of coefficients on immigration between export regressions and import regressions are significant at the 1% level.

[18] These coefficients are statistically significant at the 1 percent level. A comparable result is from Head and Ries (1998). Using Canadian trade data over 1980-1992, they find that a 10 percent increase is associated with a 1 percent increase in exports and 3 percent increase in imports.

the extensive margin ($0.273/0.344 \approx 79\%$). The immigrant-related increase in the intensive margin of imports constitutes only 21 percent of this increase ($0.071/0.344 \approx 21\%$).

For other variables, the foreign country GDP raises the extensive and intensive trade margins for both Canadian exports and imports. For export regressions, positive effects of the foreign country GDP on both margins are expected in equations (13) and (14), since the large economy in the destination country demands a large number of Canadian exporters and large exports per product. The positive effect of the foreign country GDP on the extensive margin of Canadian imports is expected in equation (15), because, given the fraction of bilateral exporters in all the firms, the large economic mass in the source country implies that a large number of firms exists; in turn, there is a large number of firms exporting to Canada. However, the positive effect of the foreign country GDP on the intensive margin of imports contradicts the prediction from equation (16), that the source country GDP does not affect the intensive margin of Canadian imports. The possible explanation is measurement errors in the number of traded goods. If HS6 codes are still at very aggregate level, then the intensive margin of imports should be considered as imports per industry instead of imports per product. Although the source country GDP does not increase imports per product, the source country GDP increases Canadian imports per industry because a larger source country economy raises the number of goods exported to Canada in a industry.

The coefficients on distance have the expected sign. Distance reduces both margins, since high variable export costs, like transportation costs, dampen the number of traded products and trade per product. The decrease in the extensive margin could also result from an increase in fixed export costs associated with distance. In principle, magnitudes of coefficients on distance hinge on underlining parameter values.

For Canadian exports, the foreign country GDP deflator expands the number of products exported from Canada to a foreign country but reduces bilateral exports per product. For Canadian imports, the foreign price raises the number of products imported from a foreign country to Canada but reduces bilateral imports per product. Based on my theory, some findings are expected, but others are surprising. The expected findings are that the higher foreign price raises the number of Canadian exported products, since this higher foreign price raises the demand for Canadian exports and profitability of Canadian exports, and higher foreign prices also reduce the imports per firm from foreign countries, because higher foreign prices reduce Canadian import demand for foreign products. However, the surprising findings are the negative effect of foreign prices on the intensive margin of Canadian exports and the positive effect on the extensive margin of Canadian imports. One possible explanation is that the high foreign price corresponds to fast growing markets, which could reduce Canadian exports per firm and enhance the number of goods imported from a foreign country to Canada. The other possible interpretation is that import barriers and export promotion policies in foreign countries could reduce Canadian exports per product and enhance the number of exported goods to Canada, and these barriers and policies also raise the foreign price.

6 The Sensitivity Analyses

Since my proxy for information flow is not perfect, numerous sensitivity tests are conducted to assure the reader of the robustness of my findings. For example, we alter the classification of my margins and provide empirical results using the Harmonized System four-digit (HS4), eight-digit (HS8) and 10-digit (HS10). To take into account inertia in the trade data, lagged dependent variables in the regressions are included. Foreign country dummies control for country specific factors like factor endowments. The sensitivity tests also include other trade related variables including GDP per capita and the share of trade in GDP. Since immigration and trade may be simultaneously determined an instrumental variable estimation is adopted. While the precise results differ across these many specifications, the overall result remains much the same: information flows are tied tightly to fixed costs of exporting and greater information about foreign countries raises entry into export markets.

6.1 Different Measures of Margins

Different measures of margins are used, because HS6 codes used in the benchmark regressions could be at an aggregated level. I measure the extensive and intensive margins of exports at the Harmonized System 4-digit (HS4) and Harmonized System 8-digit (HS8) levels, while I measure both margins of imports at the the Harmonized System 4-digit and Harmonized System 10-digit (HS10) level, because HS8 codes only apply to Canadian exports and HS10 codes only apply to Canadian imports. The number of HS4 codes is less than the number of HS6 codes whereas the number of HS8/HS10 codes is greater than the number of HS6 codes. (In 1988, the number of HS4 codes was 1,252; the number of HS6 codes was 5,032; the number of HS8 codes was 5,701; the number of HS10 codes was 13,662. Since the number of HS6 codes is very close to the number of HS8 codes, we expect the similar estimates as I use these two codes to measure margins.) Thus, we expect the effects on the extensive margin decrease as we move from HS8/HS10 codes to HS4 codes.

Table 2 presents these results for Canadian exports and imports. The benchmark results are also included in the third and fourth columns. Different measures of margins do not alter my results significantly. In the first row of Table 2 for export regressions, the immigrant stock has positive and significant effects on the extensive margin of Canadian exports, and it does not significantly affect Canadian exports on the intensive margin. This suggests that information of immigrant original countries can only change the fixed export costs rather than the variable export costs. In the first row of Table 2 for import regressions, immigrant stocks mostly have positive and significant effects on both extensive and intensive margins of Canadian imports. This is the evidence of the immigrant preference effect. In addition, distance, the foreign country GDP, and the foreign price still have significant influences on two margins of trade.

The coefficients in regressions of the extensive margin measured by HS8/HS10 codes are largest, whereas the coefficients in regressions of the extensive margin measured by HS4 codes are smallest, since the number of codes decreases as we move from HS8/HS10 codes to HS4 codes. These results suggest that my benchmark results could underestimate the effect of immigration on the extensive margin, if HS6 codes are at the very aggregate level. Moreover, as we measure margins by HS8 or HS6 codes in export regressions of Table 2, the

coefficients are very similar because the number of HS8 codes is close to the number of HS6 codes.

Table 2: Different Measures of the Extensive and Intensive Margins

Exports						
Variables	**HS8 codes**		**HS6 codes (benchmark)**		**HS4 codes**	
(in logarithms)	Extensive	Intensive	**Extensive**	**Intensive**	Extensive	Intensive
MigrantStock	0.08	-0.015	0.079	-0.013	0.072	-0.006
	$(0.011)^a$	(0.01)	$(0.011)^a$	(0.01)	$(0.010)^a$	(0.01)
GDP	0.467	0.492	0.459	0.5	0.383	0.576
	$(0.011)^a$	$(0.010)^a$	$(0.011)^a$	$(0.010)^a$	$(0.011)^a$	$(0.010)^a$
Distance	-0.679	-0.225	-0.667	-0.236	-0.555	-0.348
	$(0.043)^a$	$(0.039)^a$	$(0.043)^a$	$(0.039)^a$	$(0.042)^a$	$(0.041)^a$
Pj	0.061	-0.024	0.061	-0.024	0.053	-0.017
	$(0.012)^a$	$(0.009)^a$	$(0.012)^a$	$(0.009)^a$	$(0.010)^a$	$(0.008)^b$
Obs	2051	2051	2051	2051	2051	2051
R-square	0.76	0.68	0.76	0.69	0.73	0.75
Imports						
Variables	**HS10 codes**		**HS6 codes (benchmark)**		**HS4 codes**	
(in logarithms)	Extensive	Intensive	**Extensive**	**Intensive**	Extensive	Intensive
MigrantStock	0.309	0.036	0.273	0.071	0.231	0.113
	$(0.015)^a$	(0.029)	$(0.013)^a$	$(0.029)^b$	$(0.012)^a$	$(0.030)^a$
GDP	0.644	0.321	0.57	0.394	0.459	0.505
	$(0.013)^a$	$(0.021)^a$	$(0.012)^a$	$(0.021)^a$	$(0.011)^a$	$(0.021)^a$
Distance	-0.315	-0.7	-0.282	-0.733	-0.242	-0.773
	$(0.045)^a$	$(0.044)^a$	$(0.044)^a$	$(0.046)^a$	$(0.041)^a$	$(0.047)^a$
Pj	0.112	-0.139	0.104	-0.131	0.092	-0.119
	$(0.019)^a$	$(0.028)^a$	$(0.018)^a$	$(0.028)^a$	$(0.017)^a$	$(0.027)^a$
Obs	2037	2037	2037	2037	2037	2037
R-square	0.78	0.25	0.77	0.31	0.75	0.41

Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level ; a constant and time dummies are included but not reported.

6.2 Adding Lagged Dependent Variables

To control for inertia in the trade data, lagged dependent variables in the benchmark regressions are added, to take into account the adjustment process and unobserved, slow-moving, country-specific, trade-related factors, like the degree of globalization in a foreign country. Results in Table 3 are quantitatively similar to the benchmark results. For export regressions, the absolute values of coefficients on the immigrant stock are slightly larger than the benchmark estimates, whereas, for import regressions, coefficients on the immigrant stock

are slightly smaller. Furthermore, the lagged dependent variables have positive coefficients in Table 3.

Table 3: The OLS Estimation with the lagged dependent variable

Variables (in logarithms)	**Exports**		**Imports**	
	Extensive # of exported goods	Intensive exports per good	Extensive # of imported goods	Intensive imports per good
LaggedDepVar	0.361	0.47	0.257	0.487
	$(0.109)^a$	$(0.037)^a$	$(0.114)^b$	$(0.037)^a$
MigrantStock	0.081	-0.015	0.27	0.065
	$(0.011)^a$	(0.009)	$(0.014)^a$	$(0.029)^b$
GDP	0.462	0.499	0.567	0.396
	$(0.012)^a$	$(0.010)^a$	$(0.012)^a$	$(0.021)^a$
Distance	-0.663	-0.239	-0.278	-0.733
	$(0.043)^a$	$(0.039)^a$	$(0.045)^a$	$(0.045)^a$
Pj	0.064	-0.03	0.113	-0.147
	$(0.014)^a$	$(0.010)^a$	$(0.020)^a$	$(0.029)^a$
Obs	1932	1932	1911	1911
R-square	0.77	0.73	0.77	0.40

Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level ; a constant and time dummies are included but not reported.

6.3 Adding Foreign Country Dummies

Country-specific variables, such as factor endowment and openness, could influence trade. Thus, the sensitivity tests include foreign country dummies in benchmark regressions to capture all the country-specific factors, although those dummies limit the cross-sectional variation. In the first row of Table 4, the immigrant stock has positive and significant effects on the extensive margins of both Canadian exports and imports, while it has insignificant effects on the intensive margins of Canadian exports and imports. This implies that immigrant knowledge of their original countries reduces fixed export costs, although the magnitude of effects on exports is different from that on imports. The findings of insignificant effects on the intensive margin of imports raise doubts on the immigrant preference effect on Canadian imports. The foreign country GDP continues to raise all the margins, while the foreign price has insignificant effects on all the margins except the intensive margin of Canadian imports. [19]

6.4 Adding Other Trade Related Factors

This paper includes other trade related factors in benchmark regressions to capture potential missing variables. These variables are: $LnGDPcpt_{jt}$ is the log of the nominal GDP

[19]Since the distance variable only varies across countries, the distance effect is captured by the country dummies.

Table 4: The Fixed Country Effect

Variables (in logarithms)	**Exports**		**Imports**	
	Extensive # of exported goods	Intensive exports per good	Extensive # of imported goods	Intensive imports per good
MigrantStock	0.057	0.003	0.198	-0.127
	$(0.014)^a$	(0.02)	$(0.038)^a$	(0.089)
GDP	0.571	0.157	0.148	0.468
	$(0.051)^a$	$(0.063)^b$	$(0.054)^a$	$(0.139)^a$
Pj	0.006	-0.007	-0.006	-0.145
	(0.009)	(0.009)	(0.015)	$(0.035)^a$
Obs	2051	2051	2037	2037
R-square	0.44	0.20	0.72	0.14

Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level ; a constant, time dummies and country dummies are included but not reported. Since the distance variable only varies across countries, the distance effect is captured by the country dummies.

per capita in country j at t; $Openness_{jt}$ is the trade share in GDP in country j at t; *US Dummy* is a contiguity dummy (the U.S. dummy), if a country has a common border with Canada, it equals one, otherwise zero; *Landlock* equals one if the country is land-locked, and zero otherwise; *Island* is one if the country is an island country, and zero otherwise; *Ten regional dummies* are Eastern Europe, Western Europe, North America, Central America, South America, Middle East, East Asia, South Asia, Africa, and Oceania. These dummies control for regional effects like factor endowment.

In the first row of Table 5, we find that the coefficients on the immigrant stock for the extensive margins of both Canadian exports and imports are positive and significant, but those for the intensive margins are insignificant. These findings suggest that knowledge of immigrant original countries affect only fixed export costs. Compared with the benchmark results, the effect of the immigrant stock on the extensive and intensive margins of Canadian imports decreases substantially. These reductions could result from controls for both trade-related and immigrant-related factors like openness. Coefficients for the foreign country GDP, distance, and the foreign price are qualitatively similar to the benchmark estimates.

Other coefficients in Table 5 have expected signs. Coefficients on GDP per capita can be positive or negative. Generally rich countries trade more, and GDP per capita could have a positive effect on both margins of trade. In contrast, rich countries are largely service-oriented, and trade in commodities for those countries could be relatively small on the extensive and intensive margins. The findings are that countries with high GDP per capita trade more products with Canada but less volume for each product.

We find coefficients on openness have positive signs in all the regressions. High openness in a country, measured by trade share in GDP, may reflect that the country has low trade barriers or superior infrastructure like ports, which could increase trade on all the margins.

Coefficients on the US dummy reflect U.S. specific effects that could be positive or negative. In addition, the coefficient on the US dummy partially corrects a measurement error in distance, since the distance between Canada and the U.S. is the great circle distance

between Toronto and New York, which tends to understate the real distance between these two countries. The negative and significant coefficients on the US dummy in Table 5 imply that Canada trade too "less" with the U.S. on all the margins except the extensive margin of Canadian exports. Furthermore, land locked countries trade less with Canada mainly on the intensive margins. Island countries trade more with Canada almost on all the margins.

Table 5: The OLS Estimation with other variables

	Exports		**Imports**	
Variables	Extensive	Intensive	Extensive	Intensive
MigrantStock	0.08	-0.007	0.165	0.015
	$(0.009)^a$	(0.01)	$(0.013)^a$	(0.028)
GDP	0.525	0.603	0.576	0.605
	$(0.016)^a$	$(0.018)^a$	$(0.020)^a$	$(0.038)^a$
Distance	-0.813	-0.742	-0.106	-0.991
	$(0.056)^a$	$(0.063)^a$	(0.072)	$(0.123)^a$
Pj	0.03	-0.011	0.076	-0.129
	$(0.011)^a$	(0.01)	$(0.018)^a$	$(0.030)^a$
GDP/capita	0.135	-0.187	0.002	-0.203
	$(0.018)^a$	$(0.021)^a$	(0.035)	$(0.066)^a$
Openness	0.005	0.002	0.003	0.007
	$(0.000)^a$	$(0.000)^a$	$(0.000)^a$	$(0.001)^a$
US Dummy	-1.698	0.801	-1.197	-0.621
	$(0.120)^a$	$(0.156)^a$	$(0.210)^a$	$(0.303)^b$
Landlock	0.022	-0.244	0.05	-0.232
	(0.041)	$(0.054)^a$	(0.063)	$(0.114)^b$
Island	0.262	-0.146	0.2	0.56
	$(0.038)^a$	$(0.048)^a$	$(0.063)^a$	$(0.094)^a$
Obs	2023	2023	2009	2009
R-square	0.86	0.77	0.83	0.39

Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level; a constant, time dummies and regional dummies are included but not reported. All the variables are in logarithms except US, Landlock and Island dummies. *Openness* is defined as the trade share of GDP (in %); *Landlock* equals one if the country is landlocked, and zero otherwise; $Island$ is one if the country is an island country, and zero otherwise. According to Eaton and Tamura (1994), ten regions are Eastern Europe, Western Europe, North America, Central America, South America, Middle East, East Asia, South Asia, Africa, and Oceania. Missing data in openness leads to a decrease in the number of observations.

6.5 Instrumental Variables

Immigration and trade may be simultaneously determined for two reasons. First, other unobserved factors, such as the degree of globalization in foreign countries, could affect both the immigrant stock and trade. This leads to a correlation between the immigrant stock

Table 6: The Instrumental Variable Estimation

Variables	**Exports**		**Imports**	
(in logarithms)	Extensive	Intensive	Extensive	Intensive
MigrantStock	0.151	0.003	0.557	-0.057
	$(0.033)^a$	(0.025)	$(0.049)^a$	(0.074)
GDP	0.419	0.491	0.412	0.465
	$(0.021)^a$	$(0.017)^a$	$(0.029)^a$	$(0.043)^a$
Distance	-0.639	-0.23	-0.171	-0.782
	$(0.043)^a$	$(0.041)^a$	$(0.051)^a$	$(0.056)^a$
Pj	0.061	-0.024	0.104	-0.131
	$(0.012)^a$	$(0.009)^a$	$(0.018)^a$	$(0.027)^a$
Obs	2051	2051	2037	2037
R-square	0.75	0.69	0.72	0.30
First Stage				
Pop. Density	0.410	0.410	0.408	0.408
	$(0.024)^a$	$(0.024)^a$	$(0.024)^a$	$(0.024)^a$
F Value	291.74	291.74	288.31	288.31

Robust standard errors in parentheses; ^{b} indicates significance at the 5% level; ^{a} indicates significance at the 1% level; a constant and time dummies are included but not reported. In the first stage, I only report the parameter of the excluded instrument, the log of population density in a foreign country, and other controls are the log of MigrantStock,the log of GDP,the log of Distance,the log of Pj, time dummies and a constant.

and the disturbance. Second, the problem of reverse causality may arise. That is, a high immigrant stock could give rise to high volume of trade, while high volume of trade could lead to a high immigrant stock simultaneously. High trade volume between Canada and a foreign country could indicate that the foreign country has better knowledge of Canada so that Canada attracts a large number of immigrants from that country. High trade volume may also imply that Canada and a foreign country have a close diplomatic relationship and fewer restrictions on immigration between two countries. Therefore, I conduct an instrumental variable estimation and use two-stage least square regressions.[20]

The log of the population density in the foreign country is used as the instrumental variable. In the last two rows of Table 6, this instrument is not weak since F values are close to three hundred, and in the first stage, the population density in the foreign country has a positive and significant effect on the immigrant stock. To prove that the instrument is valid, I add the log of the population density in the foreign country into the benchmark regressions in equation (17)- (18). The effect of the population density on all the margins except the extensive margin of imports are not significant at the 1% level. This implies after I control for the immigrant stock, the population density does not have a significant effect on most margins of trade.[21]

In the first row of Table 6, the immigrant stock has positive and significant impacts on the extensive margins of both Canadian exports and imports, while it has insignificant effects on the intensive margins of Canadian exports and imports. This implies that knowledge of immigrant original countries only reduces the fixed export costs. The insignificant effect on the intensive margin of imports questions the immigrant preference impact on imports. I also find that the effects of the immigrant stock on the extensive margins of exports and imports almost double the effects in the benchmark results. In Table 6, the foreign country GDP, distance, and the foreign price continue to have significant effects on all the margins.

7 Conclusion

This paper investigates whether information on foreign market influence fixed export costs, using a combination of theory and empirics. To answer this question, I develop a simple model of monopolistic competition that shows how I can distinguish between the impact of better information on fixed and variable export costs. Then, I show how information flows affect both the intensive and extensive margins in principle. Using Canadian bilateral export and import data for 125 Canada's trading partners over 1988-2004, I have documented empirical evidence that information on foreign market affects fixed export costs but not variable export costs. While my findings may be not surprising, they are novel to the literature.

Overall, my results indicate that information flows primarily affect trade via the extensive margin. I adopt the immigrant stock as a proxy of information of immigrant original

[20]Hausman tests, however, can not reject the null hypotheses that OLS is a consistent estimator for the four regressions.

[21]In addition, in the first stage, the specifications for all the regressions are the same, but the number of observations for export and import regressions are different. This leads to the same estimates for two export regressions and the same estimates for two import regressions in the first stage.

countries. I find that a 10 percent increase in the immigrant stock from a foreign country is associated with a 0.8 percent increase in the number of products exported from Canada to a foreign country. In addition, a 10 percent increase in the immigrant stock from a foreign country is associated with a 2.7 percent increase in the number of products imported from a foreign country to Canada.

Evidence that new information lowers fixed export costs has been discovered. My findings show that the immigrant stock from a foreign country to Canada has the statistically significant effect on the extensive margin of Canadian exports, but the insignificant effect on the intensive margin of Canadian exports. Based on my theory, this is evidence that better information on foreign markets only influences fixed export costs rather than variable export costs. When fixed export costs decrease, export volumes per firm do not change, and exports on the intensive margin do not alter. However, with lower fixed export costs more firms can profitably export, and the extensive margin expands. I also find that effects of immigration on both margins for Canadian imports are greater and more significant than those effects for Canadian exports. Immigrant preference of their original countries could contribute to these larger effects for Canadian imports, since this preference raises demand for goods from immigrant original countries, and both margins expand. Moreover, a series of sensitivity tests confirms my findings.

This paper suggests that market information in destination countries can reduce fixed export costs for domestic firms, lower uncertainty of trade policy responses, and improve policy making processes. Few government policies designed to enhance or stimulate trade are successful. Part of the problem is thought to be that the response to trade enhancing policies differs across countries and time periods, and recent empirical literature proposes that diverse policy responses are likely when there are substantial fixed costs of exporting. I find that better information on foreign markets can lower fixed export costs. This finding supports those trade promotion programs and foreign missions such as embassies and consulates in many countries, which provide market demand and supply information of domestic and foreign countries for their clients. These programs and foreign missions are an effective way to ameliorate uncertainty of trade policy impacts, improve policy making processes, and help many countries benefit from trade.

This paper hinges on a perfect information model. Future work can be extended to incorporate hidden action and hidden information to study information effects on trade. Behavior of adverse selection and moral hazard can be analyzed in an international context.

Data Appendix

`Data Source`

`Harmonized System codes`

The Harmonized System is an international 6-digit commodity classification. Both Canadian export and import goods classifications are based on the international HS6 codes and are comparable at this 6-digit level. Canada has extended HS 6-digit codes to HS 8-digit codes for the purpose of Canadian exports, whereas Canada has extended them to HS 10-digit codes for the purpose of Canadian imports. HS10 codes are not based on HS8 codes. For example, the HS8 code 0102.10.10 represents "Bovine, live pure-bred breeding, dairy", while the HS10 code 0102.10.0010 refers to the same good.

A potential limitation for HS codes is that they are constantly updated. HS6 codes have been updated every 6-7 years. Two major amendments occurred in 1996 and 2002. The magnitude of amendment in HS6 codes is fortunately small. For HS6 codes, in 1988, the number of HS6 codes was 5,032; in 1996, the number of the codes was changed to 5,131; in 2004, the number of the codes became 5,241. Fortunately, 91 percent of HS6 codes in 1988 had not changed over 1988-2004, and the total number of HS6 codes increased by only 4 percent over the whole period.

This problem of amendment is more serious for HS8 and HS10 codes. For HS8 codes, in 1988, the number of the codes was 5,701; in 1996, the number of the codes was changed to 5,743; in 2004, the number of the codes became 6,187. 75 percent of HS8 codes in 1988 had not changed over 1988-2004, and the total number of HS8 codes increased by only 8.5 percent. In addition, in 1988, the number of HS10 codes was 13,662; in 1996, the number of the codes was 16,080; in 2004, the number of the codes was 18,952. Only 27 percent of HS10 codes had not changed over 1988-2004, and the total number of the codes increased by 39 percent.

I realize that all sorts of data amendments appeared for HS6, HS8 and HS10 codes. In the code dimension, codes could merge, delete, extend, regroup, upgrade, or change descriptions. In the time dimension, codes could be unchanging, change once or update many times.

`Data on the immigrant stock`

Data on Canadian immigrant stock by county of birth is available from the 1991, 1996 and 2001 census. To obtain annual stocks I need to combine the stock data with arrival data from Citizenship and Immigration Canada. Assume an attrition rate δ, which results from departures from Canada and deaths, is constant over time and across countries. I calculate the annual stocks of immigration using the following stock-flow rule: $S_{it} = (1-\delta)S_{it-1} + F_{it-1}$. S and F are immigrant stocks and flows respectively; i and t refer to country of origin and time respectively. Using immigrant stocks data in the 1991, 1996 and 2001 Censuses, and annual immigrant flows data, I estimated δ via the following non-linear equation:

$$S_{it} = S_{it-5}(1-\delta)^5 + (1-\delta)^4 F_{it-5} + (1-\delta)^3 F_{it-4} + (1-\delta)^2 F_{it-3} + (1-\delta)F_{it-2} + F_{it-1} + u_{it} \quad t = 1996, 2001$$

The equation fits the data very well, with an R-squared of 0.998, and I find that about 2.3 % of each year's immigrant stock departs from Canada or dies.

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Table A1: The Number of Traded Products measured by HS6 codes in 1995

Country	# of Ex Products	# of Im Products	Country	# of Ex Products	# of Im Products
Afghanistan	4	22	Cameroon	61	34
Albania	14	10	Chile	779	388
Algeria	123	11	China	817	2,766
Angola	28	4	Colombia	457	367
Argentina	560	384	Congo, Republic Of	13	9
Australia	1,292	1,291	Congo, The Democratic Republic of	60	27
Austria	491	1,414	Costa Rica	256	359
Bahamas	231	58	Cyprus	152	44
Bahrain	171	28	Cte d'Ivoire	128	67
Bangladesh	83	223	Denmark	523	1,479
Barbados	336	80	Dominican Republic	253	295
Belgium-Lux	901	1,770	Ecuador	210	252
Belize	77	58	Egypt	347	284
Benin	29	3	El Salvador	104	193
Bermuda	455	39	Ethiopia	64	35
Bolivia	106	78	Fiji	34	91
Brazil	791	1,263	Finland	539	1,005
Bulgaria	123	233	France	1,353	3,029
Burkina Faso	19	24	Germany	1,588	3,535
Burundi	9	6	Ghana	217	115
Cambodia	15	30	Greece	418	551

Country	# of Ex Products	# of Im Products	Country	# of Ex Products	# of Im Products
Guatemala	168	338	Lebanon	344	167
Guinea	51	26	Liberia	6	4
Guyana	161	101	Libya	117	1
Haiti	178	74	Madagascar	30	64
Honduras	127	168	Malawi	15	32
Hong Kong	1,597	2,000	Malaysia	570	1,044
Hungary	270	512	Mali	48	63
Iceland	174	247	Malta	93	96
India	550	1,655	Mauritius	53	105
Indonesia	431	988	Mexico	656	1,988
Iran	187	352	Morocco	178	355
Iraq	1	3	Mozambique	23	12
Ireland	518	924	Nepal	19	212
Israel	606	1,026	Netherlands	1,138	2,139
Italy	1,026	2,868	Netherlands Antilles	234	50
Jamaica	442	244	New Zealand	719	730
Japan	1,623	2,991	Nicaragua	113	40
Jordan	163	70	Nigeria	111	76
Kenya	115	146	Norway	496	886
Korea, South	957	2,000	Pakistan	215	562
Kuwait	292	15	Panama	328	91
Laos	12	27	Papua New Guinea	84	21

Country	# of Ex Products	# of Im Products	Country	# of Ex Products	# of Im Products
Paraguay	150	30	Sweden	749	1,691
Peru	413	336	Switzerland	754	2,233
Philippines	602	951	Syria	116	107
Poland	474	753	Tanzania	90	28
Portugal	341	822	Thailand	644	1,431
Qatar	128	14	Togo	23	4
Romania	253	277	Trinidad and Tobago	647	210
Rwanda	43	10	Tunisia	129	172
Saint Kitts and Nevis	79	21	Turkey	341	649
Saudi Arabia	627	113	Uganda	62	46
Senegal	79	61	United Arab Emirates	575	145
Seychelles	11	23	United Kingdom	1,921	3,436
Sierra Leone	18	77	United States	4,596	4,959
Singapore	950	856	Uruguay	191	112
Somalia	41	15	Venezuela	492	203
South Africa	777	701	Vietnam	187	299
Spain	676	1,601	Yemen	53	6
Sri Lanka	123	446	Zambia	81	18
Sudan	28	21	Zimbabwe	161	108
Suriname	70	17	**Total**	**47,165**	**70,469**

Table A2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Export	2125	1.57E+09	1.55E+10	0	2.68E+11
Import	2125	1.37E+09	1.07E+10	0	1.61E+11
Ex Extensive HS8	2125	423.6273	620.4665	0	5,475
Ex Extensive HS6	2125	396.768	558.0878	0	4,787
Ex Extensive HS4	2125	207.7238	203.4098	0	1,223
Im Extensive HS10	2125	1,266.717	2,438.549	0	17,919
Im Extensive HS6	2125	607.7087	964.1547	0	5,170
Im Extensive HS4	2125	241.0729	299.4879	0	1,252
Ex Intensive HS8	2123	606,015.2	2,941,809	616.0769	4.91E+07
Ex Intensive HS6	2123	659,961.1	3,336,869	616.0769	5.62E+07
Ex Intensive HS4	2123	1,743,212	1.28E+07	883.6608	2.20E+08
Im Intensive HS10	2111	1,192,972	1.13E+07	14.6679	4.02E+08
Im Intensive HS6	2111	1,650,823	1.33E+07	14.6679	4.02E+08
Im Intensive HS4	2111	2,656,400	1.56E+07	14.6679	4.02E+08
MigrantStock	2125	36,352.12	82,663.19	1	766,371
GDP	2062	2.20E+11	8.74E+11	1.27E+08	1.17E+13
Distance	2125	8,631.491	3,592.52	548.3946	15,815.39
Pj	2074	86.96188	227.2548	9.63e-10	9,844.227
PhoneCall Traffic 1995	2125	1.43e+07	1.37e+08	0	1.54e+09

Table A3: Correlation

	Export	Import	exext8	exext6	exext4	imext10	imext6	imext4	exint8
Export	1.00								
Import	0.99	1.00							
exext8	0.69	0.74	1.00						
exext6	0.67	0.72	1.00	1.00					
exext4	0.45	0.50	0.94	0.95	1.00				
imext10	0.56	0.62	0.88	0.88	0.85	1.00			
imext6	0.42	0.48	0.85	0.85	0.87	0.98	1.00		
imext4	0.31	0.37	0.79	0.80	0.87	0.92	0.98	1.00	
exint8	0.99	0.99	0.73	0.71	0.50	0.61	0.48	0.38	1.00
exint6	0.99	0.99	0.72	0.71	0.50	0.61	0.48	0.38	1.00
exint4	1.00	0.99	0.70	0.69	0.47	0.58	0.45	0.34	0.99
imint10	0.05	0.05	0.01	0.00	-0.02	0.00	-0.02	-0.04	0.06
imint6	0.15	0.15	0.08	0.08	0.03	0.06	0.03	0.00	0.17
imint4	0.54	0.54	0.38	0.37	0.24	0.31	0.23	0.16	0.55
MigStock	0.23	0.27	0.54	0.55	0.55	0.62	0.62	0.58	0.26
GDP	0.86	0.89	0.84	0.83	0.67	0.79	0.69	0.58	0.89
Dist	-0.20	-0.20	-0.22	-0.22	-0.22	-0.16	-0.14	-0.11	-0.19
Pj	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.00

	exint6	exint4	imint10	imint6	imint4	MigStock	GDP	Dist	Pj
exint6	1.00								
exint4	1.00	1.00							
imint10	0.06	0.05	1.00						
imint6	0.17	0.15	0.98	1.00					
imint4	0.55	0.54	0.85	0.91	1.00				
MigStock	0.26	0.24	0.00	0.02	0.13	1.00			
GDP	0.89	0.87	0.03	0.13	0.48	0.37	1.00		
Dist	-0.19	-0.19	0.00	-0.02	-0.10	-0.10	-0.19	1.00	
Pj	0.00	0.01	-0.01	-0.01	-0.00	0.00	0.01	0.03	1.00

where exnum8 is the number of Canadian exported products at the HS8 level; imext10 is the number of bilateral imported products at the HS10 level; exint8 (the intensive margin) is the bilateral exports divided by exnum8; imint10 is the bilateral imports divided by imnum10.