

Aziz, Nusrate; Aziz, Ahmed; Mahar, Gerry

Working Paper

Migration and Canadian Interprovincial Trade

GLO Discussion Paper, No. 341 [rev.]

Provided in Cooperation with:

Global Labor Organization (GLO)

Suggested Citation: Aziz, Nusrate; Aziz, Ahmed; Mahar, Gerry (2022) : Migration and Canadian Interprovincial Trade, GLO Discussion Paper, No. 341 [rev.], Global Labor Organization (GLO), Essen

This Version is available at:

<https://hdl.handle.net/10419/265372>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Migration and Canadian Interprovincial Trade*

Nusrate Aziz[†], Ahmed Aziz[‡] and Gerry Mahar[§]

October 2022

Abstract

This study estimates international and interprovincial migrants' impact on interprovincial trade using panel data from 1981- 2016 for Canadian provinces. Estimated results show that migration plays a significant role in determining Canadian interprovincial trade. Although the stock of interprovincial migrants is smaller than the stock of immigrants in Canadian provinces, the earlier plays a consistently positive and significant role in interprovincial trade, but the latter is not consistently significant across estimators. Trade openness, population-weighted distance, and language proximity are also significant factors of interprovincial trade creation. Our results are robust to different estimation methods, model specifications, and alternative measures of migrants' stock in Canadian provinces.

Keywords: interprovincial migration, immigration, interprovincial trade, gravity model, IV approach.

JEL Codes: C33, C36, F16, F22

* The first author received the Algoma University Research Fund (AURF) and partially utilized the Northern Ontario Heritage Fund Corporation (NOHFC) funds for this research. We thank Leandra Papa (research assistant), the discussant at the CEA conference, and the conference participants for their useful comments and suggestions.

[†] School of Business and Economics, Algoma University, Canada; Fellow, *Global Labor Organization (GLO)*; Member, *International Migration Research Centre(IMRC)*; and Research Associate, *NORDIK Institute*. Email: nusrate.aziz@algonau.ca

[‡] School of Business and Economics, Algoma University, Canada. Email: ahmed.aziz@algonau.ca

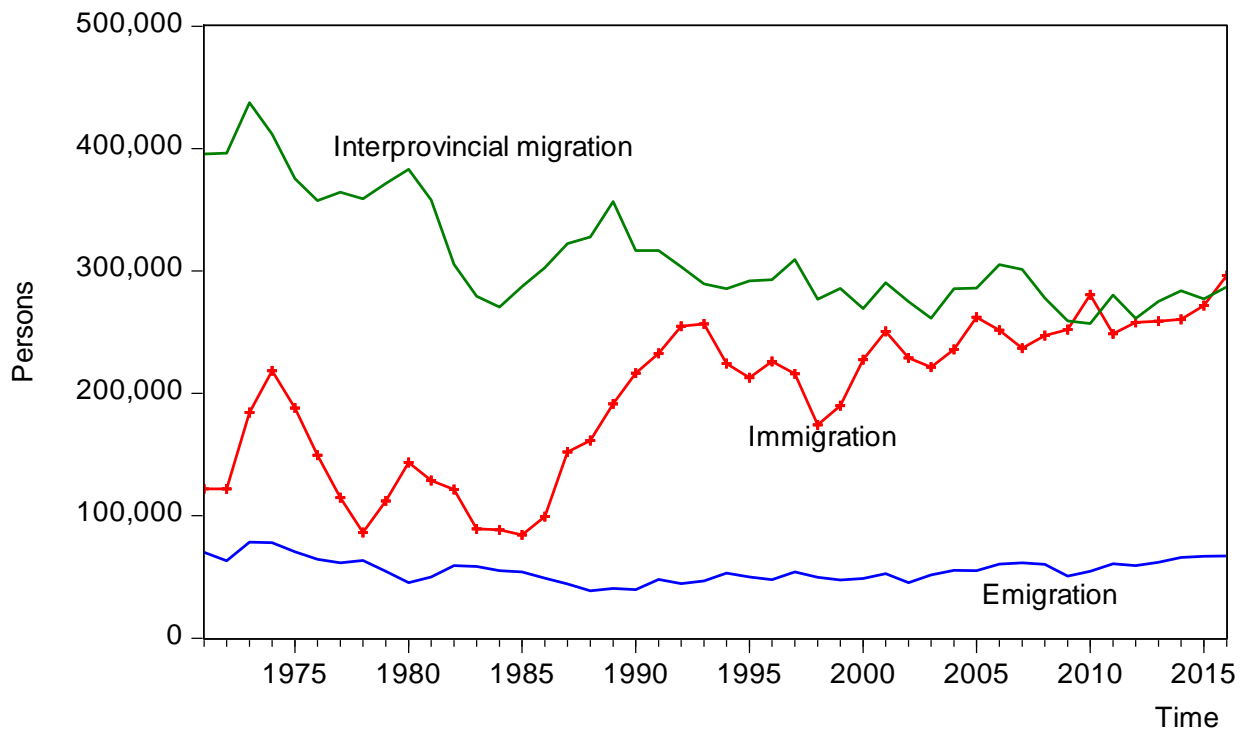
[§] School of Business and Economics, Algoma University, Canada. Email: gerry.mahar@algonau.ca

1. Introduction

Canada has been a net immigration country, accepting more migrants per capita than the United States, the United Kingdom, and Europe. Today, migrants represent more than 20 percent (1 in 5 persons) of Canada's total population (Canadian National Household Survey 2016). This trend is likely to continue in the future because Canada’s immigration policy and economic policy are highly integrated with an emphasis on immigration to meet Canada’s labour market requirements (Challinor 2011).

Over the past 35 years, on average, approximately 294 thousand Canadians moved between provinces every year (see, Table 3). In addition to interprovincial migration, on average, Canada received approximately 212 thousand foreign immigrants every year. Thus, over 500 thousand migrants each year migrate into the Canadian economy (see, Figure 1). The federal and provincial governments of Canada administer a number of programs to enable the full utilization of immigrants' contributions to the economy.

Figure 1: Interprovincial and International Migration of Canada (1971-2016)



Source: Author’s calculations, based on data from Statistics Canada (CANSIM Tables 0510018 & 0510037).

A significant amount of migration to a province increases the aggregate demand of the province. For example, suppose that a large number of immigrants moved from abroad to Ontario. These immigrants will add to the existing aggregate demand in Ontario. Within Ontario, it may not be able to meet the entire demand of these newcomers immediately. Ontario may import goods and services from other provinces, like Quebec, in the short run (maybe in the long run, too). This leads to an increase in imports to Ontario and exports from Quebec. In this circumstance, immigration leads to interprovincial trade. Similarly, if British Columbia (BC) can attract more migrants from other provinces due to higher employment opportunities, migrants will likely move from other provinces to BC. Employment and earnings of migrants in BC would create additional demand for goods and services in the province, resulting in more trade between BC and other provinces.

New immigrants bring information and skills to the destination and reduce the cost of trade between the source and the destination of migrants. A sizable migration not only creates more demand for goods and services but also contributes to the supply of goods and services, thereby, can increase exports. This creates trade between migrants' destination and source locations (Rauch and Trindade 2002).

Canada has promoted many policies on a national level to foster people's free movement and trade of goods and services within the country. The Canadian Free Trade Agreement (CFTA) 2017** was one such attempt to eliminate existing interprovincial barriers and avoid the creation of new barriers to trade, investment, and labour mobility. The goal was the free movement of persons, goods, services, and investments within Canada. The CFTA reaffirms labour mobility provisions and obligations established under the 1995 Agreement on Internal Trade (AIT). If CFTA 2017 becomes successful, i.e., all barriers to the free movement of persons and trade would be eliminated, the intra-industry trade and imports and exports of goods and services between provinces will become much easier. All provinces may enjoy the benefit of CFTA 2017, and the benefits described in the CFTA 2017, such as increased migration and trade will likely grow faster. If this takes place, the Canadian economy will likely become more competitive and vibrant.

Canadian interprovincial migration has attracted renewed attention from economists and policymakers. There are studies about the assimilation of immigrants into the Canadian labour

** CANADIAN FREE TRADE AGREEMENT 2017 (Consolidated Version).

market, and the impact of immigration on Canadian international trade, but *there are no studies that specifically estimated the impact of migration on interprovincial trade*. The impact of labour migration on Canadian interprovincial trade is, therefore, an important question to investigate. Specifically, we investigate whether the stock of migrants plays a significant role in the creation of interprovincial trade. It is worth noting here that we used both the interprovincial stock of migrants as well as the stock of immigrants in Canadian provinces in this study. A combined trade model and separately, the imports and exports models are estimated. We also test if the degree of provincial trade openness, language proximity, and population-weighted distance play any significant role in interprovincial trade.

Immigrants come with knowledge of home-country markets, language, and business contacts that can potentially decrease trading transaction costs. Immigration typically increases trade between the host and the source countries. Sgrignoli, Metulini, Schiavo, and Riccaboni (2015), Iranzo and Peri (2009), Lewer and Hendrick (2009), Lewer (2011), Dunlevy and Hutchinson (1999), and Gould (1994) found that immigration increased trade between the immigrants' host and origin countries. Head and Ries (1998) also found that immigration increased Canadian imports and exports; however, imports increased three times more than exports. Mundar (2005) found that immigration positively affected imports of both intermediate and finished goods, while it positively affected only exports of finished goods. Genc, Gheasi, Nijkamp and Poot (2012) found that a ten percent increase in immigration increased trade volume by 1.5 percent for heterogeneous goods. However, this increase was lower for homogeneous goods. These studies, therefore, indicate no controversy in the literature about the positive impact of immigration on international trade.

Several studies investigated the determinants of interprovincial migration (Day and Winer 2006, Helliwell 1996, Newbold 1996, Gordon and Lin 1994, Day 1992, Robinson and Tomes 1982, Laber and Chase 1971, Courchene 1970). However, a limited number of studies estimated the impact of interprovincial migration on macroeconomic variables. Sharpe, Arsenault and Ershov (2007), and Beine, Coulombe and Vermeulen (2015) were the exceptions. Between them, the earlier study estimated the impact of interprovincial migration on output and labour productivity in Canada. In contrast, the latter study examined how immigration mitigated the increase in the non-tradable sector's size in booming regions of Canada. To the best of our knowledge, there is no

previous study about the impact of Canadian migrants on interprovincial trade. This study addresses the gap in the literature.

What factor(s) influences people to migrate (from one province to another or internationally) is also an important issue to consider when estimating migration's impact on trade creation. Several studies show that migration is significantly correlated with macroeconomic factors (see, Edmonston and Lee 2013, Coulombe 2006, Day and Winer 2006, Helliwell 1996, Newbold 1996, Osberg, Gordon and Lin 1994, Day 1992, Robinson and Tomes 1982, Laber and Chase 1971, Courchene 1970). As such, endogeneity is likely to be an issue to address in a migration-trade model. This study addresses the endogeneity issue. We closely follow the method proposed by Peri and Requena (2010) to construct the instrumental variable in this study.

The gravity model of trade and migration is applied in a balanced panel of the 10 Canadian provinces for the period 1981-2016. The empirical model includes the provincial spatial factors of the trade, including language proximity, provincial population-weighted distance, and provincial trade openness. We apply a number of estimators, including pooled OLS, the fixed effects, two-stage least squares (2SLS), the fixed effects instrumental variable (FE-IV), and the Poisson pseudo maximum likelihood (PPML) in this study.

The stock of interprovincial migrants, the stock of immigrants in each province, and the cumulative net stock of migrants are used in alternative empirical trade models. The estimated results are consistent with each other, indicating the robustness of the study.

Estimated results show that in general, the stock of interprovincial migrants and stock of (international) immigrants increases Canadian interprovincial trade. Specifically, the provincial stock of interprovincial migrants significantly increases both provincial imports and exports. However, immigration can only increase imports between provinces.

Geographical proximity plays a significant role in interprovincial trade. Province-wise spatial factors such as provincial trade liberalization and language proximity between provinces also positively affect interprovincial trade. We use the product of the originating province^{††} and the

^{††} For example, Ontario is an originating province (OP) if people in-migrate to Ontario from other provinces and out-migrate from Ontario to other provinces. In other words, we can say that Ontario is the host province and other provinces are the source provinces of migrants in this case. On the other hand, all other provinces (except Ontario) are the partner provinces (PP).

partner province's GDPs^{‡‡}. The income of provinces is found to be positive and significant in fostering interprovincial trade. Provinces with a common language, English and French, engage more in interprovincial trade than the provinces with a common language, either English or French. Estimated results are robust to different estimation methods, model specifications, and different measures of the stock of migrants.

The remainder of the paper is organized as follows. Section 2 gives a brief discussion of the history of Canadian interprovincial trade flow, trade policy, and migration. Section 3 explains the model specification, data, and methods. Section 4 estimates the empirical models and discusses the results, and Section 5 concludes the study.

2. An overview of Canadian migration and interprovincial trade

About 150 years on, Canada has unfinished business left over from Confederation in 1867. The promise of lower internal trade barriers among former independent colonies helped bring these colonies into Confederation to create the Canadian nation-state. In the intervening years, barriers to interprovincial trade and economic development were making headlines as late as 2018 concerning national pipeline construction to the Pacific Ocean and the Atlantic Ocean. However, persistent trade barriers between provinces are still very high^{§§}.

It is not unusual for consumers, workers, and business firms to encounter as many roadblocks doing commerce across provincial borders as with international trade to the United States or elsewhere. For example, a charge of trying to transport alcohol by a consumer from Quebec to New Brunswick resulted in a case heard by the Supreme Court of Canada in 2018. Tradespeople have difficulties doing similar work at federal government facilities in Ottawa, Ontario, and across the Ottawa River in Gatineau, Quebec due to competing provincial trade license requirements. Restrictions also exist for firms in Ottawa, Ontario bidding on similar federal construction work in Gatineau, Quebec. These barriers to trade and commerce are an imposition on Canadians'

^{‡‡} Even though the standard gravity equation (theoretically) does not allow any role for GDP variable, however with non-homothetic preferences, there would be a natural role for income in gravity model. Therefore, we include the product of the originating and the partner province's GDPs in the model.

^{§§} Gordon Infeld, "Why can't Canada learn to get along? How provincial trade barriers remain a conundrum" Canadian Press, Nov. 28, 2014

freedom to work anywhere in the country. Why do these barriers to trade and migration continue to exist, and what can be done about them is an ongoing public policy debate in Canada^{***}?

From a macroeconomic perspective, it makes little sense to have barriers to trade and economic activity between the provinces of Canada. Protectionist trade policies in the provinces have existed since 1867. If trade barriers are intended to make one province or territory richer by making others poorer, they usually fail, and all suffer economically. The national government has a leading role in ensuring that Canada has an open, efficient, predictable, and stable domestic market where all Canadians are treated fairly and equally.

Interprovincial migration and immigration have become the most important component of population growth in some provinces and territories of Canada (Dion and Coulombe 2008, Gunderson 1994). For higher economic growth, all economic resources must be used efficiently. If resources concentrate in a few regions of the country, balanced provincial growth will be difficult to attain throughout the economy. Equitable distribution of human and capital resources is therefore required for balanced growth in the economy. However, there are natural and artificial barriers that hinder interprovincial labour migration in Canada. Natural barriers include language and cultural differences, availability and scarcity of natural resources, geographical distance, weather, and climate, among others. Artificial barriers include non-recognition of professional certifications (such as medicine, law, and tradespeople certifications) by provinces, the difference in provincial governments' licensing of trades, preferential hiring practices in each province, differences in migration policy, differences in provincial social safety net programs, differences in the education systems and employment standards (see, Gunderson 1994 for detail). Besides, provincial differences in wage rates, cost of living, housing price, provincial tax rates, and urbanization also play an important role in determining migration within Canada (see, Robinson and Tomes 1982, Helliwell and Verdier, 2001). Canadian interprovincial migration is often very difficult to project because it has become extremely volatile over time (Smith 1986).

Interprovincial trade and international trade explain approximately 23 percent and 77 percent of Canada's total trade, respectively (CANSIM data, 2015). The trade openness data show that international trade openness in Canada is much higher (international trade and GDP ratio is 66

^{***} Marie-Danielle Smith, "Will Kinder Morgan walk away from the Trans Mountain pipeline expansion? National Post, May 23, 2018

percent) than interprovincial trade openness (interprovincial trade and interprovincial GDP ratio is about 21 percent) (data source: WDI 2018, and CANSIM 2018). According to 2015's CANSIM data, Canada's interprovincial trade was \$367,884 million, while its provincial import demand from abroad was \$589,855 million per year. Canada has been searching for new international trade partners in Europe and Asia. This initiative involves high transaction and negotiation costs. These initiatives will definitely add value to Canadian international trade and the growth of GDP. However, Canada can also take advantage of a less expensive option to foster Canada's GDP growth with the much lower transaction and negotiation costs. If the country improves its trade relationships among the provinces, it could expand its internal market and increase its GDP. The Standing Senate Committee on Banking, Trade and Commerce agreed with recent estimates suggesting that internal trade barriers reduce Canada's GDP by between \$50 billion and \$130 billion. Elimination of internal trade barriers is expected to increase Canada's GDP ranging between 0.05% and 7.0% (Tkachuk and Day 2016).

It is difficult to list all the trade barriers to interprovincial trade in Canada. However, it is known widely that the provinces have barriers to trade and migration in many forms. For example, not allowing out-of-province doctors to practice, forbidding fish and crab from being processed in another province, prohibiting the export of liquid natural gas, a unique provincial standard for the length of transport trucks, a province's decision to buy domestic goods and services, and provincial production subsidies to businesses (among others) still hinder Canada's internal trade. Canada has been struggling with the problem of interprovincial trade and migration barriers for quite some time. Several initiatives have been taken to reduce these barriers. In 1993, a trade agreement called Agreement on the Opening of Public Procurement took place between New Brunswick and Quebec to reduce trade barriers. In 1995, the Agreement on Internal Trade (AIT) aimed to eliminate and reduce barriers to the free movement of persons, goods & services, and investment within Canada while leaving many interprovincial barriers still in place. In 1996, Atlantic Procurement Agreement took place among New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island. British Columbia and Alberta signed a bilateral agreement called TILMA (Trade, Investment, and Labour Mobility Agreement) in 2007. It was expected that other provinces would take similar initiatives. However, other provinces have not followed the lead of TILMA. However, in 2009, another agreement called Partnership Agreement on Regulation and the Economy took place between New Brunswick and Nova Scotia to enhance competitiveness,

improve productivity, contribute to workforce development, and positively influence issues of mutual interest. In order to eliminate obstacles to interprovincial trade, labour mobility, facilitate economic cooperation etc., Quebec and Ontario signed an agreement in 2009 called Trade and Cooperation Agreement. Builds on TILMA, to remove interprovincial barriers affecting trade, investment, and labour mobility, British Columbia, Alberta, and Saskatchewan signed another agreement called New West Partnership Trade Agreement in 2010 (see, Beaulieu and Zaman, 2019). Later, a Standing Senate Committee on Banking, Trade and Commerce was formed in early 2016. The committee was asked to examine and report on issues pertaining to internal barriers to trade.

A report of the Standard Senate Committee on Banking, Trade and Commerce of Canada (2016) stated that 150 years since the Confederation was formed, there remain too many unnecessary regulatory and legislative differences among Canada's provincial jurisdictions. These create "walls" and prevent the free flow of people, goods, services and investments between provinces and territories. Provincial barriers increase the cost of production, business, and trade. Tkachuk and Day (2016) state that the Canadian economy incurs a loss of \$50–\$130 billion annually due to the barriers that obstruct trade and labour mobility within Canada. The committee recommended that the federal government work actively with provincial and territorial governments to ensure and reform the existing rules and policies and laws and regulations for the free movement of people, goods, services and investment in Canada.

In 2017, the Federal and Provincial governments of Canada signed the Canadian Free Trade Agreement (CFTA, 2017) to overcome the main barriers in trade and labour migration and to foster economic growth in Canada. Over time this may contribute to provincial growth in Canada. The main objectives of the CFTA, 2017 are to reduce and eliminate barriers to the free movement of persons, goods, services, and investments within Canada (see, Article 100). All parties mutually agreed to the principles of ensuring (i) to eliminate of existing barriers and avoiding new barriers, (ii) non-discriminatory treatment of persons, goods, services, and investments, irrespective of where they originate in Canada, and (iii) to reconcile occupational standards and regulatory measures to provide for the free movement of persons and the removal of barriers to trade and investment within Canada (see, Article 102, CFTA 2017). Canada is now looking forward to seeing the success of CFTA 2017.

3. Model Specification, Methods and an Overview of Data

Model Specification

The gravity model^{†††} has been recognized as the most influential model of international trade and migration analysis. It has been used empirically for analyzing the determinants of trade flows across countries by a number of previous studies (for example, Head and Ries 1998, Dunlevy & Hutchinson 1999, Narayan & Nguyen 2016, Kinuthia 2017). We apply a similar empirical model to estimate the relationship between labour migration and international trade.

Although Tinbergen (1962) was the first to apply the gravity equation in explaining trade flows. McCallum (1995) later applies a gravity model to estimate bilateral trade. McCallum's version of the gravity model can be written for Canadian interprovincial trade as follows:

$$T_{ijt} = \mu_0 + \alpha Y_{it} + \beta Y_{jt} + \theta D_{ijt} + \partial Z_{ijt} + \varepsilon_{ijt} \quad (1)$$

where T_{ijt} is provincial trade from region i to j at time t , Y_i and Y_j are GDPs of region i and j , D_{ij} stands for the distance between i and j , Z_{ijt} for other control variables, and ε_{ijt} for errors. However, McCallum's empirical model suffers from non-micro-foundation and the estimation results are biased due to omitted variables.

Anderson and Van Wincoop (2003) first introduced the gravity equation from trade with a micro-foundation. The study predicts that trade flows depend on relative trade costs, and a well-specified gravity model can address these costs. Anderson and Van Wincoop (2003) identify that trade restrictions should be considered (as trade costs) while estimating a gravity model. Theoretically, the gravity equation does not allow any role for the GDP of the destination and source country. However, with non-homothetic preference, there is a role of GDP in the trade model (Felbermayr, Jung, and Toubal, 2010). Hence, the cross-sectional empirical model followed by Felbermayr et al. (2010) based on Anderson and Van Wincoop (2003) theoretical foundation suggested cross GDPs term can be written for Canadian interprovincial trade as follows:

$$t_{ij} = \mu_0 + \gamma(y_i y_j) + \theta d_{ij} + \partial z_{ij} + \rho c_{ij} + \varepsilon_{ij} \quad (2)$$

^{†††} See Anania & McCalla (1991) for detail.

Here, small letters indicate a logarithmic form of the variable(s), and c_{ij} stands for relative costs of trade.

Factor movement (such as labour migration) has a significant role in international trade (Head and Ries 1998, Dunlevy and Hutchinson 1999, Gould 1994, Mundar 2005, Lewer and Hendrick 2009, Lewer 2011, Genc et al. 2012). Combes et al. (2005), Felbermayr and Jung (2009) and Giovannetti and Lanati (2017) assume that trade costs are also correlated with the migrant networks between regions i and j . Subsequently, taking the contribution of migrants to the trade into account, we can re-write equation (2) as follows.

$$t_{ijt} = \mu_0 + \gamma y_{it} y_{jt} + \theta d_{ijt} + \partial z_{ijt} + \varphi m_{ijt} + \lambda_{ij} + \varepsilon_{ijt} \quad (3)$$

Here, m_{ijt} stands for migration to the region i from j at time t . Equation (3) is the main empirical model for this study. m_{ijt} was alternatively used for the stock of provincial migrants, stock of immigrants and cumulative net interprovincial migrants. λ_{ij} represents the relative cost between provincial regions and control for province-specific heterogeneity in the model.

In this study, the gravity model includes the proximity between Canadian provinces as an essential variable. Gravity is measured by the provincial population-weighted distance between provinces. Distance between Originated Province (OP) and Partner Province (PP) is the distance from the considered province, OP to the average of all other provinces in kilometers. We have not only counted the trade costs but also considered the spatial aspects of provinces (Anania and McCalla 1991) in our empirical model. “Common language” is proxied by the *de facto* common language for the provinces. The value is 1 if the provincial language is both English and French, and zero (0) if the provincial language is either English or French.

Methods of Analysis

Canada's bilateral interprovincial trade data was not constructed using a single procedure for a longer time period in the existing data sources. Data from 1992 to 2008 (Tables 12-10-0085 and 12-10-0086 of Statistics Canada (SC)) was constructed using Standard Industrial Classification (SIC), and from 2007 to 2015 (Table 12-10-0088 of SC) was constructed by using North American Industrial Classification System (NAICS). Therefore, consistent long time series data for Canada's

bilateral interprovincial trade are unavailable in the existing data sources. We use data for provincial import and export from each province to all other provinces from 1981 to 2016 that are available in the SC.

We apply a balanced panel approach and use pooled OLS, the fixed effects, the two-stage least square estimator the fixed effects instrumental variable, and the Poisson pseudo maximum likelihood for estimating the empirical models. In addition to a trade flow variable, we estimate the imports and exports models separately and use the stock of interprovincial migrants, and the stock of immigrants' variables in alternative models. The stock of interprovincial migrants for a province is the stock of people who were born outside that province but now are living in that province. The stock of immigrants in a province is the stock of people who were born outside Canada and now residing in that province. The stock of provincial migrants and the stock of immigrants are mutually exclusive variables. Therefore, our preferred results come from the estimated results using these variables in the same model. We also use the cumulative net interprovincial migrants' variable for robustness.

Potential Endogeneity

For a model that estimates the relationship between migration and trade - the issue of endogeneity cannot be ignored for the following reasons. First, some studies found evidence that macroeconomic factors significantly affect labour migration (Edmonston and Lee 2013, Coulombe 2006, Day and Winer 2006, Helliwell 1996, Newbold 1996, Osberg, Gordon and Lin 1994, Day 1992, Robinson and Tomes 1982, Laber and Chase 1971, Courchene 1970). Second, the efficiency of estimators is sensitive to the presence of endogeneity. If a model with an endogeneity problem is estimated by the OLS estimator, the estimated results would not be unbiased. Moreover, as shown by Silva and Tenreyro (2006) the parameters of a log-linearized gravity model estimated by OLS lead to a biased estimate. Our empirical model is a log-linearized gravity model. Therefore, in addition to the pooled OLS, fixed effects, and PPML estimators, we apply 2SLS and the fixed effects instrumental variables estimators addressing the endogeneity issue in this study.

To instrument the changes in the number of migrants in a particular province, we use the imputed stock of migrants and closely follow the method proposed by Peri and Requena (2010) to construct

the stock of interprovincial and international migration. In each case, we allocate the total number of migrants to each province, for each year, proportional to the initial distribution of migrants across provinces in 1981 using the overall migration growth in Canada. If migrants tend to settle in provinces following the footsteps of the existing cohort of migrants, the imputed series will follow the actual one. These newly constructed instruments are not affected by any province-specific demand shock as they are based on the initial distribution of migrants from the year 1981. Therefore, they should be effective in dealing with issues of reverse causality.

First-stage F statistics and Kleibergen–Paap F statistics are included at the bottom of the tables (see, the “estimated results” section), which confirms the validity of the IV regressions. The F statistics check the weakness of the instrument. We compare these F statistics with the Stock–Yogo critical values for the Cragg–Donald F-statistic with one and two endogenous regressors (Stock and Yogo 2002) and learn that our IV estimators are valid.

An Overview of Data

The names of the variables and the description of the variables and the respective sources are given in the Appendix (see, ANNEX 1). A summary of the interprovincial and international flow of migration is given in Table 1 and Table 2.

As mentioned earlier, there are two main features of Canadian migration: (a) interprovincial migration among Canadian provinces and (b) international migration to Canadian provinces. Table 1 and Table 2 show that Ontario, Quebec, BC, and Alberta are the major provinces of interprovincial and international migration.

Canadian migration data during 1981-2016 shows that the share of **interprovincial migration** is 24.5% for Ontario, 22% for Alberta, 18% for BC, and 9.5% for Quebec. Immigration shares by province show that Ontario (50%) is the largest immigration host, followed by Quebec (18%), BC (16%), and Alberta (9%) in Canada. This indicates that Ontario is the highest migration hub for both internal and external migrants. Alberta is the 2nd largest province for interprovincial migrants; however, it is the 4th largest province for immigrants. Quebec is just the opposite. It is the 2nd largest province for immigrants but the 4th largest province for interprovincial migration. BC is the 3rd largest province for both interprovincial migrants and immigrants.

Table 1: Average Interprovincial Migration in Canada (1981-2016)

Province	Average in-migration	Average out-migration	Net migration*	Provincial share of total migration**
Ontario	72,628	69,901	2,727	24.51%
Quebec	22,519	32,954	-10,435	9.54
British Columbia	57,053	45,647	11,406	17.66
Alberta	68,451	57,796	10,655	21.71
Saskatchewan	16,924	21,282	-4,358	6.57
Manitoba	14,536	19,043	-4,507	5.77
Nova Scotia	16,394	17,283	-889	5.79
New Brunswick	11,576	12,726	-1,150	4.18
Newfoundland and Labrador	8,194	11,010	-2,816	3.30
Prince Edward Island	2,777	2,867	-90	0.97

Note: *Net provincial migration is the difference between average in-migration and average out-migration during 1981-2016. **Provincial share of total migration is the provincial share of average in-migration plus out-migration during 1981-2016.

Source: Author's calculations, based on data from Statistics Canada (CANSIM Table 0510018).

Table 2: Average International Migration to and from the Provinces of Canada (1981-2016)

Province	Immigration	Emigration	Net Migration*	Share of immigration**	Share of Net Migration***
Ontario	103,373	24,047	79,326	48.95%	50.15%
Quebec	37,078	7,985	29,093	17.56	18.39
British Columbia	34,032	9,393	24,639	16.12	15.58
Alberta	20,553	7,056	13,497	9.73	8.53
Saskatchewan	4,059	877	3,182	1.92	2.01
Manitoba	7,596	1,779	5,817	3.60	3.68
Nova Scotia	2,134	840	1,294	1.01	0.82
New Brunswick	1,214	645	569	0.57	0.36
Newfoundland and Labrador	563	290	273	0.27	0.17

Prince Edward Island	566	87	479	0.27	0.30
----------------------	-----	----	-----	------	------

Note: *Provincial net migration is the difference between average immigration from the world and average emigration from Canada during 1981-2016. **Share of immigration is the percentage of average provincial immigration compared to the total immigration in Canada during 1981-2016. ***Share of net migration is the percentage of average net migration in each province during 1981-2016 compared to (total) net migration (immigration minus emigration) in Canada. Source: Author's calculations, based on data from Statistics Canada (CANSIM Tables 0510018 & 0510037).

Canadian immigration data (1981 - 2016)^{†††} shows that some provinces are preferable to immigrants over others. As with interprovincial migration, **immigration** to some provinces is significantly higher than to other provinces. On average, the immigrant population in Ontario (49%), Quebec (18%), British Columbia (16%), and Alberta (10%) are significantly higher than other provinces such as Manitoba (4%), Saskatchewan (2%), Nova Scotia (1%), New Brunswick (0.5%), Prince Edward Island, and Newfoundland and Labrador. Unlike net interprovincial migration, net immigration in all provinces of Canada is significantly positive (see, Table 2).

Interprovincial trade in Canada has grown over time. There has been a 4.2% growth (on average) in interprovincial trade in Canada between 1981 and 2014 (Statistics Canada, March 2016). Provincial import data in our sample period (1981-2016)² indicates that Ontario (28%), Quebec (20%), Alberta (16%), and British Columbia (13%) are the major trading provinces, followed by Saskatchewan (6.5%), Manitoba (5.5%), Nova Scotia (4%), New Brunswick (4%) Newfoundland and Labrador (2.6%) and Prince Edward Island (less than 1%). Export data for the same period also shows a similar interprovincial trade pattern. The major exporting provinces are Ontario (37%), Quebec (20.5%), Alberta (17%), and British Columbia (8.6%) followed by Saskatchewan (4.5%), Manitoba (4.5%), New Brunswick (3%), Nova Scotia (2%) Newfoundland and Labrador (2%) and Prince Edward Island (less than 0.5%).

If we compare (interprovincial and international) migration data with the data on interprovincial trade, there appears to be a link between migration and interprovincial trade. Ontario, Quebec, BC, and Alberta are the major immigration hosts, and these provinces are also the top trading provinces in Canada. Among these four major migration hosts, net migration in all provinces except Quebec is positive. Accordingly, net interprovincial trade of all provinces is positive except in Quebec. Net immigration in Ontario, BC, Alberta, Manitoba, and Saskatchewan is positive and higher than

^{†††} See ANNEX 2 for detail.

in other provinces. Similarly, the international trade balance for these provinces is also positive and higher than other provinces (see, Table 3). Quebec is the only exception that has a negative trade balance despite a positive and large net immigration.

Table 3: Descriptive Statistics (provincial data, 1981 - 2016)

Variable	Mean	SD	Min	Max	Net Migration	Net Trade
Ontario						
Provincial Import (million)	66810.14	14781.36	44374	92062		+
Provincial Export (million)	88618.31	17154.69	63813	116018		
In-migration (persons)	72628	12823	56690	105002	+	
Out-migration (persons)	69901	10332	52942	98420		
Provincial Migration Stock (persons)	1008485	58474	851731	1086338		
International import (million)	153683.1	68559.65	43392	255722		+
International Export (million)	157871.5	66852.88	49670	244860		
Immigration in the province (persons)	103373	29592	40121	148654	+	
Emigration from the province (persons)	24047	3901	16620	29849		
International Migration Stock (persons)	2808827	659396	2015695	4122835		
Quebec						
Provincial Import (million)	48280.97	8189.06	33485	60151		+
Provincial Export (million)	49603.39	8426.72	37051	63095		
In-migration (persons)	22519	2695	18392	28849	-	
Out-migration (persons)	32954	5285	23880	47561		
Provincial Migration Stock (persons)	31155	98515	-135715	217243		
International import (million)	69975.67	31559.58	20852	115675		-
International Export (million)	67415.69	25961.04	28230	98763		
Immigration in the province (persons)	37078	12517	14698	55050	+	
Emigration from the province (persons)	7985	1441	5117	10650		
International Migration Stock (persons)	716614	197390	522150	1204895		
British Columbia						
Provincial Import (million)	30673.42	8037.34	18261	43762		-
Provincial Export (million)	20761.94	8936.42	9607	37372		
In-migration (persons)	57053	11829	41901	79204	+	
Out-migration (persons)	45647	5955	37632	64009		
Provincial Migration Stock (persons)	1066128	127795	848991	1237485		
International import (million)	31890.06	16165.56	8953	59112		+
International Export (million)	38323.22	11055.23	18975	57426		
Immigration in the province (persons)	34032	10847	12256	52025	+	
Emigration from the province (persons)	9393	2594	5668	13231		
International Migration Stock (persons)	912722	248226	627560	1426450		
Alberta						
Provincial Import (million)	38473.92	13816.98	21591	66955		+
Provincial Export (million)	41828.03	11529.46	28487	62954		
In-migration (persons)	68451	16109	39938	102406	+	
Out-migration (persons)	57796	9650	42003	80213		
Provincial Migration Stock (persons)	757942	159530	580965	1054314		
International import (million)	36294.5	24845.67	9845	82565		

International Export (million)	64942.64	32208.27	17967	121661		+
Immigration in the province (persons)	20553	10526	8989	49214	+	
Emigration from the province (persons)	7056	1096	4753	9201		
International Migration Stock (persons)	470140	142672	361170	938495		
Saskatchewan						
Provincial Import (million)	15475.97	4785.91	9951	24667		-
Provincial Export (million)	10946.61	3566.74	5723	16235		
In-migration (persons)	16924	2203	13228	22067	-	
Out-migration (persons)	21282	4243	15124	32939		
Provincial Migration Stock (persons)	32647	56123	-28638	132425		
International import (million)	8821.81	5599.34	2631	20634		+
International Export (million)	15943.19	5907.74	7014	25259		
Immigration in the province (persons)	4059	3765	1572	14859	+	
Emigration from the province (persons)	877	196	483	1441		
International Migration Stock (persons)	64598	17441	47825	127725		
Manitoba						
Provincial Import (million)	13232.39	4009.23	8060	19385		-
Provincial Export (million)	10906.89	3143.70	6848	15847		
In-migration (persons)	14536	2757	10295	21020	-	
Out-migration (persons)	19043	3289	13608	26963		
Provincial Migration Stock (persons)	62614	50197.49	-21947	137921		
International import (million)	9042.53	4806.49	2538	17137		+
International Export (million)	10297.03	4886.62	3295	16829		
Immigration in the province (persons)	7596	4490	3004	16826	+	
Emigration from the province (persons)	1779	251	1353	2430		
International Migration Stock (persons)	151738	26284	133660	249625		
Nova Scotia						
Provincial Import (million)	9440.61	1400.63	7048	11945		-
Provincial Export (million)	5785.19	1331.77	3308	7518		
In-migration (persons)	16394	1627	13687	20257	-	
Out-migration (persons)	17283	1522	14190	20828		
Provincial Migration Stock (persons)	102217	12466.98	78432	117587		
International import (million)	7399.39	2959.47	2840	11361		-
International Export (million)	5200.33	1840.59	2322	7663		
Immigration in the province (persons)	2134	951	833	5483	+	
Emigration from the province (persons)	840	237	430	1245		
International Migration Stock (persons)	44689	7404	39110	70310		
New Brunswick						
Provincial Import (million)	9416.64	1939.11	6283	13592		-
Provincial Export (million)	8006.06	1623.32	4681	10703		
In-migration (persons)	11576	1379	9676	14874	-	
Out-migration (persons)	12726	1424	10127	17615		
Provincial Migration Stock (persons)	73953	12674	48633	91151		
International import (million)	9575.92	4372.95	2902	16470		-
International Export (million)	8735.11	3361.19	3699	13083		
Immigration in the province (persons)	1214	879	554	4675	+	
Emigration from the province (persons)	645	210	343	1060		
International Migration Stock (persons)	26785	4103	22465	41395		

Newfoundland and Labrador						
Provincial Import (million)	6332.69	1026.85	5079	8269		
Provincial Export (million)	4325.28	2562.79	1726	8674		-
In-migration (persons)	8194	1172	5810	10224		
Out-migration (persons)	11010	2335	7419	15485		-
Provincial Migration Stock (persons)	-40114	36789	-80867	18472		
International import (million)	5101.47	3207.08	1289	12284		
International Export (million)	7401.08	2655.77	3935	12628		+
Immigration in the province (persons)	563	217	274	1189		
Emigration from the province (persons)	290	87	184	511		+
International Migration Stock (persons)	9438	1781	8025	16835		
Prince Edward Island						
Provincial Import (million)	1802.58	407.62	1117	2401		
Provincial Export (million)	959.53	216.85	665	1347		-
In-migration (persons)	2777	311	2202	3482		
Out-migration (persons)	2867	483	1925	4216		-
Provincial Migration Stock (persons)	49514	1628	45549	51704		
International import (million)	668.83	392.80	170	1378		
International Export (million)	674.33	340.70	196	1140		+
Immigration in the province (persons)	566	699	107	2593		
Emigration from the province (persons)	87	29	33	155		+
International Migration Stock (persons)	5093	1699	4105	10800		

Source: Authors' calculations, based on data from Statistics Canada (CANSIM Tables 0510018 & 0510037).

Descriptive statistics (Table 3) give a preliminary view of the structure of the data and the relationship between variables. Table 3 indicates that eight out of ten provinces (British Columbia and Quebec are the exceptions) show, on average, a positive relationship between net interprovincial migration and net interprovincial trade. All provinces except Quebec and Nova Scotia show positive net immigration and international trade. As well, all provinces except Quebec and British Columbia indicate a positive relationship between net immigration and net interprovincial trade.

The correlations between provincial trade and both interprovincial and international migration are presented in ANNEX 2 in Appendix.

ANNEX 2 (in Appendix) shows that there are positive correlations between interprovincial migration flow and interprovincial trade of Quebec, Alberta, Saskatchewan, Newfoundland, and Labrador. However, they are negatively correlated in Ontario, British Columbia, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island. Therefore, almost half of Canadian provinces show a positive correlation between interprovincial migration and interprovincial trade. The correlation matrix also shows that correlations between net immigration and interprovincial trade

are positive for all provinces except Nova Scotia. The correlation between the stock of immigrants and interprovincial trade is also positive for all provinces except Saskatchewan.

Descriptive statistics and the correlation matrix, in general, indicate that migration and interprovincial trade are positively related. For further evidence and more insight, we estimate the impact of the stock of interprovincial migration and the stock of immigration on interprovincial trade.

4. Estimated Results

First, we estimate the gravity model (Equation 3) using pooled OLS estimator^{§§§}. The results are presented in Table 4. Estimated results indicate that both interprovincial migration and immigration significantly increase Canadian interprovincial imports, exports, and overall trade. A 10 percent increase in the stock of interprovincial migration increases almost 2 percent of exports, about 1 percent of imports, and more than 1 percent of overall interprovincial trade. A 10 percent increase in the stock of immigrants increases more than 2.5 percent of exports, about 2 percent of imports, and more than 2 percent of overall interprovincial trade. Distance between provinces negatively affects interprovincial trade. That is, as the population-weighted distance between provinces becomes larger, the amount of interprovincial trade gets smaller. English and French-speaking provinces can attract more trade than a province that uses only one of the common languages. As mentioned in section 3, the stock of interprovincial migration and the stock of immigration variables are mutually exclusive variables. Subsequently, we estimate the empirical model by using these two variables in the same model.

^{§§§} We test for unit root using Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) and found that our series are stationary at level.

Table 4: Ordinary Least Square Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade	Export	Import	Trade	Export	Import
Provincial Migration Stock	0.130*** (0.026)	0.185*** (0.039)	0.088*** (0.026)			
Stock of immigrants				0.215*** (0.023)	0.267*** (0.041)	0.184*** (0.018)
Product of Origin and Destination GDP	0.795*** (0.020)	0.942*** (0.026)	0.700*** (0.019)	0.622*** (0.019)	0.724*** (0.037)	0.554*** (0.017)
Population Weighted Average Distance	-0.541*** (0.117)	-0.870*** (0.148)	-0.260** (0.113)	-0.192* (0.108)	-0.412*** (0.140)	0.016 (0.092)
English_French	0.162*** (0.048)	0.155** (0.060)	0.154*** (0.044)	0.147*** (0.035)	0.151*** (0.046)	0.128*** (0.032)
Openness	-0.0304 (0.122)	0.303* (0.167)	-0.180* (0.107)	0.400*** (0.119)	0.786*** (0.176)	0.241*** (0.103)
ProvinceFE	No	No	No	No	No	No
N	120	120	120	120	120	120
R ²	0.96	0.95	0.96	0.98	0.96	0.98

Robust Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

As OLS regression does not control for provincial fixed effects, we apply the fixed effects model that controls for all province-specific factors. Estimated results are reported in Table 5.

Table 5: Fixed Effect Regression

	(1) Trade	(2) Export	(3) Import	(4) Trade	(5) Export	(6) Import
Provincial Migration Stock	0.0470*** (0.011)	-0.0556 (0.041)	0.120*** (0.024)			
Stock of immigrants				0.055*** (0.019)	-0.087 (0.065)	0.157*** (0.040)
Product of Origin and Destination GDP	0.498*** (0.006)	0.557*** (0.022)	0.468*** (0.013)	0.476*** (0.006)	0.586*** (0.022)	0.411*** (0.014)
Population Weighted Average Distance				Dropped		
English_French				Dropped		
Openness	1.008*** (0.039)	1.364*** (0.140)	0.755*** (0.082)	1.019*** (0.041)	1.339*** (0.144)	0.792*** (0.087)
ProvinceFE	Yes	Yes	Yes	Yes	Yes	Yes
N	120	120	120	120	120	120
R ²	0.98	0.89	0.93	0.98	0.89	0.93

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 5 shows that both interprovincial migration and immigration significantly increase interprovincial trade among Canadian provinces. Specifically, both the interprovincial stock of migrants and the stock of immigrants contribute to an increase in demand for imports. Note that we used three-year average data for all series for estimation. Intuitively, the stock of migrants leads to an increase in the demand for goods and services in a province, thereby increasing the demand for imports. However, the contribution of migrants might take a much longer time to be reflected in provincial exports. This may explain why the fixed effects model shows an insignificant role of migrants in the export trade. Nevertheless, interprovincial migration and immigration significantly increase overall interprovincial trade. Interprovincial trade openness plays a highly significant positive role in interprovincial trade. Provincial income also plays a positive and significant role

in interprovincial trade. The provincial fixed effects capture distance and language proximity; therefore, they are automatically dropped by the estimator.

Table 6: Two-Stage Least Square/Instrumental Variable Regression

	(1) Trade	(2) Export	(3) Import	(4) Trade	(5) Export	(6) Import
Provincial Migration Stock	0.174*** (0.064)	0.265*** (0.089)	0.108** (0.051)			
Stock of immigrants				0.208*** (0.054)	0.263*** (0.076)	0.177*** (0.033)
Product of Origin and Destination GDP	0.800*** (0.032)	0.950*** (0.041)	0.702*** (0.035)	0.627*** (0.033)	0.727*** (0.067)	0.559*** (0.030)
Population Weighted Average Distance	-0.587** (0.256)	-0.952*** (0.313)	-0.280 (0.238)	-0.198 (0.254)	-0.416 (0.338)	0.00946 (0.211)
English_French	0.136 (0.099)	0.109 (0.118)	0.143 (0.094)	0.150** (0.070)	0.152* (0.088)	0.131* (0.072)
Openness	0.069 (0.200)	0.481* (0.264)	-0.137 (0.176)	0.379 (0.256)	0.773** (0.320)	0.218 (0.221)
ProvinceFE	No	No	No	No	No	No
N	120	120	120	120	120	120
R ²	0.97	0.96	0.97	0.98	0.96	0.98
First Stage F-Stat	150.41	150.41	150.41	490.11	490.11	490.11

Robust Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Although the fixed effects model has controlled for provincial fixed effects, the issue of endogeneity remains unsolved in the results of that model. As mentioned earlier, in a trade and migration model, endogeneity could be an important issue to address. Therefore, we apply the two-stage least square estimator using instruments for the stock of provincial migrants and the stock of immigrants' variables. We closely follow the method proposed by Peri and Requena (2010) to construct the imputed stock of interprovincial and international migration. The estimated results are presented in Table 6.

Table 6 indicates that both the stock of interprovincial migrants and the stock of immigrants play a positive and significant role in trade creation among Canadian provinces. A 10 percent increase in interprovincial migration increases more than 2.5 percent of exports, more than 1 percent of imports, and more than 1.5 percent of overall interprovincial trade. Similarly, a 10 percent increase in the stock of immigration increases more than 2.5 percent of exports, more than 1.5 percent of imports, and more than 2 percent of overall interprovincial trade. Although population-weighted geographical proximity is negative, it is not a consistently significant variable across all models. Language proximity and trade openness are positive but not consistently significant across all models.

Table 6 addresses the issue of endogeneity; however, it does not control for the provincial fixed effects per se. Subsequently, we apply the fixed effects instrumental variable regression that addresses both the issue of endogeneity and controls for the effect of province-specific factors. This made this estimation one of our *preferred ones*. The estimated results are presented in Table 7. Table 7 includes both the interprovincial stock of migrants and the stock of immigrants' variables in the same model****.

Table 7: Fixed Effect Instrumental Variable Regression (using both stocks of migrants)

	(1) Trade	(2) Export	(3) Import
Provincial Migration Stock	0.238*** (0.075)	0.279* (0.167)	0.212** (0.093)
Stock of immigrants	0.134 (0.082)	0.0883 (0.156)	0.165* (0.092)
Product of Origin and Destination GDP	0.523*** (0.028)	0.627*** (0.061)	0.463*** (0.031)
Population Weighted Average Distance		Dropped	
English_French		Dropped	
Openness	1.155***	1.543***	0.879***

**** Statistically, these two stock variables are correlated; however, this correlation must be coincidental because, based on the construction method, these are two mutually exclusive variables.

	(0.097)	(0.248)	(0.128)
ProvinceFE	Yes	Yes	Yes
N	120	120	120
R ²	0.94	0.82	0.92
Kleibergen-Paap F Statistics	5.619	5.619	5.619

Note: Robust Standard errors are in parentheses. Kleibergen-Paap F Statistics of 5.619 > Stock-Yogo critical value of 4.58 at 15% relative bias. * $p < .10$, ** $p < .05$, *** $p < .01$

Estimated results show that interprovincial migration plays a positive and significant role in interprovincial trade creation. A 10 percent increase in interprovincial migration increases more than 2.5 percent in exports and more than 2 percent in imports. However, immigration can only increase interprovincial imports (see, Table 7). This is maybe because first, it is not easy for immigrants to create a migration and trade network between provinces as they are less familiar with Canadian provinces. Second, the stock of immigrants reduces trade costs between the origin and destination of immigrants, and it increases international trade (see, Head and Ries, 1998) but cannot contribute to interprovincial trade significantly. Head and Ries (1998) find that immigration increases Canadian international trade. Consequently, the contribution of immigrants is reflected in international trade^{††††}.

Interprovincial trade openness is found to be a highly positive and strongly significant factor for interprovincial trade. Provincial income also plays a positive and significant role in interprovincial trade.

^{††††} There is a detailed discussion about this in the introduction section.

Table 8: PPML Fixed Effect Regression (both the stocks are applied in the same model)
(Allow for Heteroscedasticity)

	(1)	(2)	(3)
	Trade	Export	Import
Provincial Migration Stock	0.065*** (0.008)	0.040** (0.017)	0.090*** (0.015)
International Migration Stock	0.065*** (0.019)	-0.012 (0.047)	0.119** (0.050)
Product of Origin and Destination GDP	0.484*** (0.006)	0.533*** (0.018)	0.451*** (0.015)
Population Weighted Average Distance		Dropped	
English_French		Dropped	
Openness	0.989*** (0.027)	1.251*** (0.084)	0.750*** (0.082)
ProvinceFE	Yes	Yes	Yes
N	120	120	120

Note: Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Traditionally the Poisson pseudo maximum likelihood (PPML) estimator is applied in the bilateral trade model if the trade balance is used as a dependent variable. PPML is suitable if there are zeros in the dependent variable. We do not have any zero values in exports, imports, and trade series. Although the trade flow does not have any zero values in the dependent variable, yet, we estimate the trade model using PPML for this study because the PPML fixed effects regression allows for any heteroscedastic modelling. The estimated results are shown in Table 8.

Estimated results using the PPML estimator indicate that there is a positive and significant role of interprovincial migration in interprovincial trade. Both exports and imports are positively influenced by interprovincial migration. Immigration also significantly affects interprovincial imports and overall trade. However, the impact of immigration on interprovincial exports is not significant. Interprovincial trade openness strongly affects interprovincial exports, imports, and

overall trade flow. Provincial income also plays a positive and significant role in interprovincial trade in Canada. Thus, the PPML estimation reinforces the results of previous estimators.

For more robustness, we construct the cumulative net interprovincial migration variable for all provinces. The construction method is as follows. The Cumulative net interprovincial migration variable was constructed by subtracting the cumulative out-migration from the cumulative in-migration over time. The cumulative in-migration and cumulative out-migration are the cumulative sums of provincial in-migration and out-migration, respectively (that a particular province receives or loses over time).

That is, cumulative net migration at year t in a province is

$$\Delta CM_{it} = \sum_{t=1}^n (CM_{it} - CM_{ot})$$

where ΔCM_t stands for the net cumulative migration at year t in province i , CM_{it} stands for cumulative in-migration at year t , and CM_{ot} for cumulative out-migration at year t .

We estimate the impact of interprovincial net cumulative migration on interprovincial trade. The results (see, Table 9) are consistent with the results in Tables 4-8.

Table 9: Models using cumulative provincial migration

	(1)	(2)	(3)	(4)	(5)	(6)
	Fixed effects instrumental variable regression			PPML fixed effects regression		
	Trade	Export	Import	Trade	Export	Import
Provincial Migration Stock (Cumulative)	0.199*** (0.044)	0.226* (0.116)	0.182** (0.075)	0.064*** (0.011)	0.041*** (0.016)	0.089*** (0.017)
Product of Origin and Destination GDP	0.505*** (0.009)	0.593*** (0.028)	0.455*** (0.017)	0.504*** (0.006)	0.530*** (0.120)	0.486*** (0.014)
Population Weighted Average Distance				Dropped		
English_French				Dropped		
Openness	0.988*** (0.064)	1.384*** (0.183)	0.706*** (0.103)	0.959*** (0.025)	1.256*** (0.080)	0.691*** (0.069)
ProvinceFE	Yes	Yes	Yes	Yes	Yes	Yes
N	120	120	120	120	120	120
R ²	0.972	0.872	0.919			
Kleibergen-Paap F Statistics	14.232	14.232	14.232			

Note: Robust Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

We conclude that our results are robust to different estimation methods, model specifications, and alternative measures of labour migration using both the flow and the stock migrants in Canadian provinces.

5. Conclusion

The purpose of this study is to estimate the effect of interprovincial migration and immigration on interprovincial trade in Canada. We estimate a gravity model of trade and migration using several estimators, including pooled OLS, the fixed effects, and the two-stage least square and PPML. Our preferred estimators are the 2SLS and the fixed effects instrumental variable regressions due to a potential endogeneity in the model. The estimated results using 2SLS indicate that both

interprovincial migration and immigration positively affect interprovincial exports and imports in Canada. A ten percent increase in the stock of interprovincial migrants and a ten percent increase in the stock of immigrants increase the interprovincial trade by approximately two percent and more than two percent, respectively. The fixed effects instrumental variable regression indicates that a ten percent increase in the stock of interprovincial migrants increases more than 2.5 percent of interprovincial trade, while the stock of immigration does not significantly increase interprovincial trade in Canada. Intuitively, immigrants can reduce international trade costs, create international business networks, and increase international trade (see, Head and Ries 1998). Hence, the stock of immigrants is more likely to influence international trade, rather than interprovincial trade (see, the details in the results and introduction sections). The estimated results are robust across the estimation methods, model specification, and alternative measures of the stock of migrants in Canadian provinces.

We also find that the provincial population-weighted geographical proximity plays a negative role in determining interprovincial trade. As the distance between provinces increases, trade between provinces falls. We also use province-specific factors such as provincial income, provincial trade openness, and common language as the determinants for interprovincial trade. Estimated results show that interprovincial trade flows are higher between provinces that speak both English and French compared to the provinces that speak only English or French.

Canadian interprovincial trade openness (approximately 21 percent) is much lower than Canadian international trade openness (approximately 66 percent). Estimated results suggest that interprovincial trade openness plays a highly significant positive impact on interprovincial trade flow. On average, there is more than a one percent increase in interprovincial trade in response to a one percent increase in trade openness.

Thus, it is clear from this study that if the Canadian Free Trade Agreement, 2017 can effectively reduce interprovincial barriers to migration and trade, labour mobility and trade between provinces would become much higher than before, and the economy would grow much faster than the current rate of growth. The results reinforce the Standing Senate Committee of Banking report, Trade and Commerce (2016) which predicts that the elimination of internal trade barriers would increase Canada's GDP ranging between 0.05% and 7.0% (Tkachuk and Day 2016).

Reference

Anania, G., & McCalla, A. F. (1991). Does arbitraging matter? Spatial trade models and discriminatory trade policies. *American Journal of Agricultural Economics*, 73(1), 103-117.

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American economic review*, 93(1), 170-192.

Beaulieu, E. and Zaman, M. R. (2019). Do Subnational Trade Agreements Reduce Trade Barriers? Empirical Evidence from Canadian Provinces. *Canadian Public Policy*, 45(1), 1-15.

Beine, M., Coulombe, S., & Vermeulen, W. N. (2015). Dutch disease and the mitigation effect of migration: evidence from Canadian provinces. *The Economic Journal*, 125(589), 1574-1615.

Canadian Free Trade Agreement 2017 (Consolidated Version), Internal Trade Secretariat, Winnipeg, Manitoba.

Canada. Parliament. Senate. Standing Committee on Banking, Trade and Commerce, Tkachuk, D., & Day, J. A. (2016). *Tear Down These Walls: Dismantling Canada's Internal Trade Barriers*. Senate.

Challinor, A. E. (2011). Canada's immigration policy: A focus on human capital. *Migration Information Source*, 1(8).

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

Coulombe, S. (2006). Internal migration, asymmetric shocks, and interprovincial economic adjustments in Canada. *International Regional Science Review*, 29(2), 199-223.

Courchene, T. J. (1970). Interprovincial migration and economic adjustment. *The Canadian Journal of Economics/Revue canadienne d'Economie*, 3(4), 550-576.

Day, K. M. (1992). Interprovincial migration and local public goods. *Canadian Journal of Economics*, 123-144.

Day, K. M., & Winer, S. L. (2006). Policy-induced internal migration: An empirical investigation of the Canadian case. *International Tax and Public Finance*, 13(5), 535-564.

Dion, P., & Coulombe, S. (2008). Portrait of the mobility of Canadians in 2006: Trajectories and characteristics of migrants. *Report on the Demographic Situation in Canada 2005 and 2006*, 78-98.

Dunlevy, J. A., & Hutchinson, W. K. (1999). The impact of immigration on American import trade in the late nineteenth and early twentieth centuries. *Journal of Economic History*, 1043-1062.

Edmonston, B., & Lee, S. M. (2013). Interprovincial migration of Canadian immigrants. This paper was for presentation at the 27th International Population of the International Union for the Scientific Study of Population, Busan, Republic of Korea, 26 to 31 August 2013.

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

Felbermayr, G. J., Jung, B., & Toubal, F. (2010). Ethnic networks, information, and international trade: Revisiting the evidence. *Annals of Economics and Statistics/Annales d'Économie et de Statistique*, 41-70.

Gould, D. M. (1994). Immigrant links to the home country: empirical implications for US bilateral trade flows. *The Review of Economics and Statistics*, 302-316.

Genc, M., Gheasi, M., Nijkamp, P., & Poot, J. (2012). The impact of immigration on international trade: a meta-analysis. In *Migration impact assessment*. Edward Elgar Publishing.

Giovannetti, G., & Lanati, M. (2017). Do High-Skill Immigrants trigger High-Quality Trade?. *The World Economy*, 40(7), 1345-1380.

Gunderson, M. (1994). Barriers to interprovincial labour mobility. *Interprovincial Trade Wars: Why the Blockade Must End*, 131-154.

Head, K., & Ries, J. (1998). Immigration and trade creation: econometric evidence from Canada. *Canadian journal of economics*, 47-62.

Helliwell, J. F. (1996). Convergence and migration among provinces. *The Canadian Journal of Economics/Revue canadienne d'Economie*, 29, S324-S330.

Helliwell, J. F., & Verdier, G. (2001). Measuring internal trade distances: a new method applied to estimate provincial border effects in Canada. *Canadian Journal of Economics*, 1024-1041.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.

Iranzo, S., & Peri, G. (2009). Migration and trade: Theory with an application to the Eastern–Western European integration. *Journal of International Economics*, 79(1), 1-19.

Kinuthia, B. K. (2017). Export spillovers: Comparative evidence from Kenya and Malaysia. *Journal of African Economies*, 26(1), 24-51.

Laber, G., & Chase, R. X. (1971). Interprovincial migration in Canada as a human capital decision. *Journal of Political Economy*, 79(4), 795-804.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24.

Lewer, J. J. (2011). The Impact of Immigration on Bi-lateral Trade: OECD Results From 1991-2000. *Southwestern Economic Review*, 33, 9-22.

Lewer, J. J., & Van den Berg, H. (2009). Does immigration stimulate international trade? Measuring the channels of influence. *The International Trade Journal*, 23(2), 187-230.

McCallum, J. (1995). National borders matter: Canada-US regional trade patterns. *The American Economic Review*, 85(3), 615-623.

Mundra, K. (2005). Immigration and international trade: A semiparametric empirical investigation. *The Journal of International Trade & Economic Development*, 14(1), 65-91.

Narayan, S., & Nguyen, T. T. (2016). Does the trade gravity model depend on trading partners? Some evidence from Vietnam and her 54 trading partners. *International Review of Economics & Finance*, 41, 220-237.

Newbold, K. B. (1996). Income, self-selection, and return and onward interprovincial migration in Canada. *Environment and Planning A*, 28(6), 1019-1034.

Osberg, L., Gordon, D., & Lin, Z. (1994). Interregional migration and interindustry labour mobility in Canada: A simultaneous approach. *Canadian Journal of Economics*, 58-80.

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

Robinson, C., & Tomes, N. (1982). Self-selection and interprovincial migration in Canada. *Canadian Journal of Economics*, 474-502.

Rauch, J. E., & Trindade, V. (2002). Ethnic Chinese networks in international trade. *Review of Economics and Statistics*, 84(1), 116-130.

Sharpe, A., & Ershov, D. (2007). The impact of interprovincial migration on aggregate output and labour productivity in Canada, 1987-2006.

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658.

Smith, S. K. (1986). Accounting for migration in cohort-component projections of state and local populations. *Demography*, 23(1), 127-135.

Sgrignoli, P., Metulini, R., Schiavo, S., & Riccaboni, M. (2015). The relation between global migration and trade networks. *Physica A: Statistical Mechanics and its Applications*, 417, 245-260.

Stock, J. H., & Yogo, M. (2002). *Testing for weak instruments in linear IV regression* (No. t0284). National Bureau of Economic Research.

Tkachuk, David; and Day, Joseph A. (2016). Tear Down These Walls: Dismantling Canada's Internal Trade Barriers. Report of the Standing Senate Committee of Banking, Trade and Commerce, Ottawa, Canada.

Tinbergen, J. (1962). Shaping the world economy; suggestions for an international economic policy.

APPENDICES

ANNEX 1: Variable, Description, and Data Source

Variable	Description	Data source
Provincial import	Interprovincial imports; expenditure-based, 2007 (chained) annual (Canadian dollars x 1,000,000)	Table: 384-0038 Statistics Canada
Provincial export	Interprovincial exports; expenditure-based, 2007 (chained) annual (Canadian dollars x 1,000,000)	Table: 384-0038 Statistics Canada
International import	International Imports; expenditure-based, 2007 (chained) annual (Canadian dollars x 1,000,000)	Table: 384-0038 Statistics Canada
International Export	International Exports; expenditure-based, 2007 (chained) annual (Canadian dollars x 1,000,000)	Table: 384-0038 Statistics Canada
Provincial in-migration	Interprovincial In-Migrants, annual (persons)	Table: 051-0018 Statistics Canada
Provincial out-migration	Interprovincial Out-Migrants, annual (persons)	Table: 051-0018 Statistics Canada
Provincial migration stock	The provincial stock of migrant population born in other provinces	Census data and Table: 051-0018 Statistics Canada
International immigration	International Immigration; Canada, provinces and territories, annual (persons)	Table: 051-0037 Statistics Canada
International emigration	International Emigration; Canada, provinces and territories, annual (persons)	Table: 051-0037 Statistics Canada
Cumulative net provincial migration stock	Constructed by authors	
The provincial stock of immigration	Immigrant population (were not citizens by birth)	Census data (1981, 1986, 1991, 1996, 2001, 2006, 2011, 2016).
Provincial Income	Gross domestic product, expenditure-based, provincial and territorial, annual (dollars x 1,000,000) Chained (2007) dollars	Table 384-0038 Statistics Canada
Provincial price level	Consumer Price Index, annual (2002=100)	Table 326-0021 Statistics Canada
Population	Estimates of population, Canada, provinces and territories, annual (persons)	Table 051-0001 Statistics Canada
Distance (population weighted)	Distance between provinces	GlobalFeed.com ^Y (Distance calculator Canada)
English & French	Dummy for the <i>de facto</i> common language	Office of the Commissioner of Official Language**

^Yhttps://distancecalculator.globefeed.com/Canada_Distance_Calculator.asp;**https://www.ocol.gc.ca/en/language_rights/provinces_territories.

ANNEX 2: Correlation between Canada's provincial migration and trade

Variable	Net interprovincial migration	Immigration	Net immigration	Net interprovincial migration (% of provincial population)	Net immigration (% of provincial population)	Stock of immigrants
Ontario						
Import	-0.4394	0.5556	0.3232	-0.4394	0.3232	0.9509
Export	-0.4646	0.4973	0.2483	-0.4646	0.2483	0.9278
Trade	-0.4548	0.5263	0.2840	-0.4548	0.2840	0.9428
Quebec						
Import	0.3223	0.7270	0.5598	0.3223	0.5598	0.8167
Export	0.2046	0.7982	0.5953	0.2046	0.5953	0.9041
Trade	0.2666	0.7721	0.5847	0.2666	0.5847	0.8710
British Columbia						
Import	-0.0889	0.6842	0.1237	-0.0889	0.1237	0.9519
Export	-0.1415	0.6340	0.0470	-0.1415	0.0470	0.9732
Trade	-0.1138	0.6576	0.0816	-0.1138	0.0816	0.9662
Alberta						
Import	0.4641	0.8446	0.8808	0.4641	0.8808	0.9187
Export	0.4227	0.7972	0.8545	0.4227	0.8545	0.9134
Trade	0.4463	0.8270	0.8727	0.4463	0.8727	0.9217
Saskatchewan						
Import	0.3422	0.8367	0.8910	0.3422	0.8910	0.0006
Export	0.2178	0.6541	0.7627	0.2178	0.7627	-0.2807
Trade	0.2929	0.7668	0.8473	0.2929	0.8473	-0.1280
Manitoba						
Import	-0.4240	0.8380	0.8946	-0.4240	0.8946	0.6054
Export	-0.4163	0.8110	0.8733	-0.4163	0.8733	0.5998
Trade	-0.4213	0.8275	0.8868	-0.4213	0.8868	0.6040
Nova Scotia						
Import	-0.3432	0.3997	-0.0832	-0.3432	-0.0832	0.7360
Export	-0.5330	0.5418	-0.1006	-0.5330	-0.1006	0.5134

Trade	-0.4466	0.4786	-0.1011	-0.4466	-0.1011	0.6445
New Brunswick						
Import	-0.2878	0.6060	0.7257	-0.2878	0.7257	0.0781
Export	-0.4247	0.5608	0.7498	-0.4247	0.7498	0.0854
Trade	-0.3632	0.6010	0.7588	-0.3632	0.7588	0.0837
Newfoundland and Labrador						
Import	0.6393	0.5771	0.4670	0.6393	0.4670	0.4401
Export	0.5485	0.3938	0.4207	0.5485	0.4207	0.0492
Trade	0.5839	0.4463	0.4368	0.5839	0.4368	0.1516
Prince Edward Island						
Import	-0.5517	0.7865	0.7382	-0.5517	0.7382	0.5404
Export	-0.5765	0.8567	0.7466	-0.5765	0.7466	0.7369
Trade	-0.5702	0.8261	0.7553	-0.5702	0.7553	0.6188

Note: all variables are in logarithmic form. If in-migration and out-migration occur in the same year, the number of migrants that remain in a province can only be shown by net migration (in-migration minus out-migration). Hence, we construct the net interprovincial migration and the net international migration variables by subtracting emigration from immigration.

Source: Authors' calculations based on data from Statistics Canada (CANSIM Table 3840038).