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Role of Provincial Migration and Immigration in Provincial Trade of Canada

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Abstract: This study estimates international and provincial migrants' impact on provincial-level trade using panel data from 1981 to 2016 for Canadian provinces. The estimated results show that migration plays a significant role in determining Canadian provincial-level trade. Although the stock of provincial migrants is smaller than the stock of immigrants in Canadian provinces, the former plays a consistently positive and significant role in provincial-level trade, while the latter is not consistently significant across estimators. This study reaffirms that labour mobility between Canadian provinces helps reduce provincial trade barriers and promote economic development within Canada. Our results are robust to different estimation methods, model specifications, and alternative measures of migrants' stock in Canadian provinces.

Keywords: provincial-level migration; immigration; provincial-level trade; IV approach

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 (one in five persons) of Canada's total population (Statistics Canada 2016 Census of Canada). 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 294,000 Canadians moved between provinces every year (see Table 1). In addition to provincial migration, on average, Canada received approximately 212,000 foreign immigrants every year. Thus, over 500,000 migrants migrate annually into the Canadian economy (see Figure 1). The federal and provincial governments of Canada administer a number of programmes to enable the full utilisation of immigrants' contributions to the economy.

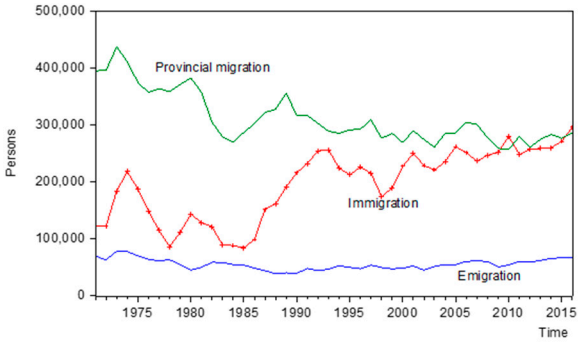

Figure 1. Provincial and international migration of Canada (1971–2016). Source: Author's calculations, based on data from Statistics Canada (2022b, 2023a).

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Table 1. Average provincial-level migration in Canada (1981–2016).

Province	Average In-Migration	Average Out-Migration	Net Migration *	Provincial Share of Total Migration **
Ontario	72,628	69,901	2727	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	−4358	6.57
Manitoba	14,536	19,043	−4507	5.77
Nova Scotia	16,394	17,283	−889	5.79
New Brunswick	11,576	12,726	−1150	4.18
Newfoundland and Labrador	8194	11,010	−2816	3.30
Prince Edward Island	2777	2867	−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 (2022b).

A significant amount of migration to a province can increase the labour force in a particular region, leading to increased productivity and economic development, thereby creating more job opportunities, increasing local demand for goods and services, and boosting local businesses and trade. For example, suppose that a large number of immigrants moved from abroad to Ontario. These immigrants will add to 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, such as 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. The 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 also 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, increasing exports and fostering trade between the migrants' origin and destination regions (Hatzigeorgiou and Lodefalk 2021; Rauch and Trindade 2002). This topic has received significant research attention, particularly in the realm of international trade. Nevertheless, this paper will focus specifically on the impact of migrants on trade between Canadian provinces. Internal migration can also facilitate the transfer of skills and knowledge from one province to another, leading to the specialisation of different provinces in particular industries or sectors, thereby promoting increased internal trade and economic development.

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 provincial-level migration has attracted renewed attention from economists and policymakers. There are studies about the assimilation of immigrants into the Canadian labour market (Adserà and Ferrer 2021) and the impact of immigration on Canadian international trade, but *there are no studies that specifically estimate the impact of migration on provincial-level trade*. The impact of labour migration on Canadian provincial-level trade is, therefore, an important question to investigate. Specifically, we investigate whether the stock of migrants plays a significant role in the creation of provincial-level trade. It is worth noting here that we used both the provincial-level 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 whether the degree of provincial trade openness, language proximity, and population-weighted distance play any significant role in provincial-level 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. Wang and Ruan (2019), Sgrignoli et al. (2015), Iranzo and Peri (2009), Lewer and Van den Berg (2009), Lewer (2011), Dunlevy and Hutchinson (1999), and Gould (1994) found that immigration increased trade between the immigrants' host and origin countries. Cardoso and Ramanarayanan (2022) found that immigrant employment enhances trade at the firm level using employer–employee-matched data from Canada. Head and Ries (1998) also found that immigration increased Canadian imports and exports; however, imports increased three times more than exports. Mundra (2005) found that immigration positively affected imports of both intermediate and finished goods, while it positively affected only exports of finished goods. Genc et al. (2012) found that a 10 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 (Serlenga and Shin 2021; White and Haan 2021; Day and Winer 2006; Helliwell 1996; Newbold 1996; Osberg et al. 1994; Day 1992; Robinson and Tomes 1982; Laber and Chase 1971; Courchene 1970). However, a limited number of studies estimated the impact of provincial-level migration on macroeconomic variables. Sharpe et al. (2007) and Beine et al. (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 concerning the impact of Canadian migrants on provincial-level trade. This study addresses the gap in the literature by testing the following set of specific hypotheses:

Hypothesis 1. *The stock of provincial-level migrants positively influences provincial-level exports.*

Hypothesis 2. *The stock of provincial-level migrants positively influences provincial-level imports.*

Hypothesis 3. *The stock of immigrants positively influences provincial-level exports.*

Hypothesis 4. *The stock of immigrants positively influences provincial-level imports.*

The results of these estimations are presented in Section 4.

The factor(s) influencing 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 Hierro et al. 2019; Edmonston and Lee 2013; Coulombe 2006; Day and Winer 2006; Helliwell 1996; Newbold 1996; Osberg et al. 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-Silvente (2010) to construct the instrumental variable in this study.

In this study, we utilise a standard empirical model for trade and migration and analyse a balanced panel consisting of 10 Canadian provinces along with the rest of their provincial counterparts for the period of 1981–2016, using a time-interval approach. 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 provincial-level 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 provincial-level migrants and the stock of (international) immigrants increases Canadian provincial-level trade. Specifically, the stock of provincial-level migrants significantly increases both provincial imports and exports. However, immigration can only increase imports between provinces.

Geographical proximity plays a significant role in provincial-level trade. Province-wise spatial factors such as provincial trade liberalisation and language proximity between provinces also positively affect provincial-level trade. We use the product of the originating province[1] and the partner provinces' GDPs[2]. The income of provinces is found to be positive and significant in fostering provincial-level trade. Provinces with a common language, English and French, engage more in provincial-level trade than the provinces with a common language, either English or French. The estimated results are robust to different estimation methods, model specifications, and different measures of the stock of migrants.

The remainder of the paper is organised as follows. Section 2 briefly discusses the history of Canadian provincial-level 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. Overview of Canadian Migration and Provincial-Level 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 provincial-level trade and economic development were making headlines as late as 2018 concerning national pipeline construction to the Pacific and the Atlantic oceans. However, persistent trade barriers between provinces are still very high[3].

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 conducting similar work at federal government facilities in Ottawa, Ontario, and across the Ottawa River in Gatineau, Quebec, due to competing provincial trade licence 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' freedom to work anywhere in the country. Why these barriers to trade and migration continue to exist and what can be done about them is an ongoing public policy debate in Canada[4].

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.

Provincial-level migration and immigration have become the most important component of population growth in some provinces and territories of Canada (Dion and Coulombe 2008; Gunderson 1995). 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 economic growth. However, there are natural and artificial barriers that hinder provincial-level labour migration in Canada. Natural barriers include language and cultural differences, the 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' licencing of trades, preferential hiring practices in each province, differences in migration policy, differences in provincial social safety net programmes, and differences in education systems and employment standards (see Gunderson 1995 for details). Moreover, provincial differences in wage rates, cost of living, housing prices, provincial tax rates, and urbanisation also play an important role in determining migration within Canada (see Zaman 2020; Helliwell and Verdier 2001; Robinson and Tomes 1982). Canadian provincial-level migration is often very difficult to project because it has become extremely volatile over time (Smith 1986).

Provincial-level 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 percent) than provincial-level trade openness (provincial-level trade and provincial-level GDP ratio is about 21 percent) (data source: WDI 2018, and CANSIM 2018). According to 2015's CANSIM data, Canada's provincial-level trade was CAD 367,884 million, while its provincial import demand from abroad was CAD 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 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 CAD 50 billion and CAD 130 billion. The elimination of internal trade barriers is expected to increase Canada's GDP ranging between 0.05% and 7.0% (Canada Parliament Senate et al. 2016).

It is difficult to list all of the trade barriers to provincial-level trade in Canada. However, it is widely known that the provinces have barriers to trade and migration in many forms. For example, not allowing out-of-province doctors to practise, 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 provincial-level trade and migration barriers for quite some time. Several initiatives have been taken to reduce these barriers. In 1993, a trade agreement called the 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 and services, and investment within Canada while leaving many interprovincial barriers still in place. In 1996, the 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 the 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 provincial-level trade and labour mobility and to facilitate economic cooperation, etc., Quebec and Ontario signed an agreement in 2009 called the Trade and Cooperation Agreement. Built on TILMA, to remove interprovincial barriers affecting trade, investment, and labour mobility, British Columbia, Alberta, and Saskatchewan signed another agreement called the 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 (Canada Parliament Senate et al. 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. Canada Parliament Senate et al. (2016) state that the Canadian economy incurs a loss of CAD 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, policies, 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 existing barriers and avoid new barriers, (ii) the 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 Overview of Data

3.1. Model Specification

We adopt a provincial trade–migration empirical model that is, in essence, close to the gravity model[5] of international trade and migration analysis. The gravity model has been used empirically for analysing the determinants of trade flows across countries by several previous studies (for example, Head and Ries 1998; Dunlevy and Hutchinson 1999; Narayan and Nguyen 2016; Kinuthia 2017). We apply a similar empirical model to estimate the relationship between labour migration and provincial-level trade in Canada.

Following McCallum (1995), who was the first to apply a gravity model to estimate bilateral trade, the trade–migration model for Canadian provincial-level trade can be written as:

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

where T_{ijt} is provincial trade from region i to j (all provinces except i) 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 micro-foundation into McCallum-type empirical trade models. The study predicts that trade flows depend on relative trade costs, and a well-specified model can address these costs. Anderson and Van Wincoop (2003) identify that trade restrictions should be considered (as trade costs) while estimating such empirical trade models. Theoretically, a micro-founded empirical trade model 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 et al. 2010). Hence, the cross-sectional empirical model followed by Felbermayr et al. (2010) based on Anderson and Van Wincoop's (2003) theoretical foundation suggested that cross GDP terms can be written for Canadian provincial-level trade as follows:

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

where small letters indicate a logarithmic form of the variable(s), and c_{ij} stands for the 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; Mundra 2005; Lewer and Van den Berg 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 region i and j. Subsequently, taking the contribution of migrants to the trade into account, we can rewrite Equation (2) as follows:

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

where 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 provincial migrants. λ_{ij} represents the relative cost between provincial regions and control for province-specific heterogeneity in the model.

In this study, the trade–migration model includes the proximity between Canadian provinces as an essential variable. Gravity is measured by the provincial population-weighted distance between provinces. The distance between the Originated Province (OP) and Partner Provinces (PPs) is the distance from the considered province, OP, to the average of all other provinces in kilometres. We have not only counted for the trade costs, but also considered the spatial aspects of the 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.

3.2. Methods of Analysis

Canada's provincial-level trade data were 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)) were constructed using Standard Industrial Classification (SIC), and from 2007 to 2015 (Table 12-10-0088 of SC) were constructed using the North American Industrial Classification System (NAICS). Therefore, consistent long time series data for Canada's provincial-level trade are unavailable in the existing data sources. We use data for provincial exports from each province to all other provinces and provincial imports to each province from all other provinces for the period from 1981 to 2016 that are available in the SC. To capture dynamic adjustment effects, as the dependent and independent variables cannot fully adjust in a single year (Trefler 2004), we adopt the time-interval approach of Cheng and Wall (2005) and utilise a 3-year average of both trade and migration data in our empirical estimations.

We apply a balanced panel approach and use pooled OLS, the fixed effects, the two-stage least squares 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 import and export models separately and use the stock of provincial-level migrants and the stock of immigrants in Canadian provinces as variables in alternative models. The stock of provincial-level migrants in 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 reside 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. The study also uses the cumulative net provincial-level migrants' variable for robustness.

3.3. 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, there are studies that found evidence that macroeconomic factors significantly affect labour migration (Edmonston and Lee 2013; Coulombe 2006; Day and Winer 2006; Helliwell 1996; Newbold 1996; Osberg et al. 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 an OLS estimator, the estimated results would not be unbiased. Moreover, as shown by Silva and Tenreyro (2006), the parameters of a log-linearised gravity model estimated by OLS lead to a bias estimate. Our empirical model is a log-linearised gravity-type 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-Silvente (2010) to construct the stock of provincial 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 footstep 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 Section 4) and confirm 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.

3.4. Overview of Data

The names of the variables, the description, and the respective sources are given in Appendix A (see Table A1). A summary of the provincial and international flow of migration is given in Tables 1 and 2.

As mentioned earlier, Canadian migration has two main features: (a) provincial-level migration among Canadian provinces and (b) international migration to Canadian provinces. Tables 1 and 2 show that Ontario, Quebec, BC, and Alberta are the major provincial and international migration provinces.

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	7985	29,093	17.56	18.39
British Columbia	34,032	9393	24,639	16.12	15.58
Alberta	20,553	7056	13,497	9.73	8.53
Saskatchewan	4059	877	3182	1.92	2.01
Manitoba	7596	1779	5817	3.60	3.68
Nova Scotia	2134	840	1294	1.01	0.82
New Brunswick	1214	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 (2022b, 2023a).

Canadian migration data during 1981–2016 show that the share of provincial-level 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 provincial 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 provincial migration. BC is the 3rd largest province for both provincial-level migrants and immigrants.

Canadian immigration data (1981–2016)[6] show that some provinces are preferable to immigrants over others. As with provincial-level migration, the immigration to some provinces is significantly higher than to other provinces. On average, the immigrant populations in Ontario (49%), Quebec (18%), British Colombia (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 provincial-level migration, net immigration in all provinces of Canada is significantly positive (see Table 2).

Provincial-level trade in Canada has grown over time. There has been a 4.2% growth (on average) in provincial-level trade in Canada between 1981 and 2014 (Statistics Canada, March 2016). The provincial import data in our sample period (1981–2016)[7] 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%). The export data for the same period also show a similar provincial-level 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 the (provincial-level and international) migration data with the data on provincial-level trade, there appears to be a link between migration and provincial-level 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, the net

provincial-level trade of all provinces is positive, except in Quebec. The net immigration in Ontario, BC, Alberta, Manitoba, and Saskatchewan is positive and higher than the other provinces. Similarly, the international trade balance for these provinces is also positive and higher than the other provinces (see Table A2 in Appendix A). Quebec is the only exception, with a negative trade balance despite a positive and large net immigration.

Descriptive statistics (Table A2 in Appendix A) give a preliminary view of the structure of the data and the relationship between variables. Table A2 indicates that eight out of ten provinces (British Columbia and Quebec are the exceptions) show, on average, a positive relationship between net provincial-level migration and net provincial-level 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 provincial-level trade.

The correlations between provincial trade and both provincial-level and international migration is presented in Table A2 in Appendix A.

Table A2 (in Appendix A) shows positive correlations between provincial-level migration flow and the provincial-level trade of Quebec, Alberta, Saskatchewan, and 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 the Canadian provinces show a positive correlation between provincial-level migration and provincial-level trade. The correlation matrix also shows that correlations between net immigration and provincial-level trade are positive for all provinces except Nova Scotia. The correlation between the stock of immigrants and provincial-level trade is also positive for all provinces except Saskatchewan.

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

4. Estimated Results

First, we estimate the trade–migration model (Equation (3)) using a pooled OLS estimator[8]. The results are presented in Table 3. The estimated results indicate that both provincial-level migration and immigration significantly increase Canadian provincial-level imports, exports, and overall trade. A 10 percent increase in the stock of provincial-level migration increases almost 2 percent of exports, about 1 percent of imports, and more than 1 percent of overall provincial-level 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 provincial-level trade. The distance between provinces negatively affects provincial-level trade. That is, as the population-weighted distance between provinces becomes larger, the amount of provincial-level trade becomes 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 provincial-level 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.

As OLS regression does not control for provincial fixed effects, we apply the fixed effects model that controls for all province-specific factors. The estimated results are reported in Table 4.

Table 4 shows that both provincial-level migration and immigration significantly increase provincial-level trade among Canadian provinces. Specifically, both the provincial-level 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,

provincial-level migration and immigration significantly increase overall provincial-level trade. Provincial trade openness plays a highly significant positive role in provincial-level trade. Provincial income also plays a positive and significant role in provincial-level trade. The provincial fixed effects capture distance and language proximity; therefore, they are automatically dropped by the estimator.

Table 3. Ordinary least squares regression.

	(1) Trade	(2) Export	(3) Import	(4) Trade	(5) Export	(6) Import
Provincial Migration Stock	0.130 ***	0.185 ***	0.088 ***			
	(0.026)	(0.039)	(0.026)			
Stock of Immigrants				0.215 ***	0.267 ***	0.184 ***
				(0.023)	(0.041)	(0.018)
Product of Origin and Destination GDP	0.795 ***	0.942 ***	0.700 ***	0.622 ***	0.724 ***	0.554 ***
	(0.020)	(0.026)	(0.019)	(0.019)	(0.037)	(0.017)
Population-Weighted Average Distance	−0.541 ***	−0.870 ***	−0.260 **	−0.192 *	−0.412 ***	0.016
	(0.117)	(0.148)	(0.113)	(0.108)	(0.140)	(0.092)
English_French	0.162 ***	0.155 **	0.154 ***	0.147 ***	0.151 ***	0.128 ***
	(0.048)	(0.060)	(0.044)	(0.035)	(0.046)	(0.032)
Openness	−0.0304	0.303 *	−0.180 *	0.400 ***	0.786 ***	0.241 ***
	(0.122)	(0.167)	(0.107)	(0.119)	(0.176)	(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; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Fixed effects regression.

	(1) Trade	(2) Export	(3) Import	(4) Trade	(5) Export	(6) Import
Provincial Migration Stock	0.0470 ***	−0.0556	0.120 ***			
	(0.011)	(0.041)	(0.024)			
Stock of Immigrants				0.055 ***	−0.087	0.157 ***
				(0.019)	(0.065)	(0.040)
Product of Origin and Destination GDP	0.498 ***	0.557 ***	0.468 ***	0.476 ***	0.586 ***	0.411 ***
	(0.006)	(0.022)	(0.013)	(0.006)	(0.022)	(0.014)
Population-Weighted Average Distance			Dropped			
English_French			Dropped			
Openness	1.008 ***	1.364 ***	0.755 ***	1.019 ***	1.339 ***	0.792 ***
	(0.039)	(0.140)	(0.082)	(0.041)	(0.144)	(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; *** $p < 0.01$.

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, the 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-Silvente (2010) to construct the imputed stock of provincial and international migration. The estimated results are presented in Table 5.

Table 5. Two-stage least squares/instrumental variable regression.

	(1) Trade	(2) Export	(3) Import	(4) Trade	(5) Export	(6) Import
Provincial Migration Stock	0.174 ***	0.265 ***	0.108 **			
	(0.064)	(0.089)	(0.051)			
Stock of Immigrants				0.208 ***	0.263 ***	0.177 ***
				(0.054)	(0.076)	(0.033)
Product of Origin and Destination GDP	0.800 ***	0.950 ***	0.702 ***	0.627 ***	0.727 ***	0.559 ***
	(0.032)	(0.041)	(0.035)	(0.033)	(0.067)	(0.030)
Population Weighted Average Distance	−0.587 **	−0.952 ***	−0.280	−0.198	−0.416	0.00946
	(0.256)	(0.313)	(0.238)	(0.254)	(0.338)	(0.211)
English_French	0.136	0.109	0.143	0.150 **	0.152 *	0.131 *
	(0.099)	(0.118)	(0.094)	(0.070)	(0.088)	(0.072)
Openness	0.069	0.481 *	−0.137	0.379	0.773 **	0.218
	(0.200)	(0.264)	(0.176)	(0.256)	(0.320)	(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; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5 indicates that both the stock of provincial-level migrants and the stock of immigrants play a positive and significant role in trade creation among Canadian provinces. A 10 percent increase in provincial-level migration increases more than 2.5 percent of exports, more than 1 percent of imports, and more than 1.5 percent of overall provincial-level 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 provincial-level trade. Although the 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 5 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 6. Table 6 includes both the provincial-level stock of migrants and the stock of immigrants' variables in the same model[9].

The estimated results show that provincial-level migration plays a positive and significant role in provincial-level trade creation. A 10 percent increase in provincial-level migration increases more than 2.5 percent of exports and more than 2 percent of imports. However, immigration can only increase provincial-level imports (see Table 6). This is possibly 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; and second, the stock of immigrants reduces trade costs between the origin and the destination of immigrants, increasing international trade (see Head and Ries 1998), but cannot contribute to provincial-level trade significantly. Head and Ries (1998) find that immigration increases Canadian international trade. Consequently, the contribution of immigrants is reflected in international trade[10].

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

Table 6. Fixed effects instrumental variable regression (using both stocks of migrants).

	(1) Trade	(2) Export	(3) Import
Provincial Migration Stock	0.238 ***	0.279 *	0.212 **
	(0.075)	(0.167)	(0.093)
Stock of Immigrants	0.134	0.0883	0.165 *
	(0.082)	(0.156)	(0.092)
Product of Origin and Destination GDP	0.523 ***	0.627 ***	0.463 ***
	(0.028)	(0.061)	(0.031)
Population Weighted Average Distance		Dropped	
English_French		Dropped	
Openness	1.155 ***	1.543 ***	0.879 ***
	(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 in parentheses. Kleibergen–Paap F Statistics of 5.619 > Stock–Yogo critical value of 4.58 at 15% relative bias. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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 the exports, imports, or trade series. Although the trade flow does not have any zero values in the dependent variable, 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 7.

Table 7. PPML fixed effects regression (both stocks are applied in the same model) (allowing for heteroscedasticity).

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

Standard errors in parentheses; ** $p < 0.05$, *** $p < 0.01$.

The estimated results using the PPML estimator indicate a positive and significant role of provincial-level migration in provincial-level trade. Both exports and imports are positively influenced by provincial-level migration. Immigration also significantly affects provincial imports and overall trade. However, the impact of immigration on provincial-level exports is not significant. Provincial-level trade openness strongly affects provincial-level exports, imports, and overall trade flow. Provincial income also plays a positive and significant role in provincial-level trade in Canada. Thus, the PPML estimation reinforces the results of previous estimators.

For more robustness, we construct the cumulative net provincial-level migration variable for all provinces. The construction method is as follows. The cumulative net

provincial-level 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 a 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 provincial-level net cumulative migration on provincial-level trade. The results (see Table 8) are consistent with the results in Tables 3–7.

Table 8. 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 ***	0.226 *	0.182 **	0.064 ***	0.041 ***	0.089 ***
	(0.044)	(0.116)	(0.075)	(0.011)	(0.016)	(0.017)
Product of Origin and Destination GDP	0.505 ***	0.593 ***	0.455 ***	0.504 ***	0.530 ***	0.486 ***
	(0.009)	(0.028)	(0.017)	(0.006)	(0.120)	(0.014)
Population Weighted Average Distance	Dropped					
English_French	Dropped					
Openness	0.988 ***	1.384 ***	0.706 ***	0.959 ***	1.256 ***	0.691 ***
	(0.064)	(0.183)	(0.103)	(0.025)	(0.080)	(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			

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The study accepts the hypotheses that the stock of provincial-level migrants positively influences provincial-level exports; the stock of provincial-level migrants positively influences provincial-level imports; and the stock of immigrants positively influences provincial-level imports. However, based on the PPML results, we could not accept the hypothesis that states that the stock of immigrants positively influences provincial-level exports.

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. Conclusions

The purpose of this study is to estimate the effect of provincial-level migration and immigration on provincial-level trade in Canada. We estimate an empirical model of trade and migration using several estimators, including pooled OLS, fixed effects, and two-stage least square and PPML. Our preferred estimators are the 2SLS and the fixed effects instrumental variable regressions due to potential endogeneity in the model. The estimated results using 2SLS indicate that both provincial-level migration and immigration positively affect provincial-level exports and imports in Canada. A ten percent increase in the stock of provincial-level migrants and a ten percent increase in the stock of immigrants increase the provincial-level 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 provincial-level migrants increases more than 2.5 percent of provincial-level trade, while the stock of immigration does not significantly increase provincial-level 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 provincial-level trade (see the details in Sections 1 and 4).

The estimated results of this study show a strong trade–migration nexus at the provincial level, as we accept three out of our four research hypotheses. The results show that provincial-level migration and immigration significantly increase Canadian provincial-level exports and imports. The results also indicate that although immigration significantly increases provincial-level imports, it cannot significantly increase provincial-level exports. The 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 provincial-level 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 provincial-level trade. The estimated results show that provincial trade flows are higher between provinces that speak both English and French compared to the provinces that speak only English or French.

Canadian provincial trade openness (approximately 21 percent) is much lower than Canadian international trade openness (approximately 66 percent). The estimated results suggest that provincial trade openness has a highly significant positive impact on provincial-level trade flow. On average, there is more than a one percent increase in provincial-level trade in response to a one percent increase in trade openness.

Provincial migration in Canada has the potential to develop new businesses and entrepreneurial ventures, as these migrants not only bring added demand for goods and services, but also bring new ideas and perspectives to the destination provinces. Such labour mobility, therefore, leads to the creation of new jobs, new products and services, and increased economic activity within Canadian provinces. The results from this study thus reinforce the report of the Standard Senate Committee on Banking, Trade and Commerce of Canada (Canada Parliament Senate et al. 2016), which predicts that the elimination of internal trade barriers would increase Canada's GDP by between 0.05% and 7.0% (Canada Parliament Senate et al. 2016). The results of this study suggest that if the CFTA (2017) can successfully eliminate interprovincial barriers to the free movement of persons, goods, services, and investments within Canada (Article 100), interprovincial migrants and immigrants will significantly increase Canadian interprovincial trade.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Variable, description, and data source.

Variable	Description	Data Source
Provincial import	Provincial imports; expenditure-based, 2007 (chained) annual (Canadian dollars × 1,000,000)	Table: 384-0038 Statistics Canada (2022c)
Provincial export	Provincial exports; expenditure-based, 2007 (chained) annual (Canadian dollars × 1,000,000)	Table: 384-0038 Statistics Canada (2022c)
International import	International imports; expenditure-based, 2007 (chained) annual (Canadian dollars × 1,000,000)	Table: 384-0038 Statistics Canada (2022c)
International export	International exports; expenditure-based, 2007 (chained) annual (Canadian dollars × 1,000,000)	Table: 384-0038 Statistics Canada (2022c)
Provincial in-migration	Provincial in-migrants, annual (persons)	Table: 051-0018 Statistics Canada (2022b)
Provincial out-migration	Provincial out-migrants, annual (persons)	Table: 051-0018 Statistics Canada (2022b)
Provincial migration stock	Provincial stock of migrant population born in other provinces	Census data and Table: 051-0018 Statistics Canada (2022b)
International immigration	International immigration; Canada, provinces and territories, annual (persons)	Table: 051-0037 Statistics Canada (2023a)
International emigration	International emigration; Canada, provinces and territories, annual (persons)	Table: 051-0037 Statistics Canada (2023a)
Cumulative net provincial migration stock	Constructed by authors	
Provincial stock of immigration	Immigrant population (not citizens by birth)	Census data (1981, 1986, 1991, 1996, 2001, 2006, 2011, 2016).
Provincial Income	Gross domestic product, expenditure-based, provincial and territorial, 2007 (chained) annual (Canadian dollars × 1,000,000)	Table 384-0038 Statistics Canada (2022c)
Provincial price level	Consumer Price Index, annual (2002 = 100)	Table 326-0021 Statistics Canada (2023b)
Population	Estimates of population, Canada, provinces and territories, annual (persons)	Table 051-0001 Statistics Canada (2022a)
Distance (population weighted)	Distance between provinces	GlobalFeed.com ϒ (Distance calculator Canada)
English & French	Dummy for de facto common language	Office of the commissioner of Official Language **

ϒ https://distancecalculator.globefeed.com/Canada_Distance_Calculator.asp (accessed 29 October 2020); ** https://www.clo-ocol.gc.ca/en/language_rights/provinces_territories (accessed 30 October 2020).

Table A2. Descriptive statistics (provincial data, 1981–2016).

Variable	Mean	SD	Min	Max	Net Migration	Net Trade
Ontario						
Provincial import (million)	66,810.14	14,781.36	44,374	92,062		+
Provincial export (million)	88,618.31	17,154.69	63,813	116,018		
In-migration (persons)	72,628	12,823	56,690	105,002	+	
Out-migration (persons)	69,901	10,332	52,942	98,420		
Provincial migration stock (persons)	1,008,485	58,474	85,1731	1,086,338		
International import (millions)	153,683.1	68,559.65	43,392	255,722		+
International export (millions)	157,871.5	66,852.88	49,670	244,860		

Table A2. *Cont.*

Variable	Mean	SD	Min	Max	Net Migration	Net Trade
Immigration in province (persons)	103,373	29,592	40,121	148,654	+	
Emigration from province (persons)	24,047	3901	16,620	29,849		
International migration stock (persons)	2,808,827	659,396	2,015,695	4,122,835		
Quebec						
Provincial import (millions)	48,280.97	8189.06	33,485	60,151		+
Provincial export (millions)	49,603.39	8426.72	37,051	63,095		
In-migration (persons)	22,519	2695	18,392	28,849	-	
Out-migration (persons)	32,954	5285	23,880	47,561		
Provincial migration stock (persons)	31,155	98,515	−135,715	217,243		
International import (millions)	69,975.67	31,559.58	20,852	115,675		-
International export (millions)	67,415.69	25,961.04	28,230	98,763		
Immigration in province (persons)	37,078	12,517	14,698	55,050	+	
Emigration from province (persons)	7985	1441	5117	10,650		
International migration stock (persons)	716,614	197,390	522,150	1,204,895		
British Columbia						
Provincial import (millions)	30673.42	8037.34	18,261	43,762		-
Provincial export (millions)	20,761.94	8936.42	9607	37,372		
In-migration (persons)	57,053	11,829	41,901	79,204	+	
Out-migration (persons)	45,647	5955	37,632	64,009		
Provincial migration stock (persons)	1,066,128	127,795	848,991	1,237,485		
International import (millions)	31,890.06	16,165.56	8953	59,112		+
International export (millions)	38,323.22	11,055.23	18,975	57,426		
Immigration in province (persons)	34,032	10,847	12,256	52,025	+	
Emigration from province (persons)	9393	2594	5668	13,231		
International migration stock (persons)	912,722	248,226	627,560	1,426,450		
Alberta						
Provincial import (millions)	38,473.92	13,816.98	21,591	66,955		+
Provincial export (millions)	41,828.03	11,529.46	28,487	62,954		
In-migration (persons)	68,451	16,109	39,938	102,406	+	
Out-migration (persons)	57,796	9650	42,003	80,213		
Provincial migration stock (persons)	757,942	159,530	580,965	1,054,314		
International import (millions)	36,294.5	24,845.67	9845	82,565		+
International export (millions)	64,942.64	32,208.27	17,967	121,661		
Immigration in province (persons)	20,553	10,526	8989	49,214	+	
Emigration from province (persons)	7056	1096	4753	9201		
International migration stock (persons)	470,140	142,672	361,170	938,495		
Saskatchewan						
Provincial import (millions)	15,475.97	4785.91	9951	24,667		-
Provincial export (millions)	10,946.61	3566.74	5723	16,235		
In-migration (persons)	16,924	2203	13,228	22,067	-	
Out-migration (persons)	21,282	4243	15,124	32,939		

Table A2. *Cont.*

Variable	Mean	SD	Min	Max	Net Migration	Net Trade
Provincial migration stock (persons)	32,647	56,123	−28,638	132,425		
International import (millions)	8821.81	5599.34	2631	20,634		+
International export (millions)	15,943.19	5907.74	7014	25,259		
Immigration in province (persons)	4059	3765	1572	14,859	+	
Emigration from province (persons)	877	196	483	1441		
International migration stock (persons)	64,598	17,441	47,825	127,725		
Manitoba						
Provincial import (millions)	13,232.39	4009.23	8060	19,385		-
Provincial export (millions)	10,906.89	3143.70	6848	15,847		
In-migration (persons)	14,536	2757	10,295	21,020	-	
Out-migration (persons)	19,043	3289	13,608	26,963		
Provincial migration stock (persons)	62,614	50,197.49	−21,947	137,921		
International import (millions)	9042.53	4806.49	2538	17,137		+
International export (millions)	10,297.03	4886.62	3295	16,829		
Immigration in province (persons)	7596	4490	3004	16,826	+	
Emigration from province (persons)	1779	251	1353	2430		
International migration stock (persons)	151,738	26,284	133,660	249,625		
Nova Scotia						
Provincial import (millions)	9440.61	1400.63	7048	11945		-
Provincial export (millions)	5785.19	1331.77	3308	7518		
In-migration (persons)	16,394	1627	13,687	20,257	-	
Out-migration (persons)	17,283	1522	14,190	20,828		
Provincial migration stock (persons)	102,217	12,466.98	78,432	117,587		
International import (millions)	7399.39	2959.47	2840	11,361		-
International export (millions)	5200.33	1840.59	2322	7663		
Immigration in province (persons)	2134	951	833	5483	+	
Emigration from province (persons)	840	237	430	1245		
International migration stock (persons)	44,689	7404	39,110	70,310		
New Brunswick						
Provincial import (millions)	9416.64	1939.11	6283	13,592		-
Provincial export (millions)	8006.06	1623.32	4681	10,703		
In-migration (persons)	11,576	1379	9676	14,874	-	
Out-migration (persons)	12,726	1424	10,127	17,615		
Provincial migration stock (persons)	73,953	12,674	48,633	91,151		
International import (millions)	9575.92	4372.95	2902	16,470		-
International export (millions)	8735.11	3361.19	3699	13,083		
Immigration in province (persons)	1214	879	554	4675	+	
Emigration from province (persons)	645	210	343	1060		
International migration stock (persons)	26,785	4103	22,465	41,395		
Newfoundland and Labrador						
Provincial import (millions)	6332.69	1026.85	5079	8269		-
Provincial export (millions)	4325.28	2562.79	1726	8674		

Table A2. *Cont.*

Variable	Mean	SD	Min	Max	Net Migration	Net Trade
In-migration (persons)	8194	1172	5810	10,224	-	
Out-migration (persons)	11,010	2335	7419	15,485		
Provincial migration stock (persons)	−40,114	36,789	−80,867	18,472		
International import (millions)	5101.47	3207.08	1289	12,284		+
International export (millions)	7401.08	2655.77	3935	12,628		
Immigration in province (persons)	563	217	274	1189	+	
Emigration from province (persons)	290	87	184	511		
International migration stock (persons)	9438	1781	8025	16,835		
Prince Edward Island						
Provincial import (millions)	1802.58	407.62	1117	2401		-
Provincial export (millions)	959.53	216.85	665	1347		
In-migration (persons)	2777	311	2202	3482	-	
Out-migration (persons)	2867	483	1925	4216		
Provincial migration stock (persons)	49,514	1628	45,549	51,704		
International import (millions)	668.83	392.80	170	1378		+
International export (millions)	674.33	340.70	196	1140		
Immigration in province (persons)	566	699	107	2593	+	
Emigration from province (persons)	87	29	33	155		
International migration stock (persons)	5093	1699	4105	10,800		

Source: Authors' calculations, based on data from Statistics Canada (2022b, 2023a).

Table A3. Correlation between migration and trade for each province in Canada.

Variable	Net Provincial-Level Migration	Immigration	Net Immigration	Net Provincial-Level 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

Table A3. *Cont.*

Variable	Net Provincial-Level Migration	Immigration	Net Immigration	Net Provincial-Level Migration (% of Provincial Population)	Net Immigration (% of Provincial Population)	Stock of Immigrants
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 provincial-level migration and the net international migration variables by subtracting emigration from immigration. Source: Authors' calculations based on data from Statistics Canada (2022c).

Notes

[1] 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 together (except Ontario) are the partner provinces (PP).

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

[3] Gordon Infeld, "Why can't Canada learn to get along? How provincial trade barriers remain a conundrum" Canadian Press, 28 November 2014.

[4] Marie-Danielle Smith, "Will Kinder Morgan walk away from the Trans Mountain pipeline expansion? National Post, 23 May 2018.

[5] See Anania and McCalla (1991) for details.

[6] See Table A2 for details.

[7] See note 2.

[8] We test for unit root using Levin et al. (2002) and Im et al. (2003) and find that our series is stationary at level.

[9] 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.

[10] There is a detailed discussion about this in the Introduction section.

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