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REVISITING BORDER EFFECTS TO TRADE ACROSS CANADIAN PROVINCES FROM THE INTERNAL TRADE-MIGRATION NEXUS

MUSTAFA RAFAT ZAMAN

Bangladesh

In this paper, I study how interprovincial migration impacts interprovincial trade in the wake of several provincial agreements and re-examine the extent and pattern of interprovincial trade barriers in Canada. For estimation, I use a migration augmented gravity model of trade and panel data on interprovincial trade and migration flows during 2000-2016. I find that while most agreements increased trade in goods and services respectively, albeit to different extents, between member provinces, others did not. I also find that the interprovincial barriers to trade are remarkably smaller than have been previously estimated and that the barriers are larger for trade in services than goods. However, over the last two decades in Canada trade barriers have decreased by 17 percent for services but increased by 52 percent for goods flows across provinces.

Keywords: Interprovincial Trade, Interprovincial Trade Barriers, Interprovincial Migration, Gravity Model
JEL Classification: F13, F14, F15, F16, J61

1. INTRODUCTION

Starting from the 1990s interprovincial trade and migration have received a lot of attention from researchers, governments, and policymakers alike. Studies have estimated that the Canadian economy incurs $50-$130 billion annually from lost trade and migration opportunities because of interprovincial barriers to trade and migration (Tkachuk and Day 2016). Moreover, the federal, provincial, and territorial governments have also negotiated bilateral agreements with other provinces to tackle these barriers. Researchers have quantified the extent of such barriers by estimating subnational border effects. For instance, Beaulieu and Zaman (2019) have empirically estimated border effects for Canadian provinces which showed that intra-provincial trade for a province was on average around fifty times more than interprovincial trade in 2013. However, they estimated without taking interprovincial migration into account which could be

important since by establishing business and social networks migrants may promote trade (Gould 1994; Rauch 2001; Wagner et al 2002). This suggests that Beaulieu and Zaman's (2019) estimates of interprovincial border effects without controlling for interprovincial migration are biased and this is also underscored by related studies for other countries. For instance, Combes et al. (2005) have shown that border effects between French regions significantly decrease in size when internal migration is included to explain trade flows within France. Similarly, Millimet and Osang (2007) find that in the presence of interstate migration internal border effects that indicate the extent to which trade is impeded across the U.S. states diminish in magnitude.

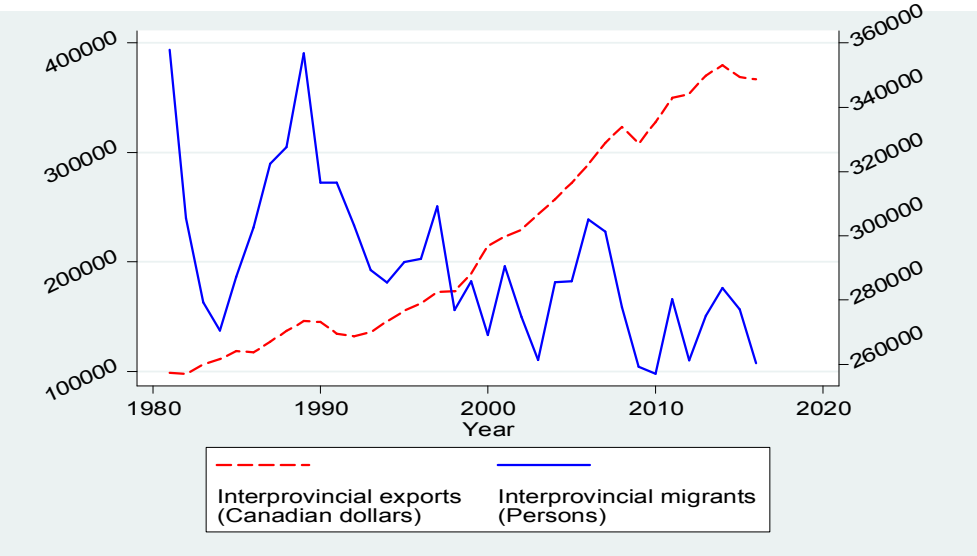
Correctly estimating the barriers to interprovincial trade in Canada is very crucial for policymaking since the federal, provincial, and territorial governments have been continuously negotiating agreements to eliminate such barriers and facilitate trade flows within Canada. Examples include nationwide interprovincial agreements such as the Agreement on Internal Trade-AIT in 1995 and subnational ones such as the Trade and Cooperation Agreement-TCA between Ontario and Quebec in 2009 and the New West Partnership Trade Agreement-NWPTA between British Columbia, Alberta, and Saskatchewan in 2010.

In this paper, I estimate border effects on interprovincial trade by including migration besides other determinants of trade such as interprovincial agreements. For my empirical estimation, I use a gravity model on panel data of interprovincial trade in goods and services as well as migration during 2000-2016. I find that the border effects are significantly smaller than those that have been estimated by Beaulieu and Zaman (2019) although my estimated impact of the agreements on aggregate trade flows are similar. Additionally, my results show that border effects are larger for trade in services than goods and the interprovincial agreements affect goods trade to a different extent than trade in services. Next, I explore the Canadian interprovincial trade and migration trends and the features of the interprovincial agreements that I examine in this article.

Interprovincial Trade, Migration and Agreements in Canada

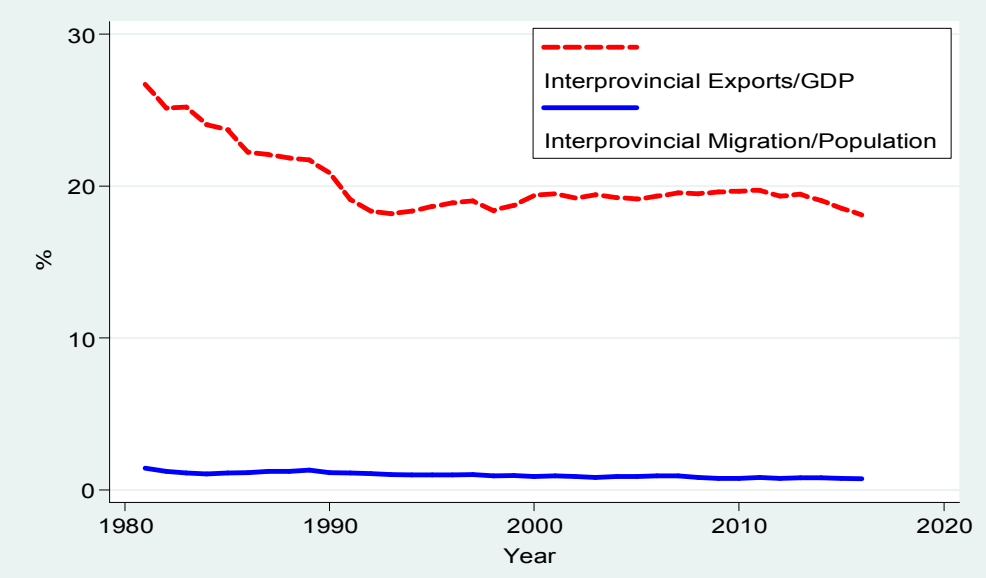
Figure 1 plots the Interprovincial exports and migration over time in Canada during 1980-2016. It can be seen that since 1980 interprovincial migration declined sharply until the mid-1980s and then increased sharply in the late 1980s before gradually declining over the remaining years. Interprovincial exports increased until the 1990s before decreasing over a few years and then increasing precipitously for most of the remaining years.

Figure 1 suggests that there is an inverse relation between interprovincial exports and migration. However, when I plot interprovincial exports as a share of the Gross Domestic Product-GDP and interprovincial migration as a share of the population there hardly seems to be any relation between the two series as can be seen from Figure 2. I also list the interprovincial agreements that I study and present a summary of their main features in Table 1.



Source: Author's calculations based on the data from Statistics Canada

Figure 1. Interprovincial exports and migrants for Canada



Source: Author's calculations based on the data from Statistics Canada

Figure 2. Interprovincial Exports and Migration as a percentage of GDP and Population, respectively for Canada

Table 1. Interprovincial Trade Agreements: Key Dates and Objectives

Name	Members	Agreement Year	Agreement Objective Summary
Agreement on the Opening of Public Procurement- OPP	New Brunswick and Quebec	2009	Reduce trade barriers between provinces through the opening of public procurement based on reciprocity and improve firms' productivity and competitiveness.
Atlantic Procurement Agreement-APA	New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island	2008	Eliminate interprovincial trade barriers from public procurement of goods, services, and construction to enhance firms' productivity and global competitiveness.
Trade, Investment, and Labour Mobility Agreement-TILMA	British Columbia and Alberta	2007	Reduce costs for consumers, businesses, and governments by eliminating barriers to trade, investment, or labor mobility; enhance competitiveness, economic growth, and stability; provide access to information and programs to facilitate labor mobility and business establishment; promote sustainable and environmentally sound development.
Partnership Agreement on Regulation and the Economy-PARE	New Brunswick and Nova Scotia	2009	Enhance competitiveness, improve productivity, contribute to workforce development, and positively influence issues of mutual interest by removing duplication and harmonizing regulations and practices between the provinces.
Trade and Cooperation Agreement-TCA	Quebec and Ontario	2009	Eliminate obstacles to interprovincial trade, labor mobility, public procurement, transportation, financial services, agriculture, and environment, and facilitate economic cooperation and the execution of joint projects between the provinces.
New West Partnership Trade Agreement-NWPTA	British Columbia, Alberta, and Saskatchewan	2010	Builds on the Trade, Investment, and Labour Mobility Agreement to remove interprovincial barriers through full mutual recognition or reconciliation of the rules affecting trade, investment, or labor mobility among the three provinces

Source: https://www.cfta-alec.ca/

The paper is divided into five sections. Section 2 provides a literature review. Section 3 describes the empirical model that I utilize for my analysis. Section 4 discusses the empirical methodology, data, and results. Finally, Section 5 concludes the research. After that, I discuss the empirical results of the analysis before I conclude.

2. LITERATURE REVIEW

There is a dearth of literature on the trade-creating effects of domestic migration compared to the international migration–trade phenomenon. Overall, it suggests one way in which migrants may facilitate trade between the origin and destination location is by reducing trade costs. This might result from avoiding regulatory and other informal barriers to trade, facilitating the flow of information about products and opportunities, and establishing businesses across international and subnational borders. If the migrants continue to exhibit home bias in their consumption patterns wherein, they continue to consume the goods that they consumed in their original country/province of residence then this will also facilitate trade flows.

The gravity model has been widely used to study the determinants of both international and intranational trade in the literature (Head and Mayer 2014). In a gravity model in its general form trade between any two countries or provinces is positively related to the size of the economies and negatively related to the trade costs between them. Using this model and data only on trade flows Wolf (2000) found high intra-state trade relative to inter-state trade in the US. Millimet and Osang (2007) argue that by not including the effect of networks empirical specifications of the gravity model are likely to suffer from omitted variable bias. Accounting for unobserved network effects using interstate migration in a gravity framework they find that border effects to trade across the US states are considerably smaller than what Wolf (2000) estimated.

Combes et al. (2005) use a gravity model to study how business and social networks affect trade among 94 French regions. Employing migration across these regions as a proxy for social networks they find a significant decline in interregional border effects in France. Using data on trade flows across provinces within Spain Garmendia et al. (2012) estimated a large internal border effect or home bias for intranational trade. However, such home bias disappeared in the presence of network effects arising from setting up businesses and migrating within the country.

In quantifying how much provincial borders impede trade flows Beaulieu and Zaman (2019) estimated large interprovincial border effects by applying a gravity model on panel data of trade flows across provinces during 1992-2013. But as noted earlier they did not consider the role that migrant networks across provincial borders might play in the process rendering their estimates of internal border effects biased.

3. METHODOLOGY AND DATA

3.1. Model

For my estimation purposes I use a gravity model and estimate different versions of

the following empirical specification:

$$X_{ijt} = \exp[\theta_{it} + \nu_{jt} + \rho_{ij} + \lambda_t + \beta_1 \ln Mig_{ijt} + \beta_2 OPP_{ijt} + \beta_3 APA_{ijt} + \beta_4 PARE_{ijt} + \beta_5 TCA_{ijt} + \beta_6 (TILMA/\ NWPTA)_{ijt}] \times \exp\left[\sum_{T=2000}^{2016} \beta_T\ BRDR(T)_{ij}\right] \times \varepsilon_{ijt}, \quad (1)$$

where X_{ijt} denotes the exports between provinces i and j in year t; Mig_{ijt} denotes the migration between provinces i and j in year t; θ_{it} and ν_{jt} represent the exporter-time and importer-time fixed effects; ρ_{ij} are province pair fixed effects; λ_t are time-fixed effects; OPP_{ijt} dummy takes a value of 0 before the agreement in 2009 between New Brunswick and Quebec and 1 thereafter but only for New Brunswick and Quebec pairs; APA_{ijt} dummy takes a value of 0 before the agreement in 2008 among New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island and 1 thereafter but only for these provinces; $PARE_{ijt}$ dummy takes a value of 0 before the agreement in 2009 between New Brunswick and Nova Scotia and 1 thereafter but only for New Brunswick and Nova Scotia pairs; TCA_{ijt} dummy takes a value of 0 before the agreement in 2009 between Ontario and Quebec and 1 thereafter but only for Ontario and Quebec pairs; $(TILMA/\ NWPTA)_{ijt}$ dummy takes a value of 0 before the agreement in 2007 between Alberta and British Columbia and 1 thereafter initially only for Alberta and British Columbia pairs but then from 2010 on also for pairs with those provinces and Saskatchewan because of the agreement's extension that year to include that province; $BRDR(T)_{ij}$ is a border dummy variable taking the value of one for interprovincial trade in each year *T* and the value of zero otherwise (i.e., it takes the value one if the source and destination provinces, *i* and *j,* respectively, are different $[i \neq j]$ and the value 0 if i and j are the same provinces $[i = j]$). The antilog of the estimated border coefficients for the years T yields an average measure of interprovincial barriers to trade faced by the Canadian provinces when trading with each other and, a priori, these coefficient estimates are expected to be negative. ε_{ijt} is the error term, which is assumed to be normally distributed.

Next, I introduce lead and lagged terms of the interprovincial agreements to avoid omitted variables bias since some of the agreements might have lagged and/or anticipatory effects. With these additional terms I have to consider the cumulative effect of each agreement and its lead and lagged terms based on their joint statistical significance to measure the effect on trade flows (Goldberger 1991, Beaulieu and Zaman 2019). The augmented empirical specification is as follows:

$$X_{ijt} = \exp[\omega_{it} + \delta_{jt} + \sigma_{ij} + \pi_t + \gamma_1 \ln Mig_{ijt} + \gamma_2 OPP_{ijt} + \gamma_3 APA_{ijt} + \gamma_4 PARE_{ijt} + \gamma_5 TCA_{ijt} + \gamma_6 (TILMA/\ NWPTA)_{ijt} + \gamma_7 OPP_{ijt+1} + \gamma_8 OPP_{ijt-1} + \gamma_9 APA_{ijt+1} + \gamma_{10} APA_{ijt-1} + \gamma_{11} PARE_{ijt+1} + \gamma_{12} PARE_{ijt-1} + \gamma_{13} TCA_{ijt+1} + \gamma_{14} TCA_{ijt-1} + \gamma_{15} (TILMA/NWPTA)_{ijt+1}$$

$$+ \gamma_{16}(TILMA/NWPTA)_{ijt-1} \times exp\left[\sum_{T=2000}^{2016} \gamma_T \, BRDR(T)_{ij}\right] \times \xi_{ijt}. \quad (2)$$

3.2. Econometric Estimation

To estimate the gravity model in its multiplicative form I use the Poisson Pseudo Maximum Likelihood-PPML estimator proposed by Santos Silva and Tenreyro (2006). Including pair fixed effects in estimation controls for the endogeneity bias of the interprovincial agreements and migration by accounting for unobservable province pair characteristics that might be cultural, historical, or political. Moreover, according to Cheng and Wall (2005), pair-fixed effects adequately and consistently control for both observable and unobservable bilateral time-invariant factors. Baier and Bergstrand (2007) pioneered the use of panel data estimation with pair-fixed effects to tackle the endogeneity of trade policies. Parsons (2012) used pair-fixed effects in his study of international trade to address the endogeneity bias of international migration and regional trade agreements. Another way I tackle the potential endogeneity bias of migration is by first regressing migration flows (in natural logs) on pair fixed effects and then using the predicted values in estimating trade flows. The first regression yields a very high R2 indicating that most migration flows across provinces are driven by bilateral time-invariant factors such as contiguity, historical ties, etc. thus making the predicted values exogenous. This approach was chosen over an instrumental variable method since according to Santos Silva and Tenreyro (2022) the instrumental variables counterpart of the Poisson Pseudo Maximum Likelihood-PPML estimator cannot be used to estimate models that include fixed effects.

3.3. Data

The sample data used in this paper are annual from 2000 to 2016 for the 10 provinces of Canada: British Columbia-BC, Alberta-AB, Saskatchewan-SK, Manitoba-MB, Ontario-ON, Quebec-QC, New Brunswick-NB, Nova Scotia-NS, Newfoundland and Labrador-NL, and Prince Edward Island-PEI. The source of the sample data was Statistics Canada's CANSIM database. Interprovincial and intra-provincial trade flows are from CANSIM Tables 386002 and 386003. Interprovincial migration flows are from the CANSIM Tables 0510019, 1110029, and 0510065. Intra-provincial migration flows were computed as in Zaman (2020) by aggregating the migration flows between each province's CMAs and non-CMAs[1]. I used

[1] In the CANSIM tables, a census metropolitan area (CMA) is defined as being formed by one or more adjacent municipalities centered on a population center, or core. A CMA must have a total population of at least 100,000, of which 50,000 or more must live in the core. Similarly, a non-CMA is defined as a metropolitan area made up of all the postal codes within a province or territory that are not allocated to a CMA. In the tables, the flows are referred to as out-migration, which means any movement out of a CMA or non-CMA to elsewhere inside or outside of Canada. Hence, aggregating the flows between the CMAs and the

the year when the interprovincial agreements that I study came into force (presented in Table 1) to calculate a dummy for each of the individual agreements. For estimation, I pooled data over four-year intervals: 2000, 2004, 2008, 2012, and 2016 (please see Olivero and Yotov, 2012 for a similar application). Cheng and Wall (2005) recommend against pooling the data over successive years in fixed effects estimation since it allows for any adjustments in the data that generally take more than a year.

4. EMPIRICAL RESULTS

From the results of estimating Equation 1 reported in Table 2, column 1 shows that TCA and PARE decrease trade flows while the other agreements are statistically insignificant. The estimated border effects are all statistically significant and negative as expected a priori. When interprovincial migration is included as a control it is statistically insignificant as shown in column 2. Although the agreements' effect remains the same as in column 1, the border effects decrease in size. When I include predicted migration as well as lead and lagged terms of agreements, results reported in column 3 show the effect of migration is statistically significant, specifically, a one percent increase in interprovincial migration leads to a 0.01 unit increase in trade flows which is equivalent to \$11,120[2]. The magnitude of the border effects remains similar to those in column 2 and increases over time from exp (1.483) = 4.41 in 2000 to 4.93 in 2016, however, these are around 17 times smaller than those estimated without including migration in column 1 of Table 2. After being in place for four years, within the agreement members, APA increases trade by [exp (0.257+0.259-0.174)-1] *100= 40.8% whereas OPP, TCA, and PARE decrease trade by 4.4%, 27.6% and 41.2% respectively while the effect of TILMA-NWPTA is statistically insignificant.

Next, I re-estimate using trade flow data disaggregated into goods and services and report the results in Tables 3 and 4 respectively. Column 1 of Table 3 shows that OPP and TILMA increase goods trade while the rest of the agreements remain statistically insignificant. The estimated border effects are all statistically significant and negative as expected indicating that those reduce goods trade. In column 2 interprovincial migration is statistically insignificant and the agreements' effect on trade remains similar to those reported in column 1 but the estimated border effects are smaller in magnitude. The third column shows a statistically significant effect of migration on trade specifically a 1 percent increase in interprovincial migration leads to an increase in goods trade flows worth \$10,610.

non-CMAs in each province yields the migration flows within the Canadian provinces.

[2] The trade flows have been measured in millions of dollars.

Table 2. Dependent Variable: Goods and Services Exports

VARIABLES	(1) PPML	(2) PPML	(3) PPML
OPP_{ijt}	0.043	0.062	0.073***
	(0.042)	(0.045)	(0.026)
OPP_{ijt+1}			-0.047
			(0.097)
OPP_{ijt-1}			-0.071
			(0.054)
APA_{ijt}	0.132	0.152	0.257
	(0.091)	(0.095)	(0.199)
APA_{ijt+1}			0.259***
			(0.099)
APA_{ijt-1}			-0.174
			(0.157)
TCA_{ijt}	-0.091***	-0.082***	0.013
	(0.022)	(0.023)	(0.029)
TCA_{ijt+1}			-0.149***
			(0.02)
TCA_{ijt-1}			-0.187***
			(0.029)
$PARE_{ijt}$	-0.220***	-0.221***	0.044
	(0.061)	(0.061)	(0.158)
$PARE_{ijt+1}$			-0.430**
			(0.218)
$PARE_{ijt-1}$			-0.145
			(0.247)
$(TILMA/\ NWPTA)_{ijt}$	0.048	0.054	0.021
	(0.042)	(0.043)	(0.063)
$(TILMA/NWPTA)_{ijt+1}$			0.030
			(0.033)
$(TILMA/NWPTA)_{ijt-1}$			0.014
			(0.063)
BRDR_2000	-4.324***	-1.415***	-1.483***
	(0.039)	(0.036)	(0.031)
BRDR_2004	-4.343***	-1.431***	-1.511***
	(0.036)	(0.032)	(0.031)
BRDR_2008	-4.428***	-1.521***	-1.553***
	(0.039)	(0.029)	(0.035)
BRDR_2012	-4.446***	-1.537***	-1.596***
	(0.044)	(0.044)	(0.041)
BRDR_2016	-4.462***	-1.550***	-1.595***
	(0.044)	(0.039)	(0.035)
$\ln Mig_{ijt}$		0.055	
		(0.050)	
$\ln\widehat{Mig_{ij}}$			1.112***
			(0.003)
Observations	500	500	500
Time fixed effects	Yes	Yes	Yes
Pair fixed effects	Yes	Yes	Yes
Exporter×Time fixed effects	Yes	Yes	Yes
Importer×Time fixed effects	Yes	Yes	Yes

Notes: Subscripts i and j denote provinces and t, $t+1$, and $t-1$ denote time and its lead and lagged terms. Fixed effects are not reported. Robust standard errors (in parentheses) clustered at the province pair level; BRDR = interprovincial border effects; APA = Atlantic Procurement Agreement; NWPTA = New West Partnership Trade Agreement; OPP = Agreement on Opening of Public Procurement; PARE= Partnership Agreement on Regulation and Economy; TCA = Trade and Cooperation Agreement; TILMA = Trade, Investment and Labor Mobility Agreement. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Dependent Variable: Goods Exports

VARIABLES	(1) PPML	(2) PPML	(3) PPML
OPP_{ijt}	0.192***	0.198***	0.180***
	(0.048)	(0.048)	(0.047)
OPP_{ijt+1}			-0.048
			(0.140)
OPP_{ijt-1}			0.028
			(0.101)
APA_{ijt}	0.176	0.182	0.316
	(0.125)	(0.127)	(0.227)
APA_{ijt+1}			0.297**
			(0.144)
APA_{ijt-1}			-0.097
			(0.176)
TCA_{ijt}	-0.027	-0.024	0.049
	(0.036)	(0.034)	(0.058)
TCA_{ijt+1}			-0.086***
			(0.027)
TCA_{ijt-1}			-0.132**
			(0.056)
$PARE_{ijt}$	-0.086	-0.086	0.136
	(0.117)	(0.116)	(0.177)
$PARE_{ijt+1}$			-0.644***
			(0.249)
$PARE_{ijt-1}$			-0.143
			(0.341)
$(TILMA/\ NWPTA)_{ijt}$	0.156**	0.158**	0.132
	(0.067)	(0.067)	(0.087)
$(TILMA/NWPTA)_{ijt+1}$			-0.009
			(0.041)
$(TILMA/NWPTA)_{ijt-1}$			0.029
			(0.062)
BRDR_2000	-3.709***	-0.906***	-0.989***
	(0.053)	(0.045)	(0.038)
BRDR_2004	-3.717***	-0.913***	-1.004***
	(0.049)	(0.042)	(0.038)
BRDR_2008	-4.027***	-1.225***	-1.284***
	(0.052)	(0.039)	(0.043)
BRDR_2012	-4.097***	-1.294***	-1.374***
	(0.059)	(0.058)	(0.052)
BRDR_2016	-4.145***	-1.341***	-1.412***
	(0.059)	(0.059)	(0.043)
$\ln Mig_{ijt}$		0.018	
		(0.068)	
$\ln\widehat{Mig_{ij}}$			1.061***
			(0.00491)
Observations	500	500	500
Time fixed effects	Yes	Yes	Yes
Pair fixed effects	Yes	Yes	Yes
Exporter×Time fixed effects	Yes	Yes	Yes
Importer×Time fixed effects	Yes	Yes	Yes

Notes: Subscripts i and j denote provinces and t, $t+1$, and $t-1$ denote time and its lead and lagged terms. Fixed effects are not reported. Robust standard errors (in parentheses) clustered at the province pair level; BRDR = interprovincial border effects; APA = Atlantic Procurement Agreement; NWPTA = New West Partnership Trade Agreement; OPP = Agreement on Opening of Public Procurement; PARE= Partnership Agreement on Regulation and Economy; TCA = Trade and Cooperation Agreement; TILMA = Trade, Investment and Labor Mobility Agreement. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4. Dependent Variable: Services Exports

VARIABLES	(1) PPML	(2) PPML	(3) PPML
OPP_{ijt}	0.023	0.071	0.005
	(0.052)	(0.062)	(0.033)
OPP_{ijt+1}			0.075
			(0.046)
OPP_{ijt-1}			0.025
			(0.036)
APA_{ijt}	0.029	0.081	0.012
	(0.066)	(0.073)	(0.076)
APA_{ijt+1}			0.127***
			(0.031)
APA_{ijt-1}			-0.109**
			(0.053)
TCA_{ijt}	-0.143***	-0.120***	-0.024
	(0.023)	(0.023)	(0.021)
TCA_{ijt+1}			-0.167***
			(0.016)
TCA_{ijt-1}			-0.216***
			(0.019)
$PARE_{ijt}$	-0.238***	-0.238***	-0.128**
	(0.058)	(0.059)	(0.063)
$PARE_{ijt+1}$			0.041
			(0.082)
$PARE_{ijt-1}$			0.070
			(0.073)
$(TILMA/\ NWPTA)_{ijt}$	0.032	0.049*	-0.032
	(0.031)	(0.027)	(0.037)
$(TILMA/NWPTA)_{ijt+1}$			0.080***
			(0.029)
$(TILMA/NWPTA)_{ijt-1}$			0.069
			(0.051)
BRDR_2000	-4.837***	-2.194***	-2.055***
	(0.027)	(0.026)	(0.020)
BRDR_2004	-4.885***	-2.230***	-2.111***
	(0.024)	(0.023)	(0.021)
BRDR_2008	-4.776***	-2.136***	-1.955***
	(0.032)	(0.022)	(0.024)
BRDR_2012	-4.712***	-2.066***	-1.924***
	(0.027)	(0.023)	(0.022)
BRDR_2016	-4.691***	-2.036***	-1.880***
	(0.034)	(0.029)	(0.028)
$\ln Mig_{ijt}$		0.157***	
		(0.039)	
$\ln\widehat{Mig_{ij}}$			1.073***
			(0.002)
Observations	500	500	500
Time fixed effects	Yes	Yes	Yes
Pair fixed effects	Yes	Yes	Yes
Exporter×Time fixed effects	Yes	Yes	Yes
Importer×Time fixed effects	Yes	Yes	Yes

Notes: Subscripts i and j denote provinces and t, $t+1$, and $t-1$ denote time and its lead and lagged terms. Fixed effects are not reported. Robust standard errors (in parentheses) clustered at the province pair level; BRDR = interprovincial border effects; APA = Atlantic Procurement Agreement; NWPTA = New West Partnership Trade Agreement; OPP = Agreement on Opening of Public Procurement; PARE= Partnership Agreement on Regulation and Economy; TCA = Trade and Cooperation Agreement; TILMA = Trade, Investment and Labor Mobility Agreement. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Cumulatively after being in place for four years, within the agreement members, OPP increases goods trade by 17.3 percent, APA by 67.4 percent, TILMA-NWPTA by 16.5 percent, whereas TCA and PARE decrease the trade flows by 15.6 percent and 47.8 percent respectively. The border effect estimates are statistically significant and are slightly higher in magnitude than those in column 2. They increased from 2.69 in 2000 to 4.1 in 2016, however, these are more than 15 times smaller than those estimated without including migration in Col 1 of Table 2.

Table 4 reports the estimated results for trade flows in services. Column 2 of Table 4 shows that interprovincial migration positively influences services trade flows and border effects decrease in size when estimation includes migration. In column 3 when the predicted migration is included, I find that a 1 percent increase in interprovincial migration increases services trade flows worth $10,730 and the estimated border effects slightly decrease in size than those reported in column 2.

The border effects are all statistically significant and decrease from 7.8 in 2000 to 6.55 in 2016 and these are more than 16 times smaller than those estimated without migration in column 1 of Table 3. After four years in place, among the agreement members, APA increased service trade by 3 percent, and TILMA-NWPTA by 12.5 percent, whereas TCA and PARE decreased the trade flows by 33.5 percent and 12 percent, respectively.

For aggregate trade flows in goods and services Beaulieu and Zaman (2019) have previously estimated interprovincial border effects that decreased by 15% from 62 in 1992 to 53.5 in 2013. Without accounting for interprovincial migration, the size of my estimated border effects is similar to those that have been estimated by Beaulieu and Zaman (2019).

However, when I incorporate interprovincial migration, I find the border effects for trade flows in goods and services diminish significantly in magnitude despite increasing over time from 4.4 in 2000 to 4.93 in 2016.

Other researchers have estimated border effects for other countries but those are not directly comparable to mine since in estimation they don't account for various factors that influence trade within countries in an all-encompassing manner. However, I present some of those findings for understanding barriers better. For aggregate trade flows in goods and services within the U.S., Wolf (2000) finds a border effect of 4. Poncet (2005) finds that in China the average border effect increased from 24 in 1992 to 31 in 1997. In Brazil, Daumal and Zignago (2010) find that the average interstate border effect decreased from 37 in 1991 to 12 in 1999.

Unlike Beaulieu and Zaman (2019) I also estimate using trade data disaggregated into goods and services. When I control for interprovincial migration, I find smaller border effects that range from 4 for goods and 6.6 for services in 2016 thus indicating the robustness of my finding using aggregate trade flows. For the effect of interprovincial agreements on aggregate trade flows, my results are mostly similar to Beaulieu and Zaman (2019) who find that after a few years in place, while OPP, APA, and TILMA/NWPTA have increased trade flows in goods and services, TCA and PARE

have decreased it. Using disaggregated trade flow data, I additionally find that after four years in place, OPP increases only goods trade; APA increases goods trade significantly more than trade in services; TILMA/NWPTA increases goods trade slightly more than services; TCA decreases services trade around two times more than goods trade; PARE decreases goods trade by four times more than services. The negative effect on interprovincial trade of some of these agreements might have resulted from their sector-specific nature for example PARE targeted reducing barriers only in the fish industry. In that way, barriers might accumulate in other sectors thus increasing overall barriers according to Beaulieu and Zaman (2019). These researchers also consider the provision of liberalized investment under all these agreements (except OPP and APA) to decrease trade flows since such provisions enable firms to produce locally and meet demand rather than through interprovincial trade under which they will have to face regulatory and other barriers. This is what multinational enterprises-MNEs often do when they locate their firms internationally to avoid various international border impediments (Nocke and Yeaple, 2007).

5. CONCLUSION

In this paper, I study how interprovincial migration influences interprovincial trade besides various other determinants such as interprovincial agreements. I use a gravity model on panel data of trade and migration flows during 2000-2016.

Previously Beaulieu and Zaman (2019) using only aggregate trade flow data estimated large interprovincial border effects that suggest Canadian provinces traded more than 50 times within a province than across provinces in 2013. Border effects are quantitative measures of frictions to interprovincial trade in Canada that serve as an extremely useful tool to help policymakers adopt policies to mitigate such frictions. Using both aggregate and disaggregate trade flow data and accounting for migrant networks I find much smaller interprovincial border effects which show that Canadian provinces on average trade goods and services respectively around 4 and 7 times more within provinces than across provinces. Beaulieu and Zaman (2019) found that interprovincial border effects for both goods and services decreased by 15 percent between 1992 and 2013. Since they used data on aggregate flows they could not distinguish between the size of barriers between goods and services. Using disaggregate data I find that trade in services faces higher barriers at the provincial border than the trade in goods. Also, while border effects for services have decreased by 16 percent between 2000 and 2016 it has increased for goods by 52 percent during the same period.

As for the agreements, Beaulieu and Zaman (2019) found that OPP, APA, and TILMA-NWPTA increased trade flows in goods and services whereas TCA and PARE decreased it. However, I find that OPP increases only goods trade; APA and TILMA-NWPTA increase both goods and services trade across provinces whereas TCA

and PARE decrease both types of flows. Additionally, I find that a one percent increase in interprovincial migration increases trade flows in goods and services worth around $11,000. This seems to be economically small but it could be because migrants may both create and divert trade as Parsons (2012) notes in his study of international trade. Since my empirical finding also shows that interprovincial migration is largely determined by exogenous factors it might not be a good idea for the Canadian government to facilitate interprovincial trade by promoting interprovincial migration through various policies. However, since accounting for migration significantly reduced interprovincial border effects on trade, consequently for adequately analyzing interprovincial trade barriers it will be important to include interprovincial migration. This further suggests that the component of border effects arising from artificial barriers (such as in government procurement and business regulation, etc.) that the federal, provincial, and territorial governments have been trying to reduce through interprovincial agreements and promote freer trade across Canadian provinces are smaller in magnitude than has been previously estimated in the literature without incorporating interprovincial migration. Hence this should be good news for the Canadian government since smaller interprovincial trade barriers should be less costly and thus easier to target and mitigate through various public policies.

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Mailing Address: Mustafa Rafat Zaman, 208 West Nakhalpara, Tejgaon, Dhaka 1215, E-mail: mrzaman@alumni.ucalgary.ca.

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