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Executive Summary

The French language is one of the world's major languages. According to L'Organisation internationale de la Francophonie (OIF), at least 220 million people in the world speak French.¹ It's the official language of all United Nations agencies and a large number of international organizations. The language originated in France and spread by way of the country's overseas expansion. Today, some 30 countries in the world, including Canada, have recognized French as an official language.

Canada also has recognized English as an official language, making Canada an officially bilingual country. Nevertheless, the population that speaks French is heavily concentrated in Quebec. Also, the proportion of the population with knowledge of both English and French is below the national average of 17.5 per cent in all but two provinces—Quebec and New Brunswick. According to the 2011 Census, 33.2 per cent of New Brunswickers and 42.6 per cent of Quebecers knew both English and French. Prince Edward Island could claim the third highest proportion, at 12.3 per cent. At the other end of the spectrum, Newfoundland and Labrador and Saskatchewan shared the lowest proportion of Canadians that know both official languages, at 4.6 per cent.

Thus, for the purposes of this study, when examining Canada's trade history with the rest of the world, we consider New Brunswick and Quebec as bilingual and the rest of Canada as less bilingual. We refer to the former entity as Bilingual Canada, while the latter is referred to as Less Bilingual Canada.

Research has shown that individuals benefit from being bilingual, as the ability to speak more than one language has a positive payoff.² But does bilingualism also boost the economic fortunes of a country in the aggregate? In other words, are there public benefits to bilingualism? These are the questions that this paper attempts to answer.

One avenue in which a country can benefit from being bilingual is through increased bilateral trade volumes. Economic theory dating back hundreds of years has detailed how countries engaged in trade are more prosperous than those that live under autarky. At the same time, empirical literature has shown that countries that share a common language tend to trade more with each other than those that do not share one. An uncommon language imposes costs on bilateral trade, as learning the other language or hiring a translator is required. Thus, if common language facilitates trade, and trade leads to increased prosperity, then it follows that being bilingual should boost trade and prosperity, as knowledge of more than one language increases the number of potential trade partners. Therefore, this paper focuses on the link between trade and language, using empirical analysis to see whether knowledge of French in Canada has boosted bilateral trade with French-speaking countries.

In fact, this paper does establish that Bilingual Canada trades more with French-speaking countries than Less Bilingual Canada. Based on location quotients where Canada is the reference area, we see that Bilingual Canada's exports to French-speaking countries are two times higher than would be expected,

¹ La Francophonie, *La langue française dans le monde 2010 - Synthèse*, 5.

² See Christofides and Swidinsky, *The Economic Returns to a Second Official Language*.

given Bilingual Canada's share of Canadian exports. Likewise, Bilingual Canada's imports originating from French-speaking countries are more than two and a half times higher. On the other hand, Less Bilingual Canada's bilateral trade volumes with French-speaking countries are lower than expected, relative to Less Bilingual Canada's share of overall Canadian trade.

Similarly, Bilingual Canada's bilateral trade volumes with French-speaking countries are higher than Less Bilingual Canada's when calculating location quotients using total world trade as the reference area. Bilingual Canada's location quotient for exports destined to French-speaking countries was 0.41 in 2011, compared to just 0.16 for Less Bilingual Canada. Bilingual Canada's location quotient for imports originating from French-speaking countries was 1.19 in 2011, compared to just 0.27 for Less Bilingual Canada.

A common tool of international trade researchers is the gravity model. The gravity equation draws its inspiration from the law of gravity in physics. Interestingly, by replacing physics variables with economic ones we get estimated equations that fit the data well. The basic concept of the gravity model in international trade research is that bilateral trade between two countries increases with economic size, but declines as the distance between the countries increases. It has become common practice to include other indicators besides size and distance in the gravity equation. Accounting for common official languages or using other language variables has become a standard feature of gravity models.³

In general, our gravity equations for Bilingual Canada, Less Bilingual Canada and Canada as a whole show that language helps explain bilateral trade volumes. For Bilingual Canada, English as a common official language helps explain its bilateral trade volumes, but French as a common official language does not. On the other hand, French as a spoken language helps explain its bilateral trade volumes, but English as a spoken language does not. For Less Bilingual Canada, only common official language for English helps explain its bilateral trade volumes. Therefore, both of Less Bilingual Canada's French language variables are statistically insignificant, suggesting that the French language seems to help explain bilateral trade volumes in Bilingual Canada but not in Less Bilingual Canada.

These results do not come as a surprise because the empirical literature is clear—sharing a common language facilitates trade. Economic theory is also clear that countries benefit from trading with each other, compared to living under autarky. In other words, theory and empirical evidence suggest that trade leads to prosperity and countries that share a common language trade more with each other. It follows then that being bilingual will boost trade and, in turn, prosperity, as knowledge of more than one language increases the number of potential trade partners.

Using location quotients and the results from our gravity equations, we can estimate how much Bilingual Canada's knowledge of French boosts trade with countries that speak French. We take comfort in the fact that both techniques yield very similar results. In 2011, exports from Bilingual Canada to French-speaking countries were valued at US\$2.7 billion, while imports from French-speaking countries to

³ Fidmurd and Fidmurd, 4.

Bilingual Canada were valued at US\$9.3 billion. Thus, average bilateral trade, using the geometric mean, was US\$5 billion that year.

Using location quotients and using 2011 as an example, we determined that Bilingual Canada's knowledge of French boosted exports by US\$1.7 billion and imports by US\$7.2 billion. Taking the geometric mean, we see that Bilingual Canada's proficiency in French boosted average bilateral trade by US\$3.5 billion in 2011.

According to our gravity equation analysis, we would expect Bilingual Canada's trade with French-speaking countries to be more than 65 per cent higher than with countries that do not speak French. This means that, again using 2011 as an example, nominal exports and nominal imports were each US\$3.3 billion higher thanks to Bilingual Canada's proficiency in French.

Other empirical research has shown that individuals benefit from being bilingual. But this paper has shown that there are also public benefits to bilingualism. General knowledge of French in New Brunswick and Quebec boosts trade between those provinces and French-speaking countries. Thus, higher bilateral trade is one mechanism through which all Canadians benefit from Canada's status as a bilingual country.

1 Introduction

The French language is one of the world's major languages. According to L'Organisation internationale de la Francophonie (OIF), at least 220 million people in the world speak French.⁴ It's the official language of all United Nations agencies and a large number of international organizations. The language originated in France and spread by way of the country's overseas expansion. Today, 31 countries in the world, including Canada, have recognized French as an official language.

Canada also uses English as an official language, making Canada an officially bilingual country. Canada is in rare company, as only six other countries in the world include both English and French as official languages.

Research has shown that there are private benefits to being bilingual, as the ability to speak more than one language has a positive payoff for the individual.⁵ But does the country as a whole benefit from its status as a bilingual country? In other words, are there public benefits to bilingualism? These are the questions that this paper attempts to answer.

One avenue in which a country can benefit from being bilingual is through increased bilateral trade volumes. Economic theory dating back hundreds of years has detailed how countries engaged in trade are more prosperous than those that live under autarky. At the same time, empirical literature has shown that countries that share a common language tend to trade more with each other than those that do not share one. An uncommon language imposes costs on bilateral trade, as learning the other language or hiring a translator is required. Thus, if language facilitates trade, and trade leads to increased prosperity, then it follows that being bilingual should boost trade and prosperity, as knowledge of more than one language increases the number of potential trade partners. Therefore, this paper focuses on the link between trade and language, using empirical analysis to see whether knowledge of French in Canada has boosted bilateral trade with French-speaking countries.

This report is organized as follows. The next chapter is a review of the empirical literature that focuses on the link between common language and bilateral trade volumes. In particular, a common feature of these papers is the use of gravity models. Thus, Chapter 2 provides an overview of gravity models and their application in international trade analysis. Chapter 3 focuses on the current language landscape of Canada and the world. Chapter 4 is a review of Canada's trade patterns, with a particular emphasis on how language influences who we trade with. Chapter 5 reports the results of our gravity model analysis, which shows whether common official language or common spoken language helps explain Canada's bilateral trade volumes. Finally, Chapter 6 provides some concluding comments.

⁴ La Francophonie, *La langue française dans le monde 2010 - Synthèse*, 5.

⁵ See Christofides and Swidinsky, *The Economic Returns to a Second Official Language*.

2 Literature Review: Gravity Equations and Their Empirical Results

Numerous studies have analyzed the relationship between language and bilateral trade. A common feature of these studies is that they use a gravity model to explain trade volume between countries. Today, gravity equations are the ones economists turn to most often when studying bilateral trade volumes. Indeed, gravity equations are considered to be an integral part of international trade analysis.⁶ We use gravity equations in our analysis, the results of which are described in Chapter 4. Therefore, before summarizing the results of the empirical literature, we will first briefly describe the gravity equation.

2.1 A Brief History of the Gravity Equation

The gravity equation is referred to as such because it draws its inspiration from the law of gravity in physics. The law of gravity states that the force of gravity between two objects is proportional to the product of the masses of the two objects and inversely proportional to the square of the distance between them. Mathematically expressed:

$$\text{force of gravity} = G * \frac{M_1 M_2}{\text{dist}_{12}^2} \quad (1)$$

In the above equation, M_1 is the mass of object one, M_2 is the mass of object two, dist_{12} is the distance between the two objects, and G is the gravitational constant.

Interestingly, equation 1 works well when the above variables are replaced with economic data—the estimated equation typically has a high R-squared. Specifically, we replace the force of gravity with the value of bilateral trade between two countries and the masses with the trade partners' GDP. Distance is the distance in kilometres (km) between the two countries. Thus, gravity equations model bilateral interactions on both size and distance.

It has become common practice to include other indicators besides size and distance in the gravity equation, in the form of binary variables, which are also suspected of influencing bilateral trade. A binary variable is a variable that takes the value 0 or 1 to indicate the absence or presence of a particular attribute (like male or female) that may be expected to shift the outcome of the regression. Some of the more popular binary variables in gravity analysis include: adjacency, landlocked countries, and common official language. The latter binary variable, of course, is the main focus of this paper. Indeed, accounting for common official languages or other language variables has become a standard feature of gravity models.⁷ These models provide ample evidence that a common language has a significant impact on bilateral trade.⁸

⁶ Head and Mayer, *Gravity Equations*, 5.

⁷ Fidmuc and Fidmuc, 4.

⁸ Melitz, *Language and Foreign Trade*, 2.

In their modern form, gravity equations incorporate various measures of physical and cultural trade costs among countries. The cost of trading a good from one country to another includes both physical costs and cultural costs. Mathematically expressed:

$$ptot = p + phy + cul \tag{2}$$

Put in words, equation 2 states that the total price of a traded good (*ptot*) is the price of the good (*p*), the physical cost of transporting the good (*phy*), plus any cultural and language costs (*cul*). Physical costs are represented in the gravity equation by the physical distance term. Cultural costs are usually represented by a language binary variable, but also sometimes by a common religion binary variable and a common legal system binary variable. As equation 2 implies, if two countries share the same culture and language, then *cul* falls out of the equation and the cost of trading a good is lower. But if the two countries do not share the same language and other cultural institutions, then the cost of trading a good is higher. Thus, everything else being equal, countries with the same language and culture should trade more often with each other than countries that have differing language and cultures, simply because the cost of exchanging goods and services is lower.

Put another way, in a gravity model, the difficulty associated with the exchange of goods between trading partners diminishes the potential volume of trade relative to that implied by their economic size in a hypothetical frictionless world.⁹ Besides distance, language barriers are one of the biggest impediments to trade.

2.2 Empirical Results

There is a compelling reason why modern gravity equations include variables besides distance to account for barriers to trade: the empirical literature is quite clear that even when controlling for geographical distance, countries trade much less with each other than regions within a country do.¹⁰ Thus, there are other costs associated with bilateral trade than just physical costs. The empirical literature is almost unanimous in that one of the significant barriers to trade is difficulty in communication. Indeed, Helliwell (1997) finds that trade between OECD countries is much lower than trade within these countries, so national borders matter.¹¹ Adding common language to a gravity equation, however, explains a large portion of this discrepancy. Similarly, Anderson and Van Wincoop (2004) add up all the costs of trade faced by industrialized countries.¹² If these costs were a tax, it would be equal to 170 per cent. According to their analysis, language barriers are responsible for 7 percentage points of this tax.

Several other papers have studied the link between language and trade. Frankel, Stein and Wei (1995), for example, find that two countries sharing linguistic or colonial links tend to trade roughly 65 per cent more than they would otherwise.¹³

⁹ Hutchinson, "Does Ease of Communication Increase Trade?" 545.

¹⁰ Konya, 495.

¹¹ Helliwell, "National Borders, Migration, and Trade, 165.

¹² Anderson and van Wincoop, "Trade Costs," 693.

¹³ Frankel, Stein, Wei, "Trading Blocs and the Americas", 73.

Hutchinson (2001) uses an index that measures the difficulty for a native English speaker to learn a given foreign language.¹⁴ For example, it is more difficult for a native English speaker to learn Japanese than to learn French. The paper finds that U.S. bilateral trade between 1970 and 1986 was lower with a country that had a dominant language which was more difficult for an English speaker to learn.

Similarly, Lohman (2010) constructs a language barrier index that measures the language barrier between two given countries.¹⁵ Even when two countries do not speak the same language, speaking more similar languages should facilitate trade between them, since it reduces the cost of communication. For example, many Spanish speakers can speak or at least understand Portuguese. His analysis shows that language barriers are negatively correlated with bilateral trade. Specifically, the results show that a 0.10 increase in the Language Barrier Index (corresponding to a 10 per cent decrease in common linguistic features) is associated with a reduction in trade of about 6.8 per cent to 9.8 per cent.

Hutchinson (2002) uses a different dataset to estimate the effect on U.S. bilateral trade of the proportion of the population in a country who speak English as a first or as a second language.¹⁶ The paper finds that both the proportion of the population that speaks English as a first language and the proportion that speaks English as a second language have a positive influence on exports and imports. Controlling for other factors, the results suggest that a country that has a 10 per cent or higher proportion of people who speak English as a first language would receive 1.3 per cent more exports from the United States and send 1.3 per cent more imports to the United States. The impact is even stronger for English as a second language: a 10 per cent or higher proportion of people who speak English as a second language would receive 1.7 per cent more exports from the United States and send 2.3 per cent more imports to the United States.

Hutchinson conjectures that the reason why the result for English as a second language is stronger than that for English as a first language is that many people learning English as a second language are doing so for the express purpose of enhancing their trade with the United States and other English-speaking countries.¹⁷

Other empirical research has focused on the effect on language on different types of traded goods and services. For example, Sauter (2008) shows that the language barrier is much higher in the trade for services than in the trade for goods, given that the services sector is likely to be more language-sensitive than manufactures.¹⁸ Specifically, he finds that communication-intensive industries trade more between Canadian provinces with a good knowledge of the other's language compared to those industries that require less communication with the trading partner. In other words, commerce in industries that require direct communication for trade increases with the probability that people in another Canadian province speak the same language. The interaction between language commonality and direct communication (spoken communication) is statistically significant at the 5 per cent level. There is, however, less evidence

¹⁴ Hutchinson, "Linguistic distance as a determinant of U.S. bilateral trade."

¹⁵ Lohman, Do language barriers affect trade? 160.

¹⁶ Hutchinson, "Does ease of communication increase trade?"

¹⁷ Hutchinson, 2002, 549.

¹⁸ Sauter, "Talking Trade," 1.

for the presence of an indirect communication (written communication) channel. It is likely that language will prove to be mainly an impediment to services trade and trade in complex goods that require direct communication with the foreign importer. He concludes by suggesting that language could turn out to be a source of comparative advantage that allows countries with higher language commonality to specialize in more advanced goods and services.

Melitz (2011) finds that all linguistic variables, including common language, linguistic diversity, and literacy in his gravity equation enter significantly with the correct positive signs.¹⁹ So, not only does common language promote foreign trade, but so does literacy. If people can read and write in a given language, they can cope better with the problems associated with communicating in a foreign language.

Higher linguistic diversity within a country also promotes foreign trade. In other words, multilingual countries have a higher propensity to engage in foreign trade. Indeed, he finds that common linguistic ground with foreigners seems to be at least as important as linguistic diversity at home in fostering foreign trade. His paper finds that a common tongue promotes trade with those particular foreigners with whom communication is especially easy, whereas linguistic diversity at home encourages trade with all foreigners indiscriminately. In other words, if people face linguistic obstacles at home, they somehow manage to trade more with foreigners.

Melitz and Toubal (2012) argue that at least two-thirds of the influence of language on bilateral trade comes from ease of communication alone and has nothing to do with ethnic ties or trust.²⁰ All influence of ethnicity on bilateral trade is primarily attributable to cross-migrants between countries. They find that all language series—official language, common spoken language, common native language, and linguistic proximity—are positive and significantly associated with bilateral trade. Their analysis also shows that English holds no special significance in explaining bilateral trade. They conclude that the distinction of English, or any other major language for that matter, is not warranted. All that really matters is common language, whatever language that may be.

Using firm-level data, Mayer and Ottaviano (2007) find that, in France, the percentage of individual firms that export to other French-speaking destinations is unusually large.²¹ Also, the firms that exploit this linguistic advantage have lower average productivity than the rest of French exporting firms. This makes sense, since the advantages brought about from a common language provide an offset to somewhat higher production costs, making it possible for less efficient firms to export.

Putting it all together, Egger and Lassmann (2011) conducted a meta-analysis on the empirical literature to gauge the effect of language on international trade.²² They find that the weighted average of studies on the language effect imply a direct effect on bilateral trade flows of 44 per cent.

¹⁹ Melitz, *Language and Foreign Trade*, 16.

²⁰ Melitz and Toubal, *Native language, spoken language, translation and trade*, 3.

²¹ Mayer and Ottaviano, "The happy few".

²² Egger and Lassmann, "The Language Effect in International Trade", 2.

Thus, as the empirical evidence shows, a common language is a key determinant of bilateral trade volumes. In this paper, we conduct our own empirical analysis to see if this fact holds true for Canada, not only for the country as a whole, but also for its bilingual and less bilingual components. We attempt to answer the following question: do provinces with substantial French-speaking communities have an edge in foreign trade because of their relatively higher proficiency in French? Before we answer this question, we first focus on Canada and the world's current language landscape.

3 The Language Landscape of Canada and the World

This section looks at the current language landscape of Canada and the World. It will answer the following questions: How many Canadians speak English? How many speak French? How many countries in the world have English, French or both as official languages?

3.1 Canada

Canada is officially a bilingual country, as both English and French are official languages. But the proportion of Canadians that understand English is much higher than those with knowledge of French. Table 1 shows the proportion of Canada's population with knowledge of official languages, as reported in Statistics Canada's 2011 Census. Some 68.1 per cent of the population claimed knowledge of English only, 12.6 per cent of the population claimed knowledge of French only, and 17.5 per cent claimed knowledge of both English and French.

Knowledge of French is also concentrated geographically. Not surprisingly, almost all Canadians who only understand French live in the province of Quebec. Also, the proportion of the population with knowledge of both English and French is below the national average of 17.5 per cent in all but two provinces—Quebec and New Brunswick.

Specifically, we see that 33.2 per cent of New Brunswickers and 42.6 per cent of Quebecers have knowledge of both English and French. Prince Edward Island could claim the next highest proportion, at 12.3 per cent. Newfoundland and Labrador and Saskatchewan shared the lowest proportion of the population that know both official languages, at 4.6 per cent.

Thus, for the purposes of this study, when examining Canada's trade history with the rest of the world we will consider New Brunswick and Quebec as bilingual and the rest of Canada as less bilingual. We refer to the former entity as Bilingual Canada, while the latter will be referred to as Less Bilingual Canada. Referring to the rest of Canada as Less Bilingual Canada is not meant to diminish the significant population that speaks French (or other languages) in these provinces.

Table 1 - Proportion of the Population with Knowledge of Official Languages (2011)

	English	French	Both	Neither
Canada	68.1	12.6	17.5	1.8
Newfoundland and Labrador	95.3	0.0	4.6	0.1
Prince Edward Island	87.1	0.1	12.3	0.5
Nova Scotia	89.5	0.1	10.3	0.2
New Brunswick	57.7	9.0	33.2	0.1
Quebec	4.7	51.8	42.6	1.0
Ontario	86.3	0.3	11.0	2.3
Manitoba	90.0	0.1	8.6	1.2
Saskatchewan	94.9	0.0	4.6	0.5
Alberta	92.0	0.1	6.5	1.4
British Columbia	89.8	0.0	6.8	3.3

Source: Statistics Canada.

Table 2 - Languages Spoken Regularly at Home (2011)

	Bilingual Canada		Less Bilingual Canada	
	<i>Level</i>	<i>Share</i>	<i>Level</i>	<i>Share</i>
Total	8,555,850	100.0	24,565,325	100.0
Single responses	8,302,210	97.0	23,656,595	96.3
English	1,279,530	15.0	20,177,545	82.1
French	6,458,970	75.5	368,890	1.5
Non-official languages	563,715	6.6	3,110,150	12.7
Punjabi	8,390	0.1	308,685	1.3
Cantonese	8,470	0.1	280,145	1.1
Other Chinese	34,740	0.4	262,555	1.1
Mandarin	9,645	0.1	193,630	0.8
Spanish	88,975	1.0	163,045	0.7
Filipino	7,560	0.1	153,520	0.6
German	3,515	0.0	122,860	0.5
Arabic	73,685	0.9	108,105	0.4
Urdu	7,245	0.1	106,535	0.4
Persian (Farsi)	14,690	0.2	104,140	0.4
Korean	4,535	0.1	100,370	0.4
Italian	39,635	0.5	99,845	0.4
Russian	18,680	0.2	91,060	0.4
Tamil	11,305	0.1	87,635	0.4
Vietnamese	20,970	0.2	83,990	0.3
Portuguese	16,090	0.2	81,115	0.3
Polish	7,020	0.1	78,185	0.3
Gujarati	3,975	0.0	51,745	0.2
Hindi	1,575	0.0	45,505	0.2
Bengali	8,385	0.1	33,680	0.1
Serbian	2,110	0.0	32,775	0.1
Romanian	23,065	0.3	31,395	0.1
Cree	14,160	0.2	30,360	0.1
Greek	20,090	0.2	27,615	0.1
Ukrainian	1,960	0.0	23,605	0.1
Somali	520	0.0	21,145	0.1
Hungarian	2,415	0.0	20,535	0.1
Multiple responses	253,645	3.0	908,725	3.7
English and French	77,790	0.9	53,420	0.2
English and non-official language	45,785	0.5	829,350	3.4
French and non-official language	100,285	1.2	9,415	0.0
English, French and non-official language	29,780	0.3	16,550	0.1

Source: Statistics Canada.

In this report, we refer to a Canadian as bilingual if he or she has knowledge of both official languages—English and French. Of course, many other Canadians are bilingual in the sense that they speak more than one language, usually one official language and one non-official language. (See Table 2).

Less Bilingual Canada's language landscape is more diverse than Bilingual Canada's, a reflection of Less Bilingual Canada's larger foreign-born population. According to Statistics Canada's 2011 National Household Survey, 25 per cent of Less Bilingual Canada's population was foreign born, compared to 13 per cent for Quebec and New Brunswick combined. More than three-quarters of those that reside in New Brunswick and Quebec primarily speak French at home, while about 15 per cent speak English. In contrast, over 80 per cent of those who reside in the rest of the country speak English at home, while only 1.5 per cent speaks French. Thus, the proportion of the population in Less Bilingual Canada that speaks a non-official language is about double that of Bilingual Canada (12.7 per cent versus 6.6 per cent). Therefore, Less Bilingual Canada may have an edge over Bilingual Canada when it comes to trading with non-English and non-French speaking countries. But this subject is beyond the scope of this paper.

3.2 The World

Including Canada, our dataset includes information on 214 countries. Of these 214 countries, there are 31 countries that feature French as an official language, 64 countries that use English as an official language, and only 7 countries, including Canada, that have both English and French as official languages. (See Table 3). These seven countries are: Canada, Cameroon, Dominica, Mauritius, Rwanda, Seychelles, and Vanuatu.

In other words, slightly less than half of the world's countries (102) have English, French or both as official languages. This means that 52 per cent of countries—111 in our dataset to be exact—count neither one as an official language.

Three countries were considered to use French as an official language even though the language of the former colonial ruler was dropped after national independence, but has remained in wide use in government and the media. These three countries are Algeria, Morocco and Tunisia. It should also be noted that English was added as an official language in Sudan only in 2005.

Table 4 lists countries where at least 20 per cent of their respective populations speak English, French or both. There are 87 countries in our dataset that meet these requirements. Thus, this list features 15 fewer countries than Table 3, which lists those that have English, French or both as official languages. There are 27 countries that can boast populations that speak French, six of which also meet the same threshold for English. Including these same six bilingual countries, there are 66 countries where at least 20 per cent of the population speak English. The six bilingual countries based on spoken language are: Cameroon, Canada, Israel, Lebanon, Seychelles, and Vanuatu. Thus, three countries that are considered bilingual based on official language drop out: Dominica, Mauritius and Rwanda. At the same time two countries are added to the list: Israel and Lebanon.

Breaking down the differences between official and spoken languages even further, we see that there are 12 countries that count French as an official language but less than 20 per cent of their populations speak

French. These countries are: Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Dominica, Equatorial Guinea, Haiti, Luxembourg, Mali, Rwanda, and Tunisia. However, Dominica and Rwanda still make our list in the English-speaking category. Israel is the only country in our dataset where at least 20 per cent of the population speaks French even though it is not an official language.

For the English language, 12 countries include English as an official language but do not meet the 20 per cent threshold: Ethiopia, Ghana, Malawi, Mauritius, Papua New Guinea, Solomon Islands, Somalia, Sudan, Tanzania, Tonga, and Uganda. Meanwhile, seven countries meet the 20 per cent threshold even though English is not an official language: Aruba, Cocos (Keeling) Islands, Egypt, Jordan, South Korea, Kuwait, and Lebanon.

In the next section, we group countries together by official language, with the goal of determining whether Bilingual Canada trades more with French-speaking countries and whether Less Bilingual Canada trades more with English-speaking ones.

Table 3 - Countries with English, French or Both as Official Languages

English and French		
Cameroon	Switzerland	Malawi
Canada	Togo	Malta
Dominica	Tunisia	Montserrat
Mauritius	Wallis and Futuna	Namibia
Rwanda		Nauru
Seychelles	English	New Zealand
Vanuatu	Anguilla	Nigeria
	Antigua and Barbuda	Niue
French	Australia	Norfolk Island
Algeria	Bahamas	Pakistan
Belgium	Barbados	Papua New Guinea
Benin	Belize	Philippines
Burkina Faso	Bermuda	Pitcairn
Burundi	Botswana	Saint Helena
Central African Republic	British Virgin Islands	Saint Kitts and Nevis
Chad	Cayman Islands	Saint Lucia
Comoros	Christmas Island	Saint Vincent and the Grenadines
Congo (Democratic Republic of)	Cook Islands	Samoa
Congo (Republic of)	Eritrea	Sierra Leone
Côte d'Ivoire	Ethiopia	Singapore
Djibouti	Falkland Islands	Solomon Islands
Equatorial Guinea	Fiji	Somalia
France	Gambia	South Africa
French Polynesia	Ghana	Sudan ¹
Gabon	Gibraltar	Swaziland
Guinea	Grenada	Tanzania
Haiti	Guyana	Tonga
Lebanon	Hong Kong	Trinidad and Tobago
Luxembourg	India	Turks and Caicos Islands
Madagascar	Ireland	Uganda
Mali	Israel	United Kingdom
Morocco	Jamaica	United States of America
New Caledonia	Kenya	Zambia
Niger	Kiribati	Zimbabwe
Senegal	Lesotho	
St. Pierre and Miquelon	Liberia	

1. English became an official language in 2005.

Sources: CEPPI; CIA World Factbook; Wikipedia.

Table 4 - Countries Where at Least 20% of Population Speaks English, French or Both

<i>English and French</i>	<i>English</i>	
Cameroon	Anguilla	Korea, South
Canada	Antigua and Barbuda	Kuwait
Israel	Aruba	Lesotho
Lebanon	Australia	Liberia
Seychelles	Bahamas	Malta
Vanuatu	Barbados	Montserrat
	Belize	Namibia
French	Bermuda	Nauru
Algeria	Botswana	New Zealand
Belgium and Luxembourg	British Virgin Islands	Nigeria
Benin	Cayman Islands	Niue
Burkina Faso	Christmas Island	Norfolk Island
Burundi	Cocos (Keeling) Islands	Pakistan
Congo (Republic of the)	Cook Islands	Philippines
Côte d'Ivoire	Dominica	Pitcairn
France	Egypt	Rwanda
French Polynesia	Eritrea	Saint Helena
Gabon	Falkland Islands	Saint Kitts and Nevis
Guinea	Fiji	Saint Lucia
Madagascar	Gambia	Saint Vincent and the Grenadines
Mauritius	Gibraltar	Samoa
Morocco	Grenada	Sierra Leone
New Caledonia	Guyana	Singapore
Niger	Hong Kong	South Africa
Senegal	India	Trinidad and Tobago
St. Pierre and Miquelon	Ireland	Turks and Caicos Islands
Switzerland	Jamaica	United Kingdom
Togo	Jordan	United States of America
Wallis and Futuna	Kenya	Zambia
	Kiribati	Zimbabwe

Sources: CEPII; CIA World Factbook; Wikipedia.

4 Canadian Trade Patterns

This section looks at Canada’s trade patterns, both in bilingual and less bilingual provinces. If a common language boosts trade, then a key question to ask is “why do we want to boost trade in the first place?” Thus, the following section is a quick overview of trade theory that explains the gains from trade.

4.1 The Gains from Trade

The idea that countries benefit from trading with one another was first clearly stated by David Ricardo when he proved the principle of comparative advantage in his 1817 publication *Principle of Political Economy*.

Table 5 - Illustrating Comparative Advantage

	Unit Labour Requirement	
	Good X	Good Y
Country A	1	2
Country B	6	3

Source: The Conference Board of Canada.

The principle of comparative advantage is best understood using a numerical example. Table 5 shows two countries (A and B) that each produce the same two goods (X and Y). In country A, it takes 1 unit of labour to produce good X and 2 units of labour to produce good Y. In country B, it takes 3 units of labour to produce good X and 6 units of labour to produce good Y. Thus, country A is more efficient than country B in producing both goods. Country A is said to have an absolute advantage in the production of both good X ($1 < 6$) and good Y ($2 < 3$).

Country A also has a comparative advantage in the production of good X because $\frac{1}{2} < \frac{6}{3}$, meaning the cost of producing good X, in terms of good Y, is less in country A than in country B. Specifically, the cost of producing one unit of good X in country A is half a unit of good Y, while it costs 2 units in country B. On the other hand, country B has a comparative advantage in good Y because $\frac{3}{6} < \frac{2}{1}$. In other words, the cost of producing one unit of good Y in country B is half a unit of good X, while it costs 2 units in country A.

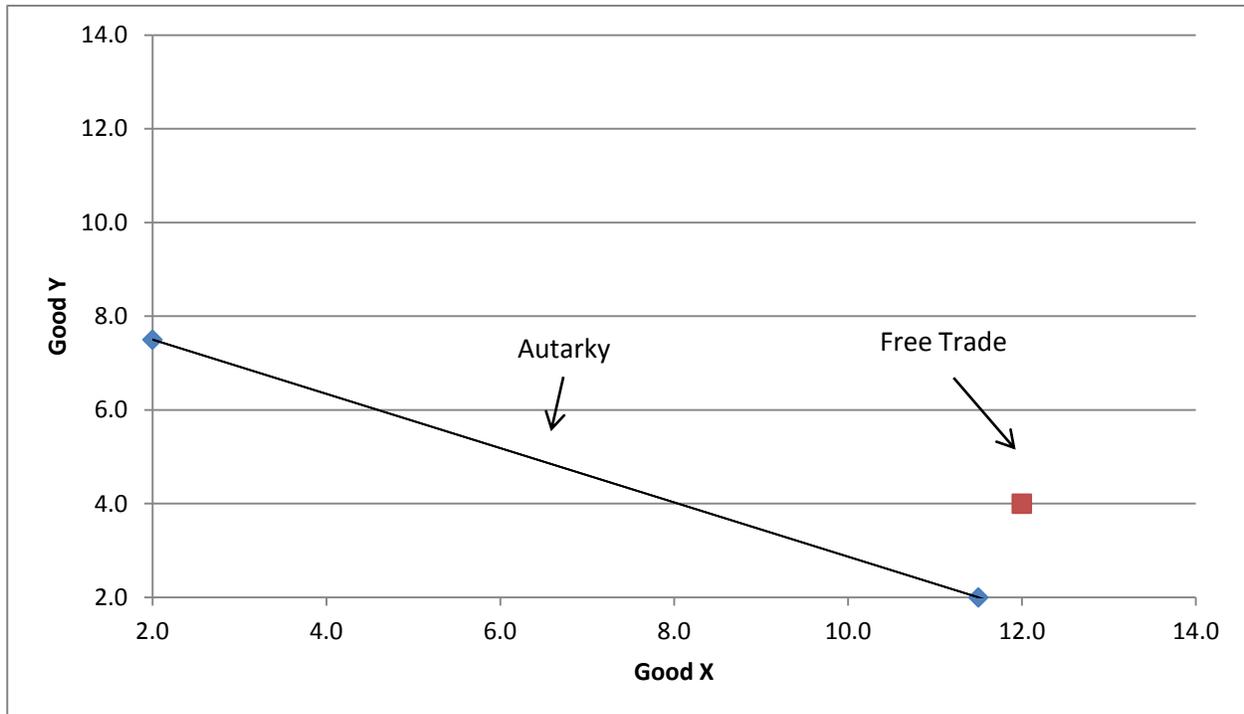
Under autarky, which occurs when countries do not trade with one another but instead try to be self-sufficient, both countries would need to produce good X and good Y. Assuming each country has 12 workers, country A could produce 10 units of good X and 1 unit of good Y. Country B could produce 1 unit of good X and 2 units of good Y. Thus, a maximum of 14 units could be produced under autarky.

But under free trade, countries A and B would be able to specialize in the production of goods in which they have a comparative advantage—good X for country A and good Y for country B. Country A could produce 12 units of good X, while country B could produce 4 units of good Y. Thus, a total of 16 units could be produced under free trade, two more units than could be produced under autarky. Therefore, both country A and country B would be better off specializing in the production of one good and trading with each other for the other good. Given that overall output is higher, but the number of inputs (24

workers) remains unchanged, specialization and trade increases global productive efficiency. Both countries can also consume more of both goods relative to autarky.

Figure 1 is a graphical representation of this hypothetical scenario. Under autarky, production of goods X and Y can occur anywhere along or below the line, which is referred to as the production possibilities frontier. But under free trade, production can occur beyond the line, signifying the gains from specialization and trade, which leads to an increase in global productive efficiency. In our scenario, production of goods X and Y, under free trade, would occur where the red box is located in figure 1.

Figure 1 - Production Possibilities Frontier



Source: The Conference Board of Canada.

In other words, trade leads to greater efficiency in the use of finite resources, which leads to increased welfare for both producers and consumers. This increased social welfare comes from the advantages that lie in specialization. The benefits of trade also come from the exchange of new ideas, know-how, techniques, and innovations between trade partners. Moreover, increased competitive pressures that come with free trade also drive productivity improvements.

Against this backdrop of the economic benefits of trade, we now focus on whether Canada trades more with countries that share a common language than with those that don't. We will use location quotients to answer this question.

4.2 Location Quotients and Trade

Location quotients allow us to compare an area to a reference area. First, we will compare Bilingual Canada to Less Bilingual Canada using Canada as a reference area. This technique will help us see if Bilingual Canada—New Brunswick and Quebec—trades more with French-speaking countries than one would expect given its overall share of national bilateral trade volumes. Using trade data from Statistics Canada, available publicly through Industry Canada’s Trade Data Online portal, we can calculate the location quotient of trade between Bilingual and Less Bilingual Canada on the one hand, and all other countries on the other hand.

Mathematically expressed, the location quotient we are interested in calculating can be defined as:

$$LQ_X = \left(\frac{EXP_{X,BIL}}{EXP_{BIL}} \right) / \left(\frac{EXP_{CAN,BIL}}{EXP_{CAN}} \right) \quad (3)$$

In equation 3, the location quotient (LQ) for exports between Bilingual Canada and country X is defined as Bilingual Canada’s exports to country X ($EXP_{X,BIL}$) divided by Bilingual Canada’s total exports (EXP_{BIL}), which is itself divided by Canada’s exports to country X ($EXP_{CAN,BIL}$) divided by Canada’s total exports (EXP_{CAN}). Location quotients are also calculated for imports.

Table 6 - Location Quotients: Canada as Reference Area (2011)

	Exports	Imports
French Countries		
Bilingual Canada	1.98	2.65
Less Bilingual Canada	0.79	0.59
Bilingual Countries		
Bilingual Canada	1.58	2.74
Less Bilingual Canada	0.88	0.57
United States		
Bilingual Canada	0.96	0.55
Less Bilingual Canada	1.01	1.11
Other English Countries		
Bilingual Canada	0.72	2.22
Less Bilingual Canada	1.06	0.70
Other Countries		
Bilingual Canada	1.18	1.22
Less Bilingual Canada	0.96	0.95

Sources: Industry Canada; Statistics Canada; The Conference Board of Canada.

4.2.1 Results Using Canada as Reference Area

Table 6 presents 2011 location quotients for both exports and imports for Bilingual Canada and Less Bilingual Canada vis-à-vis countries with French, English and both as official languages, as well as location quotients for all other countries. Because our trade relationship with the United States is so large, we separate out trade with the U.S. from the other English-speaking countries. From these results, it appears that language plays a key role in trade relationships. In 2011, Quebec and New Brunswick's exports to French-speaking countries were two times higher than would be expected given their share of overall Canadian exports. The gap is even larger for imports—Quebec and New Brunswick's imports from French-speaking countries were two-and-a-half times higher than would be expected given their share of overall Canadian imports. This implies that Less Bilingual Canada traded much less with French-speaking countries, relative to its share of total Canadian trade.

A similar disparity exists with countries that count both English and French as an official language. In 2011, Bilingual Canada's exports to both English and French-speaking countries were over one-and-a-half times higher than would be expected, while imports from these same countries were over two-and-a-half times higher than would be expected.

Of course, Canada's most important trading partner is the United States. In this case, Less Bilingual Canada exports and imports more with our southern neighbour than would be expected compared to Canada overall. For Bilingual Canada, its exports to the U.S. are much closer to Less Bilingual Canada's than its imports.

When it comes to other English-speaking countries, Quebec and New Brunswick's exports are much lower than would be expected given their share of overall Canadian trade, but their imports are much higher. The opposite is true for Less Bilingual Canada.

Bilingual Canada's location quotients for non-English and non-French speaking countries are higher than Less Bilingual Canada's. This result is somewhat surprising given that nearly 13 per cent of Less Bilingual Canada speaks a non-official language at home, much higher than the 6.6 per cent that do so in Bilingual Canada. Less Bilingual Canada's trade with the rest of the world could be relatively low because its trade relationship with the United States is so dominant. So, all in all, the location quotients reported in table 6 suggest that common language plays a key role in Bilingual Canada and Less Bilingual Canada's trade relationships.

Table 7 - Location Quotients: World as Reference Area (2011)

	Exports	Imports
French Countries		
Bilingual Canada	0.41	1.19
Less Bilingual Canada	0.16	0.27
Bilingual Countries		
Bilingual Canada	0.35	0.17
Less Bilingual Canada	0.19	0.04
United States		
Bilingual Canada	8.54	2.17
Less Bilingual Canada	8.96	4.41
Other English Countries		
Bilingual Canada	0.37	0.83
Less Bilingual Canada	0.54	0.26
Other Countries		
Bilingual Canada	0.29	0.78
Less Bilingual Canada	0.24	0.61

Sources: Industry Canada; Statistics Canada; The Conference Board of Canada.

4.2.2 Results Using World as Reference Area

Using the world as a reference area instead of Canada yields similar results. It can be mathematically expressed in the following way:

$$LQ_X = \left(\frac{EXP_{X,BILL}}{EXP_X} \right) / \left(\frac{EXP_{W,BIL}}{EXP_W} \right) \quad (4)$$

In words, the location quotient for exports between Bilingual Canada and country X is defined as Bilingual Canada's exports to country X ($EXP_{X,BILL}$), divided by country X's total exports (EXP_X), which is itself divided by Bilingual Canada's total exports ($EXP_{W,BIL}$) divided by total world exports (EXP_W). The same calculation is conducted for imports. This location quotient will tell us if Bilingual Canada's trade to French-speaking countries is higher than would be expected given Bilingual Canada's share of overall global trade.

Bilingual Canada trades more with bilingual and French-speaking countries than Less Bilingual Canada, relative to each region's overall share of world trade. For countries that count French as an official language, Bilingual Canada's location quotient for exports was 0.41, compared to just 0.16 for Less Bilingual Canada. (See Table 7). For bilingual countries, the location quotients for exports were 0.35 and 0.19, respectively, for Bilingual Canada and Less Bilingual Canada.

It is not a surprise that the location quotients for exports for French-speaking and bilingual countries are below 1, given that so much of our trade is directed towards the United States. Plus, most French-speaking countries are far away, and as suggested from the gravity model, trade volumes tend to fall in proportion to distance. Indeed, the location quotients for exports to the United States stood at 8.54 for Bilingual Canada and 8.96 for Less Bilingual Canada. Thus, both regions of Canada trade with the United States over 8 times more than expected, given their respective shares of global bilateral trade volumes.

Less Bilingual Canada, relative to its share of world trade, not only exports more to the United States than Bilingual Canada, it also trades more with other English-speaking countries. The location quotient for other English-speaking countries was 0.37 for Bilingual Canada and 0.54 for Less Bilingual Canada. In contrast, Bilingual Canada trades more with non-English and non-French speaking countries than Less Bilingual Canada. Location quotients were 0.29 and 0.24, respectively, for Bilingual Canada and Less Bilingual Canada.

4.3 Evidence from Overall Trade with French and Bilingual Countries Not So Conclusive

Although Bilingual Canada’s trade with French-speaking countries is higher than would be expected, relative to Bilingual Canada’s overall share of world trade, it still represents a relatively small share of Bilingual Canada’s overall trade. Table 8 displays Canada, Bilingual Canada, and Less Bilingual Canada’s shares of exports and imports by country-groups: French-speaking, English- and French-speaking, the United States, other English-speaking, and other countries. In 2011, 3.4 per cent of Bilingual Canada’s exports were destined for French speaking countries, while 10.6 per cent of its imports originated from French speaking countries. Of course, these shares are much higher than Canada’s as a whole, which stood at 1.7 per cent and 4 per cent, respectively, in 2011.

Table 8 - Shares of Exports and Imports by Country-Group (2011)

	Exports			Imports		
	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>
French	1.7	3.5	1.4	4.0	10.6	2.4
Bilingual	0.0	0.0	0.0	0.0	0.0	0.0
United States	73.7	70.8	74.3	50.0	27.3	55.5
Other English	7.2	5.1	7.6	5.8	13.0	4.1
Other	17.4	20.6	16.7	40.2	49.1	38.0
Total	100	100	100	100	100	100

Sources: Industry Canada; Statistics Canada.

But these shares pale in comparison to our trade with the United States. In 2011, 73.7 per cent of Canada’s exports were destined for the United States, while 50 cent of our imports originated from south of the border. For Bilingual Canada, the respective shares for exports and imports were 70.8 per cent and 27.3 per cent. True, these shares are way down from the late 1990s and early 2000s. In 2000, 87 per cent

of Canada’s exports were destined for the United States, while 66 per cent of our imports originated from south of the border. But clearly, the United States is our dominant trade partner.

Interestingly, Bilingual Canada’s largest importer group are non-English and non-French speaking countries. Nearly 50 per cent of Bilingual Canada’s imports came from this country-group in 2011. Less Bilingual Canada’s largest importer is, of course, the United States.

It should also be noted that Canada’s trade with bilingual countries—those that speak both English and French—is even lower. Indeed, our trade volumes with countries that speak both English and French barely registers. Shares are 0.0 per cent across the board. Recall, however, that excluding Canada, only six countries have both English and French as official languages and none of them post very large levels of GDP per capita. Thus, the fact that Canada trades relatively little with these countries does not mean that one should reject the idea that language helps explain bilateral trade volumes.

Table 9 - Exports and Imports by Country Group (2011, Millions U.S. \$)

	Exports			Imports		
	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>
French	7,904	2,749	5,156	17,802	9,317	8,485
Bilingual	47	13	34	20	11	9
United States	332,716	56,098	276,618	223,332	24,118	199,214
Other English	32,349	4,075	28,274	26,121	11,459	14,662
Other	78,695	16,333	62,362	179,668	43,400	136,267

Sources: Industry Canada; Statistics Canada.

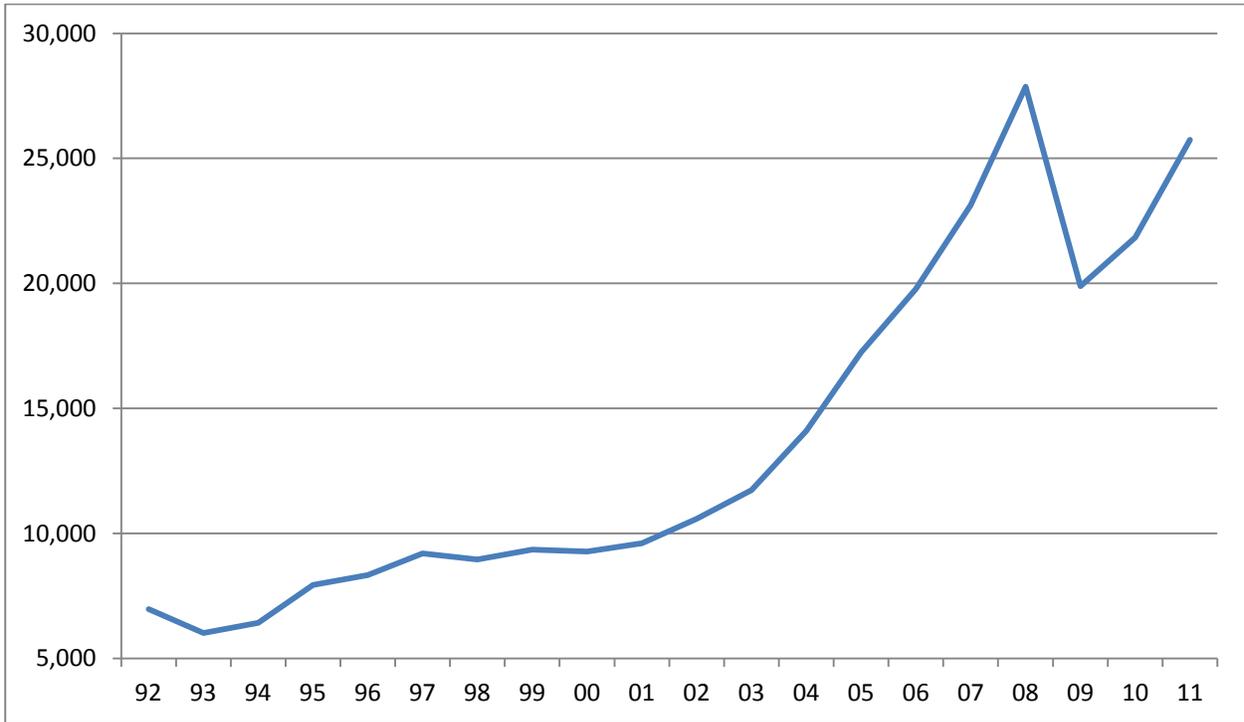
Table 9 shows the same information in level terms. In 2011, Canadian exports to French-speaking countries were valued at US\$7.9 billion, while imports were valued at US\$17.8 billion. Only US\$47 million of exports were destined for bilingual countries, while US\$20 million of imports originated from bilingual countries. These values pale in comparison to our trade volumes with the United States—US\$332.7 billion worth of exports and US\$223.3 billion worth of imports. Our trading activity with other English-speaking countries and non-English and non-French speaking countries is even higher than our activity with French-speaking and bilingual countries. Specifically, we exported US\$32.3 billion to other English-speaking countries and US\$78.7 billion to non-English and non-French speaking countries. The respective import volumes were US\$26.1 billion and US\$179.7 billion.

4.4 Canada’s Trade Volume with French-Speaking has Grown Strongly in Recent Years

Figure 2 shows Canada’s total trade volume with French-speaking countries over the 1992 to 2011 period. As we can see in Table 9, trade between Canada and French-speaking countries totalled \$25.7 billion in 2011. This was down from the peak in 2008, when exports and imports equalled \$27.9 billion. From 1992 to 2011, trade increased by a total of 7.1 per cent per year. This is slightly stronger than Canada’s trade volume with the entire world. Canada’s total trade with the world grew by 6.8 per cent

per year over the same time frame. Thus, French-speaking countries share of Canada's overall trade volume increased slightly from 2.7 per cent in 1992 to 2.9 per cent in 2011. So even though Canada's trade volume with French-speaking countries is relatively small, their share of overall trade has been growing.

Figure 2 - Canada's Trade Volumes with French-Speaking Countries (Millions U.S. \$)



Sources: Industry Canada; Statistics Canada.

4.5 Trade with French-Speaking Countries Still Boosts Canadian Economy

Although French-speaking countries have relatively small economies (with the exception of France) and they are relatively far away, trading with these countries still benefits the Canadian economy. Bilateral trade volumes with these countries, it can be argued, would be much smaller if it were not for the ability of 30 per cent of Canada's population to speak French, with most of these people residing in New Brunswick and Quebec. In other words, the presence of Bilingual Canada enables us as a country to increase our trade with French-speaking countries. Using the location quotients displayed in Table 7, we can estimate the benefit of Bilingual Canada's knowledge of French, based on the higher volume of trade between Bilingual Canada and French-speaking countries, compared to the volume of trade between Less Bilingual Canada and French-speaking countries.

In 2011, Bilingual Canada's exports to countries that feature French as an official language totalled US\$2.7 billion. Imports from these countries were even higher, coming in at US\$9.3 billion in 2011. What if Bilingual Canada had traded with these countries at the same fraction of overall trade as Less Bilingual Canada? In other words, what would Bilingual Canada's trade with French-speaking countries be if we applied Less Bilingual Canada's location quotients to Bilingual Canada? Exports to French-speaking countries and imports from French-speaking countries would have been just US\$1.1 billion and US\$2.1 billion, respectively, in 2011.

We are assuming that the difference in trade volumes between Bilingual Canada and Less Bilingual Canada with respect to countries that feature French as an official language is entirely due to differences in knowledge of French. Of course, there could be other reasons why Bilingual Canada trades more with these countries than Less Bilingual Canada, such as stronger colonial ties, different factor endowments, and differences in comparative advantage. However, it is difficult to believe that factor endowments or comparative advantages between Bilingual Canada and Less Bilingual Canada are so different that they explain the significant difference in trade volumes with French-speaking countries. In addition, empirical literature clearly shows that language is an important contributor to bilateral trade volumes. Making this assumption, it follows that Quebec and New Brunswick's knowledge of French boosted 2011 trade with French-speaking countries by a total of US\$ 8.9 billion (exports totalled US\$1.7 billion and imports totalled US\$7.2 billion). Put another way, average trade volumes (average of exports and imports) were US\$3.5 billion higher thanks to proficiency in French, which translates into US\$2.8 billion when adjusted for inflation.

We conduct the same exercise in the next chapter but instead of using location quotients we will use gravity models. Running regressions using gravity models is statistically more rigorous than using location quotients.

5 Gravity Analysis

This section presents the results from our gravity equation analysis of trade in Canada, Bilingual Canada and Less Bilingual Canada. Using location quotients, we saw that New Brunswick and Quebec trade more with French-speaking countries and Less Bilingual Canada trades more with English-speaking countries, relative to their overall trade. Using gravity equations will allow us to see if language plays a statistically significant role in Canada's bilateral trade relationships. But first, we focus on the two key features of gravity equations—that bilateral trade volumes increase with economic size and decrease with distance—to show that these features also hold for Canada's trade relationships.

5.1 Gravity and Trade Analysis

The first way in which trade data mirror gravity is that exports rise in proportion to the size of the destination country and imports rise in proportion to the size of the origin economy. These phenomena are illustrated in figures 3 and 4. Figure 3 shows Canada's 2011 exports to non-English and non-French speaking countries that are members of the European Union, while figure 4 shows Canada's 2011 imports from these same countries. These countries are sufficiently far from Canada that relative differences in distances between them can be largely ignored. Language can also be ignored because we excluded countries that share a common language with Canada. Both figures clearly feature an upward slope, signifying that trade grows in relation to economic size.

This relationship between trade and economic size can also be seen in table 10. It shows each country-group's share of global GDP alongside their share of trade with Canada. The ranking of country-group by GDP matches the ranking of country-group by trade volume. Thus, Canada's trade with French and bilingual countries (English and French speaking) is relatively low because their economies are relatively small.

Also, notice that the United States' share of overall Canadian trade, at 61.9 per cent, is much higher than the country's share of global GDP, at 28.9 per cent. All other country-groups' share of Canadian trade is lower than their share of global GDP. This is another sign of how important the United States trade partnership is to Canada.

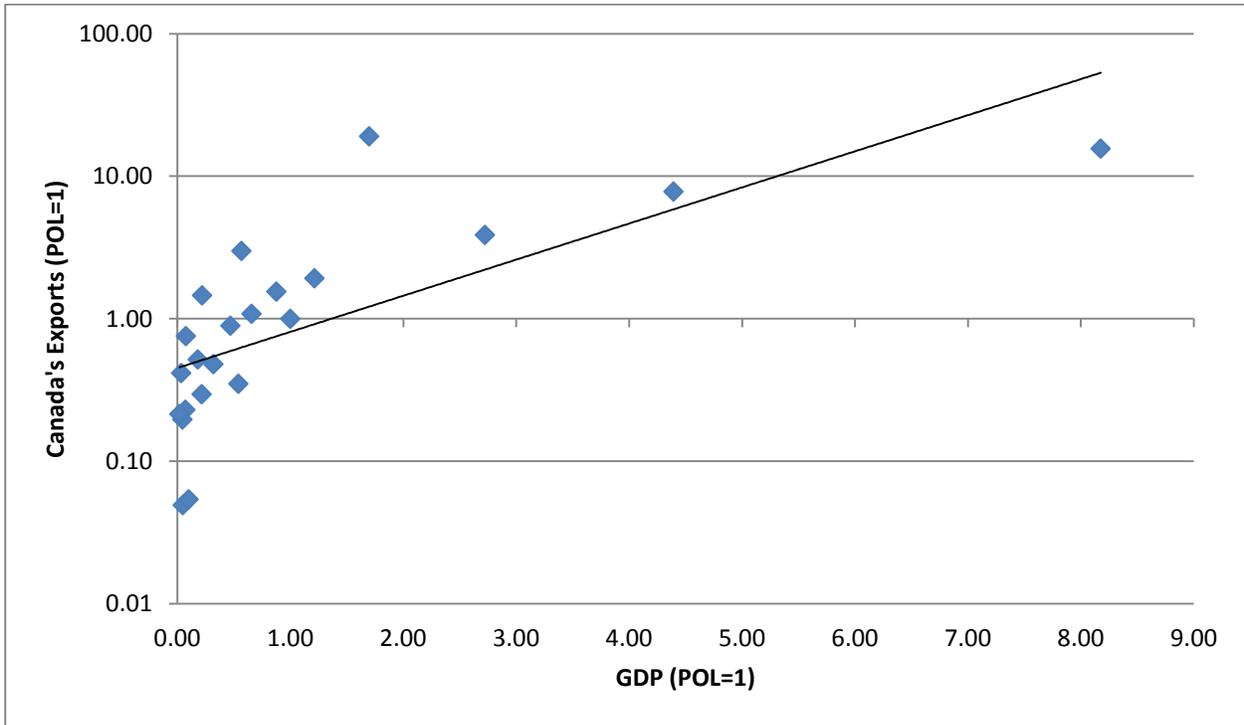
Table 10 - GDP Shares and Trade Volume Shares by Country-Group (2011)

Country-Group	Global GDP Share	Canadian Trade Volume Share
French	5.9	2.9
Bilingual	0.1	0.0
United States	28.9	61.9
Other English	12.0	6.5
Other	53.2	28.7
Total	100	100

Sources: World Bank; Industry Canada; Statistics Canada.

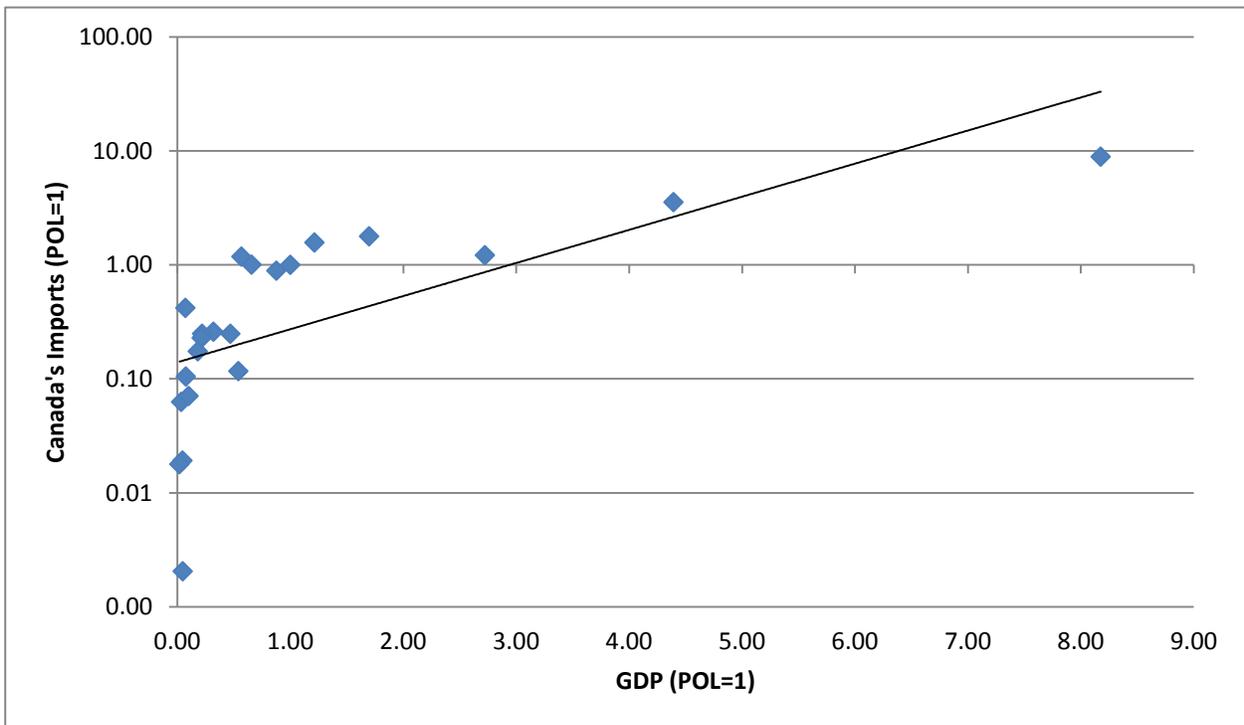
Figures 5 and 6 illustrate the second key relationship in gravity equations—the negative relationship between trade and physical distance. Figure 5 displays Canada’s exports in relation to the distance in kilometres of all its trade partners, while figure 6 displays Canada’s imports in relation to its partners’ physical distance. Here the trend line is sloping downwards in both charts, signifying the negative relationship.

Figure 3 - Exports and GDP



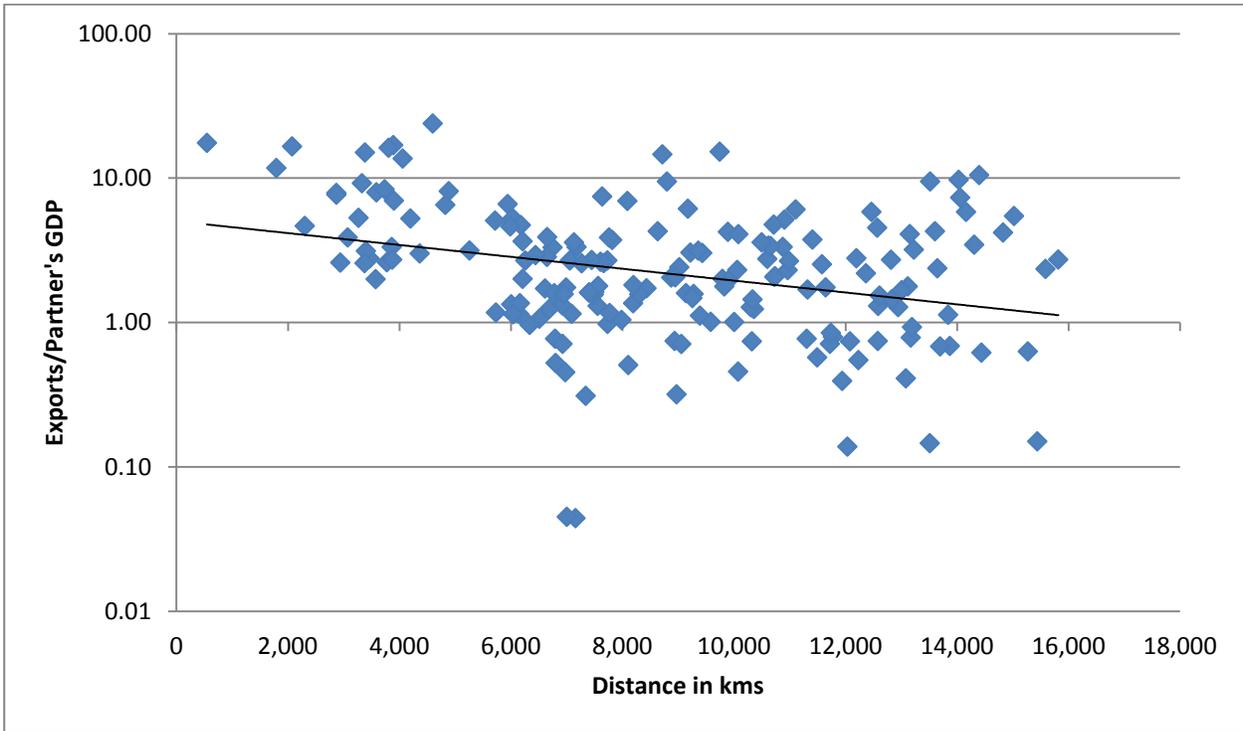
Sources: Industry Canada; World Bank.

Figure 4 - Imports and GDP



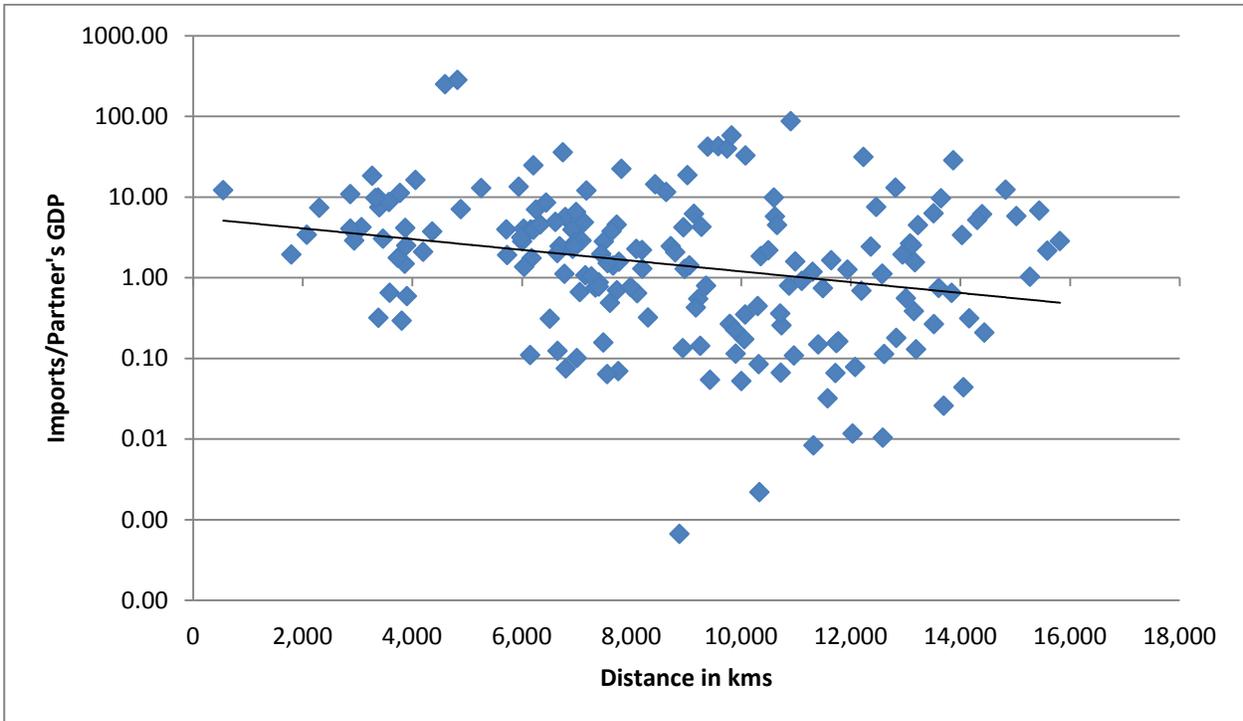
Sources: Industry Canada; World Bank.

Figure 5 - Exports and Distance



Sources: Industry Canada; CEPII.

Figure 6 - Imports and Distance



Sources: Industry Canada; CEPII.

5.2 Data and Assumptions

Our time series run from 1992 to 2011. In such cases where the gravity estimations employ data sets that span many years, time-varying fixed effects should be used. We do so here. Therefore, the estimates strictly rest on the cross-sectional evidence.

The trade data come from Industry Canada's Trade Data Online web portal. The World Bank's World Development Indicators database is the source of the GDP information. We have timely real GDP data for 181 of the 214 countries in our trade database (comparable GDP data for 33 of the countries is not available). Thus, our gravity estimates are based on information for 181 countries.

Distance is in kilometres (km) and is calculated using the great-circle distance between the two most populated cities in each country. For Canada and Less Bilingual Canada, the largest city is Toronto; for Bilingual Canada, the largest city is Montreal.

Official language and spoken language information comes from many sources, including CEPII's GeoDist database, the Central Intelligence Agency's World Factbook, Ethnologue, and Wikipedia. For Canada and Bilingual Canada, countries with English or French as official languages are assigned a 1 in the binary variable, while other countries are assigned a 0 in the binary variable. For Less Bilingual Canada, only countries with English as an official language are assigned a 1, all others are assigned a 0.

Algeria, Morocco, and Tunisia were assigned a 1 for French as an official language, even though French is no longer an official language in these countries. At the same time, we left Sudan as a 0 even though English was added as an official language in 2005. We chose to leave it as a 0 because there is no reason to believe that the decision to adopt English was independent of a desire to promote trade.²³

For the spoken language binary variable, countries where at least 20 per cent of the population speaks English or French are assigned a 1, while other countries are assigned a 0.

We also created four other language binary variables for separate gravity equation estimations. We built an official language binary for English-speaking countries, an official language binary for French-speaking countries, a spoken language binary for English-speaking countries, and a spoken language binary for French speaking countries. These results will allow us to separate out the effects of English and French on Canada's trade patterns.

We also included binary variables for contiguity (1 for the United States, 0 for all others); colonial heritage (1 for the United Kingdom and France, 0 for all others); land locked (1 for all countries whose borders are entirely enclosed by land, 0 for all others); free trade agreement (1 for all countries that have a regional free trade agreement with Canada, 0 for others); WTO (1 for all countries that are members of the World Trade Organization, 0 for all others).

The additional terms in the equation are required controls in order to discern the impact of linguistic ties on bilateral trade. Countries with a common border often share a common language. Colonial links are

²³ Melitz and Toubal, 19.

also important.²⁴ We would expect Canada to trade more with countries in which we have signed a free trade agreement. We would also expect Canada to trade more with countries who are members of the World Trade Organization. Finally, we would expect Canada to trade less with countries that are land locked, irrespective of language.

Thus, we are estimating gravity equations using the following general functional form:

$$\log(t_{ij}) = \alpha + \beta_1 \log(GDP_i GDP_j) - \beta_2 \log(Dist_{ij}) + \beta_3 \log(Dum_{ij}) \quad (5)$$

In words, we are regressing real average bilateral trade volumes between countries *i* and *j* on the product of their GDPs, the distance in kilometres between them, and other indicators, in the form of binary variables, that are thought to affect bilateral trade.

Table 11 - Regression Results: Real Trade

Variable	Average Real Bilateral Trade		
	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>
Intercept	-35.285*	-34.798	-36.960
	(-55.692)**	(-47.731)	(-56.861)
GDP	1.194	1.232	1.215
	(111.265)	(96.041)	(112.120)
Distance	-0.994	-1.239	-0.957
	(-22.008)	(-23.229)	(-20.364)
Contiguity	-2.226	-3.515	-2.242
	(-6.840)	(-9.378)	(-6.652)
Colony	-1.090	-0.937	-1.064
	(-5.537)	(-4.153)	(-5.309)
Free Trade	0.343	0.160	0.492
	(2.333)	(0.955)	(3.221)
Land Locked	-0.404	-0.491	-0.422
	(-7.622)	(-7.793)	(-7.395)
WTO	0.452	0.545	0.516
	(9.029)	(9.196)	(9.872)
Official Language	0.271	0.436	0.691
	(4.120)	(5.550)	(9.163)
Spoken Language	0.261	0.200	0.033
	(4.085)	(2.611)	(0.437)

* Coefficient

**t-statistic (to measure the degree of significance)

Source: The Conference Board of Canada.

²⁴ Melitz and Toubal, 17.

5.3 Explaining Our Results

5.3.1 Results with English and French in One Binary Variable

Table 11 displays the results from our gravity equations. As the theory suggests, GDP is positively related to bilateral trade volumes, as evidenced by the positive coefficients on the GDP variable (1.194 for Canada as a whole). Likewise, distance is negatively related to bilateral trade volumes in all three equations. In the equation for Canada, the coefficient is -0.994. The GDP and distance variables are also statistically significant, given that the t-statistics, which are reported in parentheses below the coefficient estimates in Table 11, are well above 2 for a positive coefficient or well below -2 for a negative coefficient.

Our empirical analysis also shows that common official language is positive and statistically significant for bilateral trade between Canada and its trade partners. In fact, the indicator is statistically significant at the 1 per cent level in all three equations—Canada, Bilingual Canada and Less Bilingual Canada. The coefficient is higher for Less Bilingual Canada than for Bilingual Canada.

While common spoken language is positive and statistically significant for Canada and Bilingual Canada, it is not statistically significant for Less Bilingual Canada. The coefficients are also much lower for spoken language than for official language.

In general, our results are consistent with the literature: sharing a common language leads to higher bilateral trade volumes. In other words, our regressions show that Canada, both its bilingual and less bilingual components, is more likely to trade with countries with a common language and a common spoken language. This also means that Bilingual Canada has an advantage over the rest of Canada with its proficiency in two official languages, giving its larger array of potential trading partners.

That being said, as mentioned in Chapter 3, immigration has been stronger in Less Bilingual Canada than in Bilingual Canada, and thus the proportion of population that speaks more than one non-official language in Less Bilingual Canada is growing more rapidly and is much larger than in Bilingual Canada. This gives Less Bilingual Canada an edge over Bilingual Canada with respect to trade with non-English and non-French speaking countries. Whether Less Bilingual Canada is taking advantage of their superior knowledge of non-official languages is beyond the scope of this paper. From our analysis using location quotients, it appears that it is not for now. However, building these new trade arrangements likely takes time.

Based on these equations, how much more would we expect Canada and its two regions—Bilingual Canada and Less Bilingual Canada—to trade with countries that speak English, French, or both compared to countries that speak neither language? Given that the gravity equation is in log-log format, taking the exponent of the coefficient on the binary variable yields the percentage increase or decrease in the intercept variable when the binary variable is 1 compared to when it is 0. The intercept variable is the expected geometric mean of average bilateral trade (the series on the left-hand side of the equation). Adding the coefficient for any binary variable to the intercept raises or lowers the geometric mean depending on whether the coefficient is positive or negative (when the binary variable equals 0).

Table 12 - Language Binary Variables

Average Real Bilateral Trade				
<i>Area</i>	<i>Variable</i>	<i>Coefficient</i>	<i>Exponent</i>	<i>Level Difference (%)</i>
Canada	Official	0.271	1.31	31.2
	Spoken	0.261	1.30	29.8
Bilingual Canada	Official	0.436	1.55	54.7
	Spoken	0.200	1.22	22.1
Less Bilingual Canada	Official	0.691	2.00	99.7
	Spoken	0.033	1.03	3.4

Source: The Conference Board of Canada.

Column 3 in table 12 shows the percentage change in the intercept when the binary variable equals 1. According to the common official language binary variable in the gravity equation for Canada, we would expect average bilateral trade between Canada and a country that has English or French as an official language to be 31.2 per cent higher than with a country that does not share one of our official languages, everything else being equal. The spoken language binary variable gives a similar result; we would expect bilateral trade between Canada and an English- or French-speaking country to be 29.8 per cent higher than with a country that speaks neither official language, again everything else being equal.

For Bilingual Canada, we get a large range between the common official binary variable and the common spoken language binary variable. According to the common official language binary variable, we expect bilateral trade with Bilingual Canada to be 54.7 per cent higher with countries that share at least one of our official languages compared to countries that do not. According to the common spoken language variable, we would expect bilateral trade to be 22.1 per cent higher.

For Less Bilingual Canada, only the common official language binary variable is significant. This variable's coefficient suggests average bilateral trade between Less Bilingual Canada would be nearly 100 per cent higher with countries that speak English, French or both compared to countries that speak neither. Less Bilingual Canada's deep trade relationship with the United States probably explains the large coefficient on the official language binary variable.

5.3.2 Results with English and French in Separate Binary Variables

What happens if we separate English and French in our language binary variables? To answer this question, we estimate a gravity equation that includes four language binary variables: common official English language, common official French language, common spoken English language, and common spoken French language. Separating out English and French will allow us to see how each language affects bilateral trade volumes in Canada as a whole and in Bilingual and Less Bilingual Canada separately.

Table 13 presents the results for such a breakdown. The results are somewhat ambiguous for Canada. English as a common official language is positive and statistically significant, but French as a common official language is not. On the other hand, French as a common spoken language is positive and statistically significant, but English is not. Thus, these results suggest that English as a common official language and French as a common spoken language partly explain Canadian bilateral trade volumes.

The results are similar for Bilingual Canada. Common official language for English and common spoken language for French are positive and statistically significant, meaning they help explain bilateral trade volumes. The other two binary variables—common official language for French and common spoken language for English—are not significant.

For Less Bilingual Canada, only common official language for English is statistically significant. Thus, both French language binary variables are insignificant. Thus, the French language does not seem to explain trade volumes in Less Bilingual Canada. This implies that Less Bilingual Canada, unlike New Brunswick and Quebec, are probably missing out on trade with French-speaking countries.

Table 13 - Regression Results: Real Trade

Variable	Average Real Bilateral Trade		
	<i>Canada</i>	<i>Bilingual Canada</i>	<i>Less Bilingual Canada</i>
Intercept	-35.028 (-55.323)	-34.241 (-46.599)	-36.143 (-54.565)
GDP	1.195 (110.923)	1.230 (94.629)	1.199 (105.780)
Distance	-1.024 (-22.609)	-1.287 (-23.792)	-0.951 (-19.983)
Contiguity	-2.338 (-7.223)	-3.473 (-9.225)	-2.148 (-6.355)
Colony	-0.953 (-4.903)	-0.875 (-3.893)	-0.879 (-4.336)
Free Trade	0.235 (1.594)	0.016 (0.096)	0.489 (3.181)
Land Locked	-0.358 (-6.777)	-0.449 (-7.101)	-0.417 (-7.290)
WTO	0.486 (9.857)	0.581 (9.862)	0.561 (10.657)
Official English Language	0.582 (7.689)	0.589 (6.536)	0.677 (8.548)
Spoken English Language	0.055 (0.746)	0.001 (0.009)	-0.001 (-0.008)
Official French Language	-0.199 (-2.429)	-0.031 (-0.315)	-0.267 (-3.087)
Spoken French Language	0.265 (2.860)	0.505 (4.525)	-0.061 (-0.629)

Source: The Conference Board of Canada.

A coefficient of 0.58 on common official English language can be transformed by exponentiation, given the log transformed format of the estimated regression. The exponent of 0.58 is 1.79. (See Table 14). This means that we would expect average bilateral trade between Canada and English-speaking countries to

be 79 per cent higher than with non-English-speaking countries. This percentage is so large because Canada trades so much with the United States, which of course is an English-speaking country.

For French as a common spoken language, the coefficient on the binary variable suggests that the expected average bilateral trade between Canada and French-speaking countries is 30.3 per cent higher than with non-French speaking countries.

For Bilingual Canada, we would expect average bilateral trade between Bilingual Canada and countries with English as an official language to be 80.2 per cent higher than with other countries. This result is very similar to Canada as a whole. According to the common spoken French language binary variable, we would expect bilateral trade volumes between Bilingual Canada and French-speaking countries to be 65.7 per cent higher than with non-French speaking countries.

For Less Bilingual Canada, the common English language binary variable states that bilateral trade between Less Bilingual Canada and countries with English as an official language is nearly double that of other countries that don't count English as an official language. But because neither French language binary variable is statistically significant, as mentioned above, this version of the gravity equation suggests that the French language does not explain bilateral trade volumes in Less Bilingual Canada, unlike in Bilingual Canada.

Table 14 - Language Binary Variables

Average Real Trade				
<i>Area</i>	<i>Variable</i>	<i>Coefficient</i>	<i>Exponent</i>	<i>Level Difference (%)</i>
Canada	Official English	0.582	1.79	78.9
	Official French	0.055	1.06	5.7
	Spoken English	-0.199	0.82	-18.1
	Spoken French	0.265	1.30	30.3
Bilingual Canada	Official English	0.589	1.80	80.2
	Official French	0.001	1.00	0.1
	Spoken English	-0.031	0.97	-3.1
	Spoken French	0.505	1.66	65.7
Less Bilingual Canada	Official English	0.677	1.97	96.8
	Official French	-0.001	1.00	-0.1
	Spoken English	-0.267	0.77	-23.4
	Spoken French	-0.061	0.94	-5.9

Source: The Conference Board of Canada.

5.3.3 How Much is Knowledge of French Boosting Trade Volumes?

We saw that Bilingual Canada's bilateral trade volumes with French-speaking countries are expected to be 65.7 per cent higher than with countries that do not speak French. What does this mean in level terms? In 2011, average bilateral trade volume (average of exports and imports) between Bilingual Canada and French-speaking countries was US\$4 billion, adjusted for inflation (US\$5 billion in nominal terms). According to the gravity equation, this would be just US\$1.4 billion if New Brunswick and Quebec

did not speak French. Average bilateral trade volumes were US\$2.6 billion higher because of Bilingual Canada's knowledge of the French language. In other words, knowledge of French boosted exports and imports, on average, by US\$2.6 billion each in 2011, US\$3.3 billion in nominal terms. These results are very similar to our analysis using location quotients, which estimated that proficiency in French boosted Bilingual Canada's trade with French-speaking countries by US\$3.5 billion.

6 Conclusion

This paper has established that Bilingual Canada's trade volumes are higher than would be expected, given its share of overall Canadian trade. As a share of overall world trade, Bilingual Canada trades much more with French-speaking countries than Less Bilingual Canada. These results do not come as a surprise because the empirical literature is clear—sharing a common language facilitates trade.

We also provided a numerical example of the benefits of trade, using David Ricardo's famous theory of comparative advantage. Given that trade leads to increased prosperity and countries that share a common language trade more with each other, it follows that being a bilingual country will boost trade and, in turn, prosperity, as knowledge of more than one language increases the number of potential trade partners.

In fact, using two separate empirical techniques—location quotients and gravity equations—we were able to estimate how much proficiency in French has boosted trade between Bilingual Canada and French-speaking countries. We take comfort in the fact that both techniques yielded very similar results. In 2011, exports from Bilingual Canada to French-speaking countries were valued at US\$2.7 billion, while imports from French-speaking countries to Bilingual Canada were valued at US\$9.3 billion. Thus, average bilateral trade, using the geometric mean, was US\$5 billion that year.

Using location quotients and using 2011 as an example, we determined that Bilingual Canada's knowledge of French boosted exports by US\$1.7 billion and imports by US\$7.2 billion. Taking the geometric mean, we see that Bilingual Canada's proficiency in French boosted average bilateral trade by US\$3.5 billion in 2011.

According to our gravity equation analysis, we would expect Bilingual Canada's trade with French-speaking countries to be more than 65 per cent higher than with countries that do not speak French. This means that, again using 2011 as an example, Canada's nominal exports and nominal imports were each US\$3.3 billion higher thanks to Bilingual Canada's proficiency in French.

Research shows that individuals benefit from being bilingual, as the ability to speak more than one language has a positive payoff. Thus, bilingualism confers private benefits on those who speak two languages. But this paper has shown that there are public benefits to bilingualism as well. General knowledge of French in New Brunswick and Quebec boosts trade between those provinces and French-speaking countries. Thus, higher bilateral trade is one mechanism through which all Canadians benefit from Canada's status as a bilingual country.

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