

Earnings Gains from Bilingualism: A Quebec and Ontario Study

by

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Introduction

Over the past three decades knowledge of French in Quebec has risen steadily. Yet, the share of the population with French as its mother tongue has significantly fallen. From 1971 to 2016, knowledge of French in the province of Quebec increased from 88.5% to 94.5% while the actual proportion of the population with French as its mother-tongue has decreased from 83% to 77% over this period (Vaillancourt, 2018) .

This interesting development is one of the reasons for ongoing debate surrounding the use and value of the French language in an increasingly English-speaking globalized economy (Albouy, 2006). The use of French in Quebec has given the province a distinct cultural identity which has over time had a lasting effect on the social, political and economic institutions that exist in the province still today (Vaillancourt, 2018).

My study examines whether there exists an earnings premium for bilinguals across the provinces of Quebec and Ontario. Using the 2016 Census of the population, which provides ample information on the language capabilities of individuals in the survey, I am able to estimate an average income effect associated with bilingual ability.

Background

The unique history of Quebec relative to Canada set the stage for many of the language dynamics that have evolved over time. Between 1608, the start of French colonisation, and 1763, when France divested its territories to Great Britain, the official language in Quebec was French while many other aboriginal languages were also in use (Vaillancourt, 1997). With the *British North America (Quebec) Act of 1774*, bilingualism eventually spread through the region and the legal framework surrounding language began to evolve. Over time, many political and

institutional changes have reinforced the use of the French language, including Bill 101 which made English and French the two official languages of Canada (Vaillancourt, 1997). Enacted in 1969, Bill 101 has had important implications on Quebec's political, cultural and economic institutions (Vaillancourt, 2018). Relevant implications of the law include, first, that all children must attend French elementary and secondary school unless at least one parent has previously studied in English in Canada. In practice, this means that all immigrants to Quebec, regardless of origin, must send their children to French elementary and secondary school unless they attend private non-subsidized school which represents only a small percentage of cases. Second, all public displays must be predominantly in French under Bill 101. Prior to 1993, signs had to be exclusively in French. Third, Bill 101 restricts the availability of certain administrative and public services in English. Finally, under Bill 101, businesses employing over 50 people must obtain a certificate proving that adequate Francophone employment is provided by that business (Vaillancourt, 2018). As this paper will discuss, the returns to bilingualism are important to understand if we want to determine the effects and consequences of Bill 101.

Previous Literature

Table 1 Previous Studies on Impact of French/English Bilingualism on Earnings

Paper	Estimates
Shapiro and Stelcner (1987, 1997)	Positive: 9.1%
Vaillancourt (1992, 1997, 2018)	Positive: 7%
Christofides and Swindinsky (1998, 2008)	Positive: 10.5%
Albouy (2006)	Positive: 6%

The existing literature on French-English bilingualism in Canada, looking specifically at Ontario and Quebec has generally found a positive earnings gain associated with bilingualism.

Existing studies use various methodologies and data sets, across various time periods and linguistic groups. In general, studies have identified a positive bilingual earnings gain ranging 6 to 16 percent using different identification methods.

Many of the studies to date do not control for industry and occupation status. My estimates result from including these variables into the equation. This will allow me to decompose the intra- and inter-industry earnings effects of bilingualism. By including these controls I will have a better idea of whether bilingualism is affecting wages within a given industry or occupation, or whether bilingualism is affecting an individual's choice of industry or occupation, which may consequently affect their income. These variables are discussed by Christofides et al. (2008) but they utilize Census 2001 data. My aim is to assess a more recent dataset and to see whether the general findings about language ability premiums hold true today.

In a paper examining the U.S labour market, Fry and Lowell (2001) assert that the lower market value of second language skills has prompted a shift towards unilingualism in the past few generations. Determining the returns to bilingualism in Canada is therefore important if we want to assess the likelihood of French-English bilingualism spreading outside of Quebec. In fact, while there has been relatively little growth in the proportion of French-English bilingualism in the Rest of Canada, the economic incentives associated with speaking English has led to growth in terms of the number of people speaking English as a second language within Quebec (Christofides et al., 2008). For example, the preeminence of English computer science and information technology has significantly increased the incentive to acquire English (Christofides et al., 2008). Bill 101 is therefore likely to be an ineffective policy if it is completely at odds with the economic incentives that exist today. By examining labour outcomes in Quebec and Ontario,

I hope to provide useful estimates that can be taken into consideration for future bilingual policy in Canada.

Hypothesis

Table 2 Hypothesis: Expected effects of bilingualism on earnings

	ONTARIO	QUEBEC
Anglophone with French as a second language	+	-
Francophone with English as a second language	-	+
Non-official language as mother-tongue with English as a second language	-	-
Non-official language as mother-tongue with French as a second language	-	-

The aim of this study is to determine whether there is an earnings premium associated with being bilingual. In the context of Bill 101, my study is specifically examining French-English bilingualism. Table 2 above shows my predictions for the direction of the coefficients on the various linguistic groups that I am studying. These predictions are informed by existing economic studies that have similarly estimated premiums for bilingualism. For Ontarian Anglophones, I expect that knowing French as a second language positively impacts income relative to Anglophones who do not speak a second language. However, I hypothesize that having any language other than English as mother-tongue in Ontario is associated with a lower average income.

For Francophones in Quebec, I predict that knowing English as a second language is associated with a higher average income relative to Francophones who do not speak a second language. For individuals with a mother-tongue other than French, I expect a lower average income.

Methodology & Data

To estimate the effect of bilingualism on earnings, I perform a simple OLS regression similar to a hedonic wage regression. This procedure is well established in labour economics and enables me to exploit the language variables available in the Census dataset. I run two main regressions and run them separately on males and females, across each province. This gives me a total of eight regressions.

The first main estimating equation is

$$(1) \text{ Natural log of income} = \beta_0 + \beta_1 \text{language dummy} + \beta_2 \text{agegrp} + \beta_3 \text{hdgree} \\ + \beta_4 \text{wkswrk} + \beta_5 \text{CMA} + \beta_6 \text{marsth} + \beta_7 \text{trans} + \beta_8 \text{DIST} + \varepsilon$$

where I treat *language dummy* as a dummy variable which indicates the linguistic group of a given individual. Along with a language attribute dummy, I include a set of control variables that are all fairly standard practice in a typical wage equation. *Agegrp*, *hdgree*, and *wkswrk*, control for an individual's age, the highest level of education they achieved and the number of weeks they worked in 2016, respectively. Similar studies examining bilingualism all included similar such controls. I also include *trans* to identify the mode of transportation used by a given individual. The *DIST* variable controls for the distance a given individual travels to work each day. *Trans* and *DIST* are included as a proxy for "urban living". The reference group is set as individuals who commute by public transit and who live less than 5 kilometers from their place of work.

My second regression includes the additional control variables *NOCS* and *NAICS* which control for occupation status and industry:

$$(II) \text{ Natural log of income} = \beta_0 + \beta_1 \text{language dummy} + \beta_2 \text{agegrp} + \beta_3 \text{hdgree} +$$

$$\beta_4 \text{wkswrk} + \beta_5 \text{CMA} + \beta_6 \text{marsth} + \beta_7 \text{trans} + \beta_8 \text{DIST} + \beta_9 \text{NOCS} + \beta_{10} \text{NAICS} + \epsilon$$

The reason I run one regression without occupation and industry controls and one with, is to differentiate between the intra- and inter-industry earnings effects of bilingualism. The *NOCS* variable is a categorical variable that controls for occupation status defined as the “kind of work performed in a job by a particular worker” where occupations are broadly “homogeneous with respect to skill type and skill level” (StatsCan, 2016). Relevant categories within this variable include managers, professionals, government workers etc. The *NAICS* variable indicates industry which includes categories such as agriculture, construction, trade, finance, education, healthcare and public administration. Both *NOCS* and *NAICS* are important for understanding whether language impacts an individual’s attainment of a certain occupation status in a certain industry. It is likely that language has an effect not only on an individual’s income within their given job, but also that it impacts their choice to end up in a certain industry or occupation.

Identification Strategy

The 2016 Census dataset contains two key language variables I exploit in order to identify the various linguistic groups that exist in each province. The first is *mother-tongue* which is a categorical variable. As per the Census codebook, “mother tongue” refers to the “first

language learned at home in childhood and still understood by the person at the time the data was collected” (StatsCan, 2016). The second key variable I utilize is the *knowledge of official language* variable, which takes on three values: English, French or both, which are the official languages in Canada under Bill 101. In this data set, 'Knowledge of official languages' refers to “whether the person can conduct a conversation in English only, French only, in both or in neither language” (StatsCan, 2016). For my analysis, I construct a full set of interaction terms between an individual’s mother-tongue and their corresponding knowledge of either Canadian official language. *EngBi* refers to Anglophones (whose mother-tongue is English) and who are bilingual (*knowledge of official language* is both). Equivalently, *FrBi* refers to Francophones (whose mother-tongue is French) and who are bilingual (*knowledge of official language* is both). I also included other dummies for individuals whose mother-tongue is neither official Canadian language. I included the three most prevalent mother-tongue languages after English and French in my regression. *NO3* indicates an individual whose mother-tongue is Arabic, *NO4* indicates Mandarin and *NO17* indicates Spanish. These language dummy indicators provide identification to cover the general linguistic environments in both Ontario and Quebec. Table 3 below demonstrates how I interact each language combination in order to create the various language dummy variables included in my regression analysis.

Table 3 Language Attribute Dummy Variables

		Mother Tongue				
		English	French	Arabic	Mandarin	Spanish
Knowledge of Official Language	English	EngUni	-	NO3Eng	NO4Eng	NO17Eng
	French	-	FrUni	NO3Fr	NO4Fr	NO17Fr
	Both	EngBi	FrBi	NO3Bi	NO4Bi	NO17Bi

Table 4 demonstrates which dummies I included in my regressions for Ontario and Quebec respectively. These differ to reflect the difference in the linguistic environment that characterizes each province. In Ontario, I set the reference group as unilingual Anglophones who speak only English (*EngUni*). Conversely, I set the reference group in Quebec as unilingual Francophones who speak only French (*FrUni*). In total, I examine 16 different linguistic groups in my study.

Table 4 Language attribute dummies for Ontario & Quebec

	ONTARIO	QUEBEC
	- EngUni (Reference group)	- FrUni (Reference group)
	- EngBi	- FrBi
	- FriBi	- EngUni
	- NO3Eng	- NO3Eng / Bi / Fr
	- NO4 Eng	- NO4 Eng / Bi / Fr
	- NO17Eng	- NO17Eng / Bi / Fr
Total coefficients of interest:	5	11

Data

To conduct my analysis, I use the 2016 public-use microdata file (PUMF) from the Census produced by Statistics Canada. The Census is a collection of demographic, labour and income variables for persons living in Canada. The Census has 930,421 observations across 141 variables and represents 2.7% of the Canadian population (I have weighed the data to reflect the population). My sample is restricted to residents of Quebec and residents of Ontario. Since income is my dependent variable, any individual with no observable income in the data set is excluded. By default, this excludes all observations below the age of 15 years old.

As described in my methodology, I am looking primarily at an individual's mother-tongue as well as the official languages they have learned as a second language. This allows me to identify the various linguistic groups that exist in each province. In order to preserve confidentiality, the smallest geographical unit available in the 2016 PUMF is the CMA. I thus use the CMA variable to estimate any geographic or urban effect that might impact the return to bilingualism.

Summary Statistics

Table 5 Summary Statistics

	ONTARIO						Total
	EngUni	EngBi	FrBi	NO3Eng	NO4Eng	NO17Eng	
Total Population Age >15	180,660	15,539	11,586	3,026	4,960	3,941	221,253
Percentage of total population	81.7	7.0	5.2	1.4	2.2	1.8	99.3
Median income	33,000	39,000	37,000	20,000	27,000	26,000	
High school degree attainment	30.04	20.33	25.39	23.87	18.41	27.41	
Bachelor's degree attainment	12.95	28.55	14.81	27.25	33.64	14.81	
Worked more than 49 hours/week	59.98	56.40	58.74	41.90	52.41	55.41	
Occupation status: Management	10.59	15.90	10.52	10.80	10.12	8.60	
Industry: Healthcare and education	21.76	18.22	31.52	22.83	14.91	14.73	
Distance to work <5km	34.05	36.43	34.26	32.02	27.58	29.94	

Table 4 shows that the large majority of Ontarians are unilingual Anglophones who speak only English (*EngUni*); this linguistic group accounts for approximately 81.7% of the Ontario population. We can also see that bilingual Anglophones (*EngBi*) in Ontario have a higher median income than any other linguistic group. Notably, bilingual Anglophones also have a much higher rate of educational attainment in terms of percentage who obtain a bachelor's degree. 28.55% of Anglophone bilinguals have a bachelor's degree compared to only 12.95% of unilingual Anglophones. Similarly, those whose mother-tongue is Arabic and Mandarin but who also speak English (*NO3Eng* and *NO4Eng*) also have a high rate of bachelor's degree education, 27.25% and 33.64% respectively. Both *NO3Eng* and *NO4Eng*,

however, have a slightly lower median income than those whose mother-tongue is one of the Canadian official languages. In terms of occupation status, Anglophone bilinguals are also over-represented in management positions with 15.90% of *EngBi* individuals working as managers compared to approximately only 10% across the other linguistic groups.

Table 6 Summary Statistics

	QUEBEC						
	FrUni	EngUni	FrBi	EngBi	NO3Eng	NO3Bi	NO3Fr
Total Population Age >15	73,919	3,834	65,056	9,599	353	2,552	1,389
Percentage of total population	46.0	2.4	40.5	6.0	0.2	1.6	0.9
Median income	28,000	24,000	35,000	31,000	14,000	26,000	21,000
High school degree attainment	22.27	29.73	20.32	25.45	20.68	15.44	18.66
Bachelor's degree attainment	6.44	11.77	18.13	19.65	27.49	26.02	15.27
Worked more than 49 hours/week	52.93	50.41	54.44	56.40	37.13	44.29	36.44
Occupation status: Management	8.19	11.95	7.29	11.23	10.78	11.57	4.48
Industry: Healthcare and education	18.28	18.79	21.23	18.82	18.62	17.87	29.48
Distance to work <5km	39.29	36.30	34.04	35.20	36.36	32.95	41.30
	NO4Eng	NO4Bi	NO4Fr	NO17Eng	NO17Bi	NO17Fr	Total
Total Population Age >16	426	310	61	120	1855	1295	160769
Percentage of total population	0.26	0.19	0.04	0.07	1.15	0.81	100
Median income	22,000	18,000	22,000	20,500	28,000	23,000	
High school degree attainment	15.02	12.62	11.48	26.67	19.69	22.49	
Bachelor's degree attainment	34.04	32.69	36.09	14.17	21.31	11.59	
Worked more than 49 hours/week	53	48.85	41.30	45.78	50.6	41.64	
Occupation status: Management	14.49	16.13	32.61	7.23	5.49	1.85	
Industry: Healthcare and education	12.72	15.21	4.31	9.43	15.56	31.16	
Distance to work <5km	28.70	37.16	45.71	26.67	36.31	38.22	

Table 5 shows that in Quebec there is an almost equal proportion of unilingual Francophones (*FrUni*) as there are bilingual Francophones (*FrBi*). These two linguistic groups make up 46% and 40.5% of the Quebec population respectively. Bilingual Anglophones (*EngBi*) are the third most represented linguistic group in Quebec but they comprise only 6% of the sample. Median income is highest among bilingual Francophones and lowest among originally Arabic speakers who know English and not French (*NO3Eng*). Notably, bachelor's degree attainment is significantly higher among those whose mother-tongue is Mandarin regardless of their knowledge of an official language (*NO4Eng*, *NO4Bi* and *NO4Fr*) as a second language.

Over a third of Mandarin speakers have a bachelor's degree. In contrast, less than 20% of individuals with either English or French as their mother-tongue obtain a bachelor's degree. In Quebec, Mandarin speakers are also vastly over-represented in management positions. 32.61% of Mandarin speakers who can also speak French (*NO4Fr*) are managers, followed by bilingual Mandarin speakers (*NO4Bi*) with 16.13% of this group working in management occupations, followed third by Mandarin Speakers who speak only English (*NO4Eng*), 14.49% of which are managers.

Empirical Results

Table 7 Regression Results

		Dependent variable = Natural logarithm of total annual income after-tax in 2016							
		ONTARIO				QUEBEC			
		(reference group = unilingual Anglophone, <i>EngUni</i>)				(reference group = unilingual Francophone, <i>FrUni</i>)			
Variables	R ²	Males		Females		Males		Females	
		(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
Language Attribute									
EngBi		0.111*** (0.011)	0.077*** (0.011)	0.095*** (0.008)	0.068*** (0.008)	-	-	-	-
EngUni		-	-	-	-	-0.049** (0.030)	-0.041** (0.030)	-0.030 (0.030)	-0.022 (0.030)
FrBi		0.096*** (0.012)	0.059*** (0.011)	0.107*** (0.010)	0.080*** (0.010)	0.092*** (0.006)	0.069*** (0.006)	0.062*** (0.005)	0.048*** (0.005)
NO3Eng		-0.283*** (0.030)	-0.226*** (0.029)	-0.225*** (0.032)	-0.183*** (0.032)	-0.529*** (0.090)	-0.457*** (0.090)	-0.203** (0.113)	-0.141 (0.113)
NO3Bi		-	-	-	-	-0.191*** (0.022)	-0.175*** (0.022)	-0.103*** (0.033)	-0.098*** (0.030)
NO3Fr		-	-	-	-	-0.263*** (0.030)	-0.212*** (0.030)	-0.118*** (0.030)	-0.092*** (0.030)
NO4Eng		-0.211*** (0.021)	-0.214*** (0.021)	-0.204*** (0.020)	-0.215*** (0.019)	-0.486*** (0.070)	-0.412*** (0.070)	-0.270*** (0.060)	-0.219*** (0.060)
NO4Bi		-	-	-	-	-0.435*** (0.070)	-0.391*** (0.070)	-0.344*** (0.080)	-0.334*** (0.060)
NO4Fr		-	-	-	-	-1.058*** (0.080)	-0.955*** (0.080)	-0.472*** (0.150)	-0.342*** (0.150)
NO17Eng		-0.160*** (0.021)	-0.118*** (0.020)	-0.152*** (0.019)	-0.122*** (0.018)	-0.078 (0.102)	-0.054*** (0.102)	-0.396** (0.219)	-0.310* (0.219)
NO17Bi		-	-	-	-	-0.154*** (0.030)	-0.125*** (0.030)	-0.123*** (0.030)	-0.105*** (0.219)
NO17Fr		-	-	-	-	-0.247*** (0.030)	-0.189*** (0.030)	-0.127*** (0.030)	-0.092*** (0.030)

Table 7. Main results showing after-tax income effects with standard deviation (in parentheses) specific to the different linguistic groups (noted in the row header) that exist in both Ontario and Quebec (noted in the column header). Note: The p-values are reported with *** indicating significance at the 5% level and ** indicating the 10% level. I conduct various robustness checks to test the sensitivity of my results against various identification strategies. My findings remain relatively similar if I adjust the sample restrictions to include various age groups and working statuses.

Main Empirical Results on Language Attribute Dummy Variables

This section discusses the estimates shown in Table 7. These estimates result from regressing the natural logarithm of annual after-tax income on the dummy variables I constructed to identify each linguistic group, as well as on the set of control variables I included in my regression (*Agegrp*, *hdgree*, *wkswrk*, *MarStH*, *CMA*, *trans* and *DIST*). Table 7 is solely showing the language dummy variable estimates which are the focus of this study. The estimates on the control variables can be found in the Appendix, where I have also included comments about those results. The first regression, Regression (I), does not include occupation and industry controls and the second regression, Regression (II), includes the controls. The large majority of my results are statistically significant at the 5% level. Furthermore the R^2 (shown in the column header) on my regressions are all relatively high and explain roughly 49% to 57% of the variation in the dependent variable.

ONTARIO: Regression (I)

Mother-Tongue: English or French

Looking first at Ontarians whose mother-tongue is one of the two official Canadian languages, English or French, we see that bilingualism is generally associated with a positive income effect. In regression (I) which does not include controls for industry or occupation status, we see that bilingual Anglophone (*EngBi*) males have on average 11.1% higher income than unilingual Anglophone (*EngUni*) males in Ontario. Similarly, Francophone bilingual males make on average 9.6% more than unilingual Anglophone males. This reveals an earnings premium associated with being bilingual regardless of whether an individual's mother-tongue is English or French.

Among females, we see that there also exists a positive earnings premium associated with bilingualism regardless of whether an individual's mother-tongue is English or French. Bilingual Anglophone (*EngBi*) women make on average 9.5% more than unilingual Anglophone (*EngUni*) women, and bilingual Francophone (*FrBi*) women make on average 10.7% more than unilingual Anglophone women.

These results show that both Anglophone and Francophone bilinguals earn more than unilingual Anglophones, which holds true across both genders. Interestingly, while the earnings premium is higher for Anglophone bilinguals compared to Francophone bilinguals among males, the reverse is true for females. Francophone bilingual females in fact make more than Anglophone bilingual females in Ontario. This may have to do with the differing employment patterns among the two genders. The rewards to language ability likely differ within occupation and industry so if males and females enter certain occupations and industries at different rates, the returns to language would differ correspondingly. For example, a higher proportion of females working in the higher-paying public and educational sector, where bilingualism is likely to be rewarded, could explain this pattern. I analyze these differences in my second regression when I control for industry and occupation status.

These findings thus confirm my hypothesis in regards to the return to Anglophones who know French as a second language. The coefficients confirm that *EngBi* individuals do in fact make more than unilingual Anglophones in Ontario. The coefficients on *FrBi* counter my hypothesis given that I had expected to find that Francophones with English as a second language would make on average less than unilingual Anglophones in Ontario. In fact, French-English bilinguals have a positive and statistically significant income advantage relative to unilingual Anglophones despite having French as their mother-tongue.

Mother-Tongue: Non-Official Languages

Expanding my analysis to individuals whose mother-tongue is neither English nor French I find a generally negative and statistically significant income effect associated with having French or English as a second language rather than as mother-tongue in Ontario. The fourth row and below in Table 7 shows the regression results on dummy variables for the linguistic groups whose mother-tongue is Arabic, Mandarin and Spanish.

For Ontario, I chose to analyze only those who can speak English fluently as a second language in addition to their mother-tongue (*NO3Eng*, *NO4Eng*, and *NO17Eng*). Other linguistic groups were not analyzed in this regression because they do not comprise a large enough proportion of the sample and did not yield any statistically significant results.

I chose to include linguistic groups whose mother-tongue was neither English nor French because it helps demonstrate how having a non-official language as mother-tongue might impact your earnings. The regression results show that linguistic groups whose mother tongue is not English nor French have statistically lower income by a substantial percentage. In Ontario, individuals whose mother-tongue is neither English nor French make 15-28% less than individuals whose mother-tongue is English. This holds true for both genders. Male Arabic speakers who speak English make on average 28.3% less than unilingual Anglophone males in Ontario. The income differential is slightly smaller among Mandarin and Spanish speakers who make 21.1% and 16% less than unilingual Anglophones respectively. The income differentials are similar among females.

My hypothesis regarding individuals whose mother-tongue is a non-official language is thus confirmed: observations in this linguistic group experienced a negative and statistically significant effect in terms of income.

ONTARIO: Regression (II)

Recall that the second regression equation included the extra *NOCS* and *NAICS* variables which account for occupation and industry status (shown in the 2nd, 4th, 6th and 8th columns of Table 7). In all cases but one, the inclusion of occupation and industry controls decreases the magnitude of the earnings effect associated with bilingualism. The earnings premium for bilingual Anglophones compared to unilingual Anglophones falls from 11.1% down to 7.7% for males and from 9.5% down to 6.8% for females. Similarly the earnings premium for bilingual Francophones compared to unilingual Anglophones falls from 9.6% down to 5.9% for males and from 10.7% down to 8% for females. A fall in the magnitude of the earnings effect when you include these controls indicates that language has an effect not so much on your earnings within industry and occupation, as on the choice of industry and occupation. What this suggests is that bilinguals go into more high-paying occupations and work in higher-paying industries. Recall from the summary statistics that 15.9% of bilingual Anglophones hold management positions compared to only 10.59% of unilingual Anglophones. This suggests that there exists a difference in the distribution of the kinds of occupations that bilingual and unilingual individuals occupy.

*QUEBEC: Regression (I)***Mother-Tongue: English or French**

As in the Ontario case, I will start by analyzing the coefficients on the linguistics groups whose mother-tongue is one of the two official languages; English or French. The reference group in this regression are individuals in Quebec whose mother-tongue is French and who only speak French (*FrUni*). Male francophones who are bilingual (*FrBi*) make 9.2% more than male francophones who only speak French. Among women, bilingual Francophones make 6.2%

more than Francophones females who speak only French. The coefficients on unilingual Anglophones show that being unable to speak French in Quebec is economically disadvantageous. Male unilingual Anglophones make 4.9% less than male unilingual Francophones in Quebec. These results fit the intuition that being unable to speak French in Quebec is associated with a negative income effect given that French is the dominant language in Quebec.

Mother-Tongue: Non-Official Languages

The estimates on the dummies for linguistic groups whose mother-tongue is nor English nor French are interesting because they reveal which language might be more beneficial to learn as a second language. Recall that *NO3* refers to Arabic, *NO4* refers to Mandarin, and *NO17* refers to Spanish. All three of these linguistic groups have a statistically lower income than unilingual Francophones in Quebec. Individuals whose mother-tongue is Arabic and who know English as a second language made 52.9% less in 2016 than unilingual Francophones. The coefficient is slightly less negative in magnitude among individuals who know French as a second language, with individuals making 26.3% less. Interestingly however, the regression estimates show that having French as a second language in Quebec is not necessarily associated with the highest return in terms of income across individuals whose mother-tongue is Arabic, Mandarin, or Spanish. In fact, among individuals whose mother-tongue is Arabic for example, the income effect is least negative among those who know *both* English and French as a second and third language. Among males, these individuals were shown to make 19.1% less than unilingual Francophones in Quebec, which is comparatively better than Arabic speakers who only have French as a second language, who make 26.3% less than the reference group. The results among females work in the same direction but are slightly weaker in magnitude. Looking specifically at female Arabic speakers, those who knew English as a second language made

27.0% less than unilingual Francophones. In comparison, the negative income effect is largest among female Arabic speakers who know only French, with individuals making 47.2% less than unilingual Francophones.

QUEBEC: Regression (II)

As in the Ontario case, the magnitude of the coefficients on linguistic groups fall as we control for industry and occupation status. For example, the earnings premium among bilingual Francophone females compared to unilingual Francophone females falls from 6.2% down to 4.8%. This could be explained by the fact that bilingual Francophone women are overrepresented in management and professional positions. In this sample, 35% of bilingual Francophone women work in management, business or finance positions compared to only 21% of unilingual Francophone women. This employment pattern could suggest that relatively higher-paying positions are more attainable if an individual can speak English as a second language on top of knowing French.

Conclusion

Table 8 Effects of bilingualism in Ontario and Quebec

	ONTARIO		QUEBEC	
	Hypothesis	Result	Hypothesis	Result
Anglophone with French as a second language	+	6.8 to 11.1%		
Francophone with English as a second language	-	5.9 to 10.7%	+	4.8% to 9.2%
Non-official language as mother-tongue with English as a second language	-	-18.3% to -28.3%	-	-7.8% to -5.3%
Non-official language as mother-tongue with French as a second language			-	-9.2% to -47.2%

I have estimated the labour market reward to investing in learning a second language, particularly in the context of Ontario and Quebec. I focused specifically on the return to English for Francophones in Ontario as well as the return to English for Francophones in Quebec. Across both provinces and both genders, I found that French-English bilingualism is associated with an earnings premium that ranges 4.8-9.2% depending on an individual's characteristics. This is in a similar range to estimates reported in existing research. My estimates are relatively lower as compared to some existing estimates, likely because I chose to control for industry and occupation in my wage regression.

I also found that for individuals whose mother tongue was neither English nor French, the earnings differential on annual after-tax income ranged from -9.2 up to -47.2%. Examining these linguistic groups gives the French-English bilingualism debate an entirely new dimension. Studying these linguistic groups however is imperative for a more appropriate, comprehensive and inclusive legal and political framework. While English and French are Canada's two official

languages, an increasingly diversifying population is likely to incentivize people, businesses and institutions towards a more diverse language mix.

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Appendix

Table 9A Regression Results

Variables	Dependent variable = Natural logarithm of total annual income after-tax in 2016							
	ONTARIO				QUEBEC			
	(reference group = toronto, <5km, public transit)				(reference group = montreal, <5km, public transit)			
	Males		Females		Males		Females	
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
R ²	0.49	0.54	0.49	0.54	0.53	0.57	0.54	0.52
CMA								
Brantford, Guelph and Barrie	0.060*** (0.125)	0.067*** (0.121)	-0.018 (0.011)	0.000 (0.011)				
Ottawa & Gatineau	0.056*** (0.009)	0.046*** (0.009)	0.058*** (0.009)	0.031*** (0.008)				
Oshawa	0.091*** (0.014)	36.430 (0.014)	-0.026** (0.013)	-0.013** (0.013)				
Hamilton	0.064*** (0.011)	0.071*** (0.011)	0.000 (0.009)	0.010 (0.009)				
Kingston & Peterborough	0.016 (0.017)	0.031*** (0.017)	-0.003 (0.015)	0.011 (0.015)				
London	0.044*** (0.013)	0.067*** (0.013)	0.006 (0.011)	0.001 (0.011)				
Windsor	0.023 (0.017)	0.056*** (0.017)	-0.036*** (0.015)	-0.010 (0.015)				
Québec					0.028*** (0.008)	0.015** (0.008)	0.020*** (0.006)	0.005 (0.008)
Sherbrooke et Trois-Rivières					-0.007 (0.012)	-0.007 (0.012)	-0.051*** (0.110)	-0.042*** (0.110)
Ottawa et Gatineau					0.040*** (0.013)	0.030*** (0.013)	0.110*** (0.006)	0.080*** (0.006)
Distance to work								
5 to 9.9 km	0.072*** (0.008)	0.052*** (0.008)	0.062*** (0.006)	0.044*** (0.006)	0.058*** (0.007)	0.041*** (0.007)	0.052*** (0.007)	0.036*** (0.006)
10 to 14.9 km	0.084*** (0.009)	0.052*** (0.009)	0.110*** (0.007)	0.073*** (0.007)	0.094*** (0.008)	0.066*** (0.008)	0.100*** (0.007)	0.064*** (0.007)
15 to 19.9 km	0.122*** (0.009)	0.076*** (0.009)	0.146*** (0.008)	0.093*** (0.008)	0.117*** (0.009)	0.083*** (0.009)	0.107*** (0.009)	0.067*** (0.007)
20 to 24.9 km	0.170*** (0.010)	0.110*** (0.010)	0.177*** (0.010)	0.111*** (0.010)	0.146*** (0.011)	0.108*** (0.011)	0.118*** (0.009)	0.077*** (0.008)
25 to 29.9 km	0.209*** (0.008)	0.139*** (0.008)	0.195*** (0.012)	0.114*** (0.012)	0.155*** (0.013)	0.114*** (0.013)	0.132*** (0.013)	0.083*** (0.008)
>= 30 km	0.235*** (0.039)	0.156*** (0.037)	0.234*** (0.008)	0.149*** (0.008)	0.166*** (0.010)	0.105*** (0.009)	0.126*** (0.013)	0.080*** (0.008)
Mode of transportation to work								
walk	0.013*** (0.008)	0.0365*** (0.008)	-0.0409*** (0.006)	-0.0306*** (0.006)	-0.0184*** (0.007)	0.014*** (0.007)	-0.0191*** (0.006)	-0.0184*** (0.006)
drive	0.1043*** (0.009)	0.1073*** (0.009)	0.0889*** (0.007)	0.0805*** (0.007)	0.1581*** (0.007)	0.1541*** (0.007)	0.1224*** (0.007)	0.1581*** (0.007)
other	0.0549*** (0.008)	0.061*** (0.008)	-0.0881*** (0.008)	-0.0831*** (0.008)	0.0622*** (0.009)	0.0638*** (0.009)	-0.081*** (0.008)	0.0622*** (0.008)

Census Metropolitan Area (CMA)

The CMA reference group in Ontario is the city of Toronto and is the city of Montreal for Quebec. Among the CMA's that yielded statistically significant results, the average male income is in fact higher in other cities across the province compared to the reference group. This differential increases when the industry and occupation controls are included (as shown in Regression (II)). As per our intuition, this would suggest that industry and occupation are correlated with CMA to some degree. Interestingly, the coefficients do not work in the same direction for the female case as they do in the male case. Furthermore, fewer coefficients are statistically significant among females.

Distance to work

The coefficients on this variable are all statistically significant at the 5% level. Notably, the coefficients on *distance to work* increase in magnitude as the distance to work increases. This could suggest that individuals are more likely to endure a longer journey to work for a job that guarantees them a higher income.

Table 9B Regression Results

Dependent variable = Natural logarithm of total annual income after-tax in 2016				
	ONTARIO		QUEBEC	
Variables	Males	Females	Males	Females
	(II)	(II)	(II)	(II)
Occupation status				
Management	0.380*** (0.010)	0.433*** (0.010)	0.326*** (0.011)	0.350*** (0.011)
Business, finance & admin	0.152*** (0.010)	0.163*** (0.007)	0.083*** (0.010)	0.143*** (0.008)
Sciences	0.221*** (0.010)	0.306*** (0.013)	0.166*** (0.010)	0.245*** (0.010)
Healthcare	0.320*** (0.023)	0.326*** (0.010)	0.262*** (0.023)	0.306*** (0.010)
Social Science, gov & educ	0.280*** (0.013)	0.197*** (0.010)	0.220*** (0.013)	0.153*** (0.010)
Arts, culture, reception & sport	-0.080*** (0.021)	-0.052*** (0.018)	-0.0946*** (0.023)	-0.039*** (0.023)
Trades & transport	0.099*** (0.009)	0.035** (0.020)	0.077*** (0.010)	0.084*** (0.023)
Processing & manufacturing	0.024*** (0.011)	0.009 (0.013)	0.018** (0.023)	0.008 (0.016)
Industry				
Agriculture & forestry	0.019*** (0.030)	0.023*** (0.043)	-0.065** (0.026)	-0.008 (0.040)
Mining & quarrying	0.655*** (0.026)	0.556*** (0.056)	0.707*** (0.033)	0.508*** (0.060)
Manufacturing	0.251*** (0.010)	0.263*** (0.012)	0.213*** (0.010)	0.183*** (0.012)
Construction	0.222*** (0.013)	0.221*** (0.020)	0.255*** (0.014)	0.155*** (0.018)
Finance & insurance	0.502*** (0.015)	0.433*** (0.010)	0.451*** (0.018)	0.338*** (0.011)
Real estate	0.170*** (0.024)	0.177*** (0.023)	0.146*** (0.029)	0.102*** (0.031)
Science & tech professional	0.321*** (0.014)	0.266*** (0.011)	0.254*** (0.015)	0.146*** (0.013)
Administration	-0.011*** (0.015)	0.067*** (0.013)	0.023** (0.014)	0.029*** (0.023)
Educational services	0.110*** (0.015)	0.232*** (0.011)	0.037*** (0.014)	0.126*** (0.012)
Healthcare and social assistance	0.117*** (0.017)	0.158*** (0.009)	0.069*** (0.014)	0.092*** (0.009)

Table 9C Regression Results

Dependent variable = Natural logarithm of total annual income after-tax in 2016									
Variables	ONTARIO				QUEBEC				
	(reference group = 40-44 yrs, Bachelor's)				(reference group = 40-44 yrs, Bachelor's)				
	Males		Females		Males		Females		
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)	
Highest Degree Earned	R ²	0.49	0.54	0.49	0.54	0.53	0.57	0.54	0.52
No certificate, diploma or ..		-0.5031*** (0.02)	-0.306*** (0.02)	-0.551*** (0.02)	-0.2708*** (0.02)	-0.4152*** (0.03)	-0.2708*** (0.02)	-0.5*** (0.04)	-0.3434*** (0.02)
Secondary (high) school dip..		-0.3404*** (0.01)	-0.1842*** (0.0153)	-0.349*** (0.04)	-0.2079*** (0.0153)	-0.3323*** (0.0153)	-0.2079*** (0.0153)	-0.3685*** (0.04)	-0.2707*** (0.0153)
Trades certificate or diplo..		-0.3849*** (0.01)	-0.2101*** (0.0082)	-0.458*** (0.0082)	-0.157*** (0.03)	-0.269*** (0.0082)	-0.157*** (0.0082)	-0.374*** (0.03)	-0.2894*** (0.02)
Certificate of Apprenticesh..		-0.1699*** (0.02)	-0.0243*** (0.02)	-0.5359*** (0.02)	-0.1131*** (0.02)	-0.2098*** (0.02)	-0.1131*** (0.02)	-0.3979*** (0.02)	-0.3089*** (0.02)
Program of 3 months to less..		-0.2753*** (0.01)	-0.1441*** (0.017)	-0.3292*** (0.017)	-0.1634*** (0.017)	-0.2422*** (0.017)	-0.1634*** (0.017)	-0.2943*** (0.017)	-0.2397*** (0.017)
Program of 1 to 2 years (Co..		-0.2381*** (0.01)	-0.1267*** (0.01)	-0.2408*** (0.01)	-0.2037*** (0.04)	-0.2824*** (0.01)	-0.2037*** (0.01)	-0.3059*** (0.04)	-0.2468*** (0.01)
Program of more than 2 year..		-0.1364*** (0.01)	-0.0699*** (0.01)	-0.1564*** (0.01)	-0.11*** (0.01)	-0.1479*** (0.01)	-0.11*** (0.01)	-0.1705*** (0.01)	-0.1559*** (0.01)
University certificate or d..		-0.2381*** (0.02)	-0.1578*** (0.01)	-0.1447*** (0.01)	-0.1066*** (0.01)	-0.1477*** (0.01)	-0.1066*** (0.01)	-0.1062*** (0.01)	-0.1031*** (0.01)
University certificate or d..		0.0647*** (0.02)	0.0612*** (0.02)	0.1009*** (0.02)	0.035*** (0.02)	0.0442*** (0.02)	0.035*** (0.02)	0.0968*** (0.02)	0.0874*** (0.02)
Degree in medicine, dentist..		0.4992*** (0.04)	0.488*** (0.0242)	0.4126*** (0.0242)	0.6778*** (0.04)	0.6558*** (0.0242)	0.6778*** (0.04)	0.6551*** (0.0242)	0.572*** (0.0242)
Master's degree		0.1217*** (0.01)	0.0889*** (0.01)	0.1732*** (0.01)	0.1315*** (0.01)	0.1608*** (0.01)	0.1315*** (0.01)	0.1111*** (0.01)	0.0914*** (0.01)
Earned doctorate		0.2902*** (0.03)	0.2812*** (0.0132)	0.3522*** (0.0132)	0.4017*** (0.0132)	0.3821*** (0.0132)	0.4017*** (0.0132)	0.3675*** (0.0132)	0.3736*** (0.0132)
Not available		-0.2145*** (0.03)	-0.0703*** (0.03)	-0.2078*** (0.03)	-0.1198*** (0.03)	-0.1939*** (0.03)	-0.1198*** (0.03)	-0.1363*** (0.03)	-0.0706*** (0.03)

Highest level of education achieved (*HDGREE*)

This control is a categorical variable that indicates the highest level of education achieved by a given individual. The reference group is set as those who have earned a Bachelor's degree. The results fit our intuition that a higher level of education leads to a higher total income.

Table 9D Regression Results

Dependent variable = Natural logarithm of total annual income after-tax in 2016									
Variables	ONTARIO				QUEBEC				
	(reference group = 40-44 yrs, Bachelor's)				(reference group = 40-44 yrs, Bachelor's)				
	Males		Females		Males		Females		
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)	
Age Group	R ²	0.49	0.54	0.49	0.54	0.53	0.57	0.54	0.52
15 to 17 years		-1.6723*** (0.02)	-1.5028*** (0.02)	-1.6791*** (0.02)	-1.549*** (0.02)	-1.6448*** (0.02)	-0.2708*** (0.02)	-1.7392*** (0.02)	-1.62*** (0.02)
18 to 19 years		-1.0515*** (0.02)	-0.9128*** (0.02)	-1.0756*** (0.02)	-0.9176*** (0.02)	-1.1036*** (0.02)	-1.5021*** (0.02)	-1.209*** (0.02)	-1.0621*** (0.02)
20 to 24 years		-0.6533*** (0.01)	-0.5641*** (0.01)	-0.7215*** (0.01)	-0.6018*** (0.01)	-0.6102*** (0.01)	-0.9676*** (0.01)	-0.7194*** (0.01)	-0.6151*** (0.01)
25 to 29 years		-0.3623*** (0.01)	-0.3203*** (0.01)	-0.3451*** (0.01)	-0.2933*** (0.01)	-0.3305*** (0.01)	-0.5199*** (0.01)	-0.3352*** (0.01)	-0.2988*** (0.01)
30 to 34 years		-0.1684*** (0.01)	-0.1631*** (0.01)	-0.1273*** (0.01)	-0.1117*** (0.01)	-0.1613*** (0.01)	-0.299*** (0.01)	-0.1015*** (0.01)	-0.0828*** (0.01)
35 to 39 years		-0.0585*** (0.01)	-0.0585*** (0.01)	-0.0158*** (0.01)	-0.0131*** (0.01)	-0.0751*** (0.01)	-0.1494*** (0.01)	-0.0008*** (0.01)	0.005*** (0.01)
45 to 49 years		0.0213*** (0.01)	0.0212*** (0.01)	0.003*** (0.01)	0.0041*** (0.01)	0.0377*** (0.01)	-0.0695*** (0.01)	-0.0459*** (0.01)	-0.0501*** (0.01)
50 to 54 years		0.0443*** (0.02)	0.0486*** (0.02)	-0.0193*** (0.02)	-0.0242*** (0.02)	0.06*** (0.02)	0.039*** (0.02)	-0.0833*** (0.02)	-0.0909*** (0.02)
55 to 59 years		0.0275*** (0.03)	0.0314*** (0.03)	-0.0357*** (0.03)	-0.042*** (0.03)	0.0627*** (0.03)	0.0644*** (0.03)	-0.122*** (0.03)	-0.1237*** (0.03)
60 to 64 years		0.017*** (0.04)	0.041*** (0.04)	-0.0184*** (0.04)	-0.0221*** (0.04)	0.0518*** (0.04)	0.0711*** (0.04)	-0.1442*** (0.04)	-0.1323*** (0.04)
65 to 69 years		0.1355*** (0.03)	0.1742*** (0.03)	0.1581*** (0.03)	0.1607*** (0.03)	0.1647*** (0.03)	0.0748*** (0.03)	-0.0043*** (0.03)	0.023*** (0.03)
70 to 74 years		0.1887*** (0.01)	0.223*** (0.01)	0.2111*** (0.01)	0.2166*** (0.01)	0.2003*** (0.01)	0.2074*** (0.01)	0.0298*** (0.01)	0.0524*** (0.01)
75 to 79 years		0.2057*** (0.08)	0.2395*** (0.08)	0.1862*** (0.08)	0.2083*** (0.08)	0.1861*** (0.08)	0.2333*** (0.08)	-0.0558*** (0.08)	-0.0481*** (0.08)
85 years and over		0.628*** (0.14)	0.3203*** (0.14)	0.3407*** (0.14)	0.3772*** (0.14)	0.3192*** (0.14)	0.2246*** (0.14)	-0.0197*** (0.14)	-1.62*** (0.14)

Age Group (AGEGROUP)

The reference group is set as 40-44 year olds. All estimates are statistically significant and the direction on the coefficients is as expected. A higher age group is associated with higher income.