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Item 15 – Beyond population projections by age and sex: Inclusion of additional population characteristics

Microsimulation of language characteristics and language choice in multilingual regions with high immigration

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Working paper

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Introduction

Language is a ubiquitous element of our everyday life. It is not only essential to human communication, it is a vector of culture and identity. The first language learnt at home in childhood generally constitutes a major piece of the self, a mean to define one's identity and to construct one's own world views. To some, language even influences how people think and process information (Crystal 2000; Deutscher 2010).

Although most of the people around the world make use of their mother tongue in their daily activities, many, such as national minorities and immigrants, have to use a second or a third language to get by in their private and public life, notably to interact with colleagues at work, to get government services or to buy day-to-day goods and services. To them, knowledge of a society's dominant language is a fundamental prerequisite to economic and cultural integration. In time, simple integration usually turns into assimilation as immigrants or their children abandon their mother tongue to use the host society's dominant language at home. Such assimilation of immigrant languages usually occurs within less than three generations (Rumbaut, Massey, and Bean 2006; Bélanger, Lachapelle, and Sabourin 2011), but some exceptions do exist¹.

In countries having high immigration intakes, the rate at which newcomers learn and adopt the language of the host society may be an important political and economic issue. The failure of immigrants to learn the language of the host country may lead them to fall in some form of ghettoization or poverty trap. Over time, this may induce negative perceptions, misunderstandings, intolerance, xenophobia or outright racism.

Linguistic integration of immigrants may also have unsuspected political consequences. In regions of the world where many languages coexist, language choice can be a strong marker of integration into a specific community, and in turn this integration may influence political preferences. In Québec and in Catalonia, support for independence is highly correlated with self-identification to a specific cultural group and to the use of a language at home (both of which are also correlated)². Language dynamics contributes to shape the political landscape.

Language also plays a significant role in the economic sphere. Language proficiency has been shown to be important in order for immigrants to achieve successful integration in the labour market. Language proficiency and literacy in general is strongly related to higher employment rates and higher income (Chiswick and Miller 2002; Chiswick and Miller 1999). Conversely, lack of literacy has been shown to be an important factor in the overqualification of immigrants with

¹ Secluded religious minorities, or communities with a strong preference for endogamous unions are cases where language may be transmitted over a longer period.

² In Québec, French speakers are mostly divided on the issue of independence, whereas more than 90% of speakers of other languages would vote for the *status quo*. Situation is similar in Catalonia. Poll data for Québec: http://www.leger360.com/admin/upload/publi_pdf/FRCA20130209.pdf. Survey data for Catalonia:

http://www.cis.es/cis/opencm/EN/1_encuestas/estudios/ver.jsp?&cuestionario=16158&estudio=13564

otherwise strong human capital (Wald and Fang 2008; Green and Craig Riddell 2003; Ferrer, Green, and Riddell 2006; Bonikowska, Riddell, and Green 2008).

Hence, language dynamics is relevant to both political science and economics, two domains which are key ingredient to the design of efficient social policies. Knowledge of how the linguistic future may unfold can then be useful for policymakers. But despite their relevance, language characteristics are seldom included in national projection models. An exception to this rule can be found in Canada, where projections of language variables are common and where data on language uses and characteristics is abundant in census and surveys alike. This is mostly explained by the fact that Canada has put its official languages – English and French – at the core of its constitution, and that those languages are part of its political symbolism and mythology³.

The Canadian census includes seven questions related to language use and language proficiency: mother tongue, language spoken at home (most often or on a regular basis), language used at work (most often or on a regular basis) and knowledge of languages (official and non-official). Combining mother tongue, language spoken at home and knowledge of official languages allows the creation of useful derived variables, such as the first official language spoken (used by the Federal government to plan services to minority language communities) or the official language proficiency (OLP) variable, designed by one of the author of this paper in his study of overqualification. This latter variable turns out to be well correlated to economic success as well, especially for immigrants with a university degree, as can be seen in table 1 below.

Official language proficiency	Canada outside Qc		Québec	
	Natives	Immigrants	Natives	Immigrants
MT-NO ; LS-NO ; KOL-0	--	15,226 \$	--	15,136 \$
MT-NO ; LS-NO ; KOL-1	43,645 \$	36,116 \$	44,983 \$	23,705 \$
MT-NO ; LS-NO ; KOL-2	41,091 \$	44,069 \$	42,892 \$	34,210 \$
MT-NO ; LS-O ; KOL-1	64,658 \$	53,872 \$	47,833 \$	35,824 \$
MT-NO ; LS-O ; KOL-2	62,106 \$	66,490 \$	58,250 \$	49,842 \$
MT-O ; LS-O ; KOL-1	67,165 \$	68,724 \$	48,546 \$	45,917 \$
MT-O ; LS-O ; KOL-2	64,256 \$	71,777 \$	63,390 \$	55,969 \$

Table 1: Total income of individuals with a university degree according to immigrant status, region of residence and Official language proficiency (source: 2006 census). MT = mother tongue; LS = language spoken at home; KOL-X = knowledge of X official languages; NO = non official; O = official. Arrow indicates increasing level of proficiency.

³ See for instance: “The Next Act – A New Momentum for Canada’s Linguistic Duality”: <http://publications.gc.ca/site/eng/244759/publication.html>.

Canada is well settled in a low-fertility, rapid-ageing and high-immigration demographic regime. The annual influx of immigrants continuously modifies the country's demographic and linguistic landscape. In the past, the high fertility of the French Canadians somewhat compensated for the higher proportion of English speakers among the immigrants. Nowadays fertility is low among both English and French Canadians, and about two thirds of the Canadian population growth is due to an increasingly diverse immigration. Between 2001 and 2006, Canada's foreign-born population increased by 14% – four times faster than the growth rate of the Canadian-born population during the same period – and most immigrants have a mother tongue that is neither English nor French. Consequently the share of the Allophone population – those having a non-official language as a mother tongue – is growing rapidly: from 18% in 2001 to 20% in 2006.

Canada is in itself a natural experiment in language dynamics. The country is officially bilingual at the federal level (French and English), but mainly monolingual at the provincial level with only one province (New-Brunswick) being officially bilingual⁴. Demographically, French is the majority language solely in Québec. This configuration gives an English majority and French minority in Canada outside of Québec, and a French majority and English minority in Québec. Conditions faced by minorities as well as their relationship to majorities vary widely from province to province.

In this paper, we will present the results of a microsimulation model projecting simultaneously three language variables: mother tongue, language spoken most often at home and knowledge of official languages. In the past, only one of these language dimensions had been projected in a single model. Termote's multistate model (Termote, Thibault, and Payeur 2011; Termote and Thibault 2008) included language spoken at home whereas Statistics Canada's *Demosim* only projected mother tongue (Caron Malenfant, Lebel, and Martel 2010). Including all three variables in the model allows us to get a more complete picture and to project derived variables, whose relevance has been shown earlier in relation to income.

Methods

The results were obtained from *Hermès*, a case-based, open, dynamic, continuous-time projection model implemented using *Modgen*, a microsimulation programming language developed at Statistics Canada. The geographical template used in the model takes into account the location of immigrants as well as the concentration of official language minorities (i.e. English in Québec and French in the rest of Canada). Although the model includes 19 regions to account for regional dynamics, only the results for the province of Québec, the Montréal Island, and the rest of Canada will be discussed in this paper. The base population used in the model is taken from the 2006 census confidential microdata.

⁴ Although the province of Québec is officially monolingual French, overriding federal legislation and an institutional configuration favoring English makes it in reality the most bilingual province of the country.

Life course events were implemented in various demographic and linguistic modules, whose input parameters are briefly described below.

Demographic characteristics

Relative age-specific fertility rates according to the place of residence and language spoken at home (see below) were estimated from census data using the own-children method (Desplanques 1993; Cho, Retherford, and Choe 1986). The fertility rates were then calibrated using the 2011 vital statistics, so that the number of births in the model matched the number of births registered in 2011. Total fertility rates in 2011 were 1.61 for Canada (including Québec) and 1.69 in Québec.

Age-specific death rates (ASDR) were taken from provincial vital statistics. ASDR were not allowed to vary according to language characteristics as the data is generally unreliable or simply not available. It has previously been shown that life expectancy is shorter for French speakers (Auger et al. 2012) and longer for non-official language speakers, who may benefit from the “healthy immigrant effect” (Ali, McDermott, and Gravel 2004), but those differences would have little impact on the projection results.

Characteristics of arriving cohorts of immigrants in the model are taken from the characteristics of recent immigrants in the 2006 census (arrived between 2000 and 2006). Table 2 shows that immigration is mostly concentrated in three provinces (Ontario, British-Columbia, and Québec) and in large cities (70% of immigrants in Québec are settled on the Montréal Island⁵).

Region	% of total immigration
Maritimes	1.2%
Ontario	53.7%
Prairies	12.7%
British-Columbia	15.8%
Québec	16.7%
Montréal Island	69.9%
Rest of Québec	30.1%

Table 2: Geographical distribution of immigrants arrived between 2000 and 2006 in Canada (Source: 2006 census).

The model allows for the geographical and linguistic (mother tongue, see below) distribution of immigrants to be modified from the original distribution in order to create different scenarios related to the distribution and composition of immigration. In the model, the proportion of immigrants settling in Québec was set to 20% instead of 16.7% (see table 2) to reflect the fact that upon arrival, close to 20% of immigrants choose to establish themselves in Québec, and also to reflect recent trends showing an increasing proportion of immigrants settling in Québec.

Net international outmigration rates were estimated by Statistics Canada and sum up to a global annual rate of approximately 1 per thousand. In the model, relative risks are also inserted so

⁵ The Montréal Island includes the city of Montréal as well as other municipalities.

that recent immigrants make up for about 80% of international out-migrants, to reflect the fact that net international migration rates are small for natives.

Annual probability of internal migration (i.e. getting out of a region) was estimated using census data and a logit model controlling for age, sex, language spoken at home, region of residence, and immigrant status. Once a migration event occurs in the model, the destination region is determined through an origin-destination matrix, which varies according to language spoken at home.

Language characteristics

Mother tongue is defined as the first language learned at home in childhood. It can take one of three values: French, English, or Others. In Québec, the “Others” category is further split in three different sub-categories: Others-Eng, Others-Fr, and Others. Suffix “Eng” and “Fr” describe the tendency of immigrants to choose English (Eng) or French (Fr) according to their ethnic or linguistic origin when making a language shift. For instance, immigrants having a Latin mother tongue or coming from the Francophonie⁶ have a strong tendency to speak French at home, whereas immigrants from the Commonwealth tend to use English. Québec has an immigration policy favoring selection of immigrants from the “Fr” category. In the Canadian demolinguistic jargon, “Others-Fr” are called “francotropes” and “Others-Eng” are called “anglotropes”. We should note that these distinctions are quite useless outside of Québec, as all immigrants to these regions switch to English when making a language shift. Table 3 below shows the linguistic distribution of recent immigration in Québec and in the rest of Canada.

	Canada outside Qc	Québec
English	16.4%	4.8%
French	1.0%	19.8%
Others - Eng	82.6%	22.4%
Others - Fr	N/A	49.2%
Others	N/A	3.8%

Table 3: Linguistic distribution (mother tongue) of immigrants arrived between 2000 and 2006 (Source: 2006 census).

In the model, mother tongue is determined at birth through an origin-destination matrix linking the mother’s mother tongue to her child’s mother tongue, and no modification is allowed

⁶ “The International Organisation of La Francophonie was created in 1970. Its mission is to embody the active solidarity between its 77 member states and governments (57 members and 20 observers), which together represent over one-third of the United Nations’ member states and account for a population of over 890 million people, including 220 million French speakers.” Taken from: <http://www.francophonie.org/Welcome-to-the-International.html>.

afterwards⁷. The matrix is estimated using census data and changes according to the mother's language spoken at home, her region of residence, and her immigrant status.

Language spoken most often at home can take one of three values: French, English, or Others. In the model, it is set at birth to be equal to the mother tongue. Individuals in the model are then submitted to the risk of making a language shift, which may only occur between the age of 0 and 49. The probability of shifting was determined using a method developed in a previous version of the model (Sabourin and Bélanger 2011). Briefly, a "survival curve" showing the proportion of a language group still speaking their mother tongue at home with respect to time is estimated and implemented in the model. "Time" is defined to be age for natives (see Figure 1 for an example with individuals having a non-official mother tongue), or length of stay for immigrants. Since no longitudinal data is available on language behaviour, the «survival curve» is derived using data from a single census. Comparison of curves between various censuses shows that the language shift process is relatively stationary. Once a language shift occurs in the model, the new home language is determined through an origin-destination matrix linking mother tongue to language spoken at home. This origin-destination matrix varies according to an individual's immigrant status and region of residence.

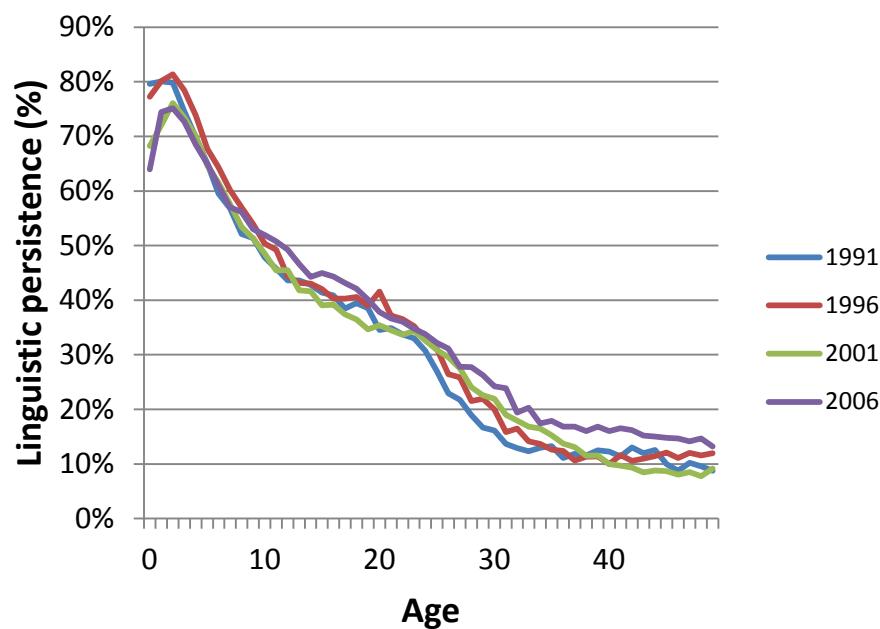


Figure 1: Proportion of natives having a non-official mother tongue and still speaking that language at home (Source: 1991 to 2006 Census).

⁷ For some individuals, mother tongue declarations have been shown to vary from census to census, but the phenomenon is relatively rare and can be ignored for the sake of the present projection (Lepage 2011).

Knowledge of official languages was determined using a technique similar to the one used above for language shift. Rates of acquisition of French and English were estimated as a function of region of residence, mother tongue, and immigrant status.

SCENARIOS

Scenarios are designed to illustrate possible policy orientations affecting language dynamics in Canada.

The base scenario is constructed on recent trends for all characteristics and demographic events, that is, for Canada as a whole: a total fertility rate of 1.61; a life expectancy of 78 years for men (84 at the end of the simulation) and 83 years for women (87 at the end of the simulation); the internal mobility rates observed from 2005 to 2006; an annual international immigration intake of 250,000 (with characteristics of immigrants arrived between 2000 and 2006); and language choices of immigrants arrived between 1986 to 2006.

Two scenarios focus on the global impact of immigration, one by increasing immigration volume by 20% (300,000 immigrants, total) and the other by decreasing it by 20% (200,000 immigrants, total). Those scenarios constitute plausible hypotheses as immigration in Canada has gone as high as 280,700 and as low as 221,300 since the year 2000.

Since sustained high or low immigration volumes are likely to be a policy response to low or high fertility regimes, two more scenarios are implemented where high immigration is matched with low fertility (recent trend minus 10%) and low immigration is matched with high fertility (recent trend plus 10%).

Since language choice of first and second generation non-French immigrants is an important issue in Québec, scenarios modifying language shift behaviour and language composition of immigration are also implemented. Two scenarios attribute language preferences of anglotropes ("Others-Eng") or francotropes ("Others-Fr") to all individuals having a non-official mother tongue. These scenarios are far-fetched in the short term because overnight changes in language choice patterns are sociologically unlikely. Nevertheless, they still provide a useful range of possible outcomes under different language shift regimes. Before language laws were first adopted in Québec in the 70s, language choices of immigrants were in fact close to the anglotropes scenario, regardless of their ethnic or linguistic origins.

Two more scenarios hold language preferences constant while modifying the linguistic composition of immigration. The language composition of immigration is modified so that the number of anglotropes or immigrants having English as a mother tongue are doubled or halved. These scenarios help to investigate the impact of the immigration selection policy. Recently, the Québec government modified the selection grid in order to favor French and francotrope immigrants. An intermediate level of French is now required to be selected as an economic immigrant.

Finally, a scenario is used to examine the impact of an increase in French immigration in Canada outside of Québec. This scenario investigates the possible long-term impact of a policy that is being implemented by Citizenship and Immigration Canada in order to linguistically revitalize French communities living in minority contexts⁸.

A summary of all scenarios is presented in table 4 below.

Scenario	Immigration volume	Linguistic composition of immigration	Language shift	Fertility
Base	250,000	Recent	Recent	Recent
Imm +	300,000	Recent	Recent	Recent
Imm -	200,000	Recent	Recent	Recent
Imm + Fer -	300,000	Recent	Recent	-10%
Imm - Fer +	200,000	Recent	Recent	+10%
Imm Eng Qc +	250,000	50% more Anglophones and Others-Eng in Qc Recent trend in the rest of Canada	Recent	Recent
Imm Eng Qc -	250,000	50% less Anglophones and Others-Eng in Qc Recent trend in the rest of Canada	Recent	Recent
Shift FR Qc +	250,000	Recent	All Others shift like Others-Fr in Qc Recent trends in the rest of Canada	Recent
Shift FR Qc -	250,000	Recent	All Others shift like Others-Eng in Qc Recent trends in the rest of Canada	Recent
Imm FR ROC +	250,000	Recent trend in Qc Number of French immigrants doubled in the rest of Canada	Recent	Recent

Table 4: Summary of all scenarios.

RESULTS

Results from the base scenario are presented in table 5 for all three language variables: mother tongue, language spoken at home and knowledge of official languages. The linguistic composition of the population in 2006 is compared to the projected population in 2056. The 50 years horizon of the projection is relatively long, but necessary to fully reveal the effects of intergenerational language shifts.

⁸ See <http://www.cic.gc.ca/english/resources/publications/settlement/framework-minorities.asp>

In Canada as a whole, variations are most important for mother tongue, as the proportion of Anglophones and Francophones drops by 3.3 points and 5.4 points, respectively. Conversely, the proportion of individuals having a mother tongue that is not an official language increases from 20.3% to 28.9%. In Québec, the English group is relatively stable (+0.6), while French drops by 11.7 points and the non-official language group increases by 11.2 points. On the Montréal Island where immigration is concentrated, Francophones are projected to represent less than 39% of the population by 2056, a decrease of 11.5 points compared to 2006.

Changes were less important for language used at home, as linguistic mobility constantly “redistribute” speakers from third language speakers to official language groups. In Canada as a whole, English increases by 1.1 point whereas French drops by 3.6 points. Proportion of third languages increases by 2.5 points. For most regions, English is relatively stable or slightly on the rise as a language spoken at home. French, on the other side, is declining in every region, including in Québec. Hence, proportion of the population speaking French at home drops from 54.2% to 48.8% in Montréal and from 90.8% to 86.3% in the rest of Québec.

Results related to knowledge of official languages show a global increase in the knowledge of English through an increase of both monolingual English (+1.4) and bilingual individuals (+3.3). The number of monolingual French individuals is globally decreasing, going from 13.0% to 9.0% between 2006 and 2056. Knowledge of French in general declines slightly, dropping from 30.4% to 29.7%, mostly due to the decrease of Québec’s demographic weight in the Federation. Proportion of bilingual individuals increases in Canada outside Québec, from 10.2% to 12%, and in Québec, from 40.7% to 52.5%. Finally, we observe a global decrease in the proportion of individuals who are not able to speak any of the two official languages, from 1.7% to 1.1%.

In order to better understand the demographical dynamics at play behind the numbers presented above, we plot the components of growth for French and English as languages spoken at home, for both Québec and the rest of Canada (Figure 2). Comparing the French majority in Québec to the English majority in the rest of Canada (Figure 2, panels B and C), we see that both groups benefit in similar ways from international migration and from internal migration. Natural increase, however, declines more rapidly for French in Québec than for English in the rest of Canada, yet fertility rates and mortality rates are similar for the two groups. This might be explained by the fact that fertility rates dropped earlier in Québec than in the rest of Canada after the Baby Boom, and also by the fact that English in Canada gets more benefits from language shift, as new “English-speaking mothers” are created through language shift and can then generate English-speaking children. French in Quebec doesn’t benefit as much from language shift as English does in the rest of Canada.

Looking at minority languages – English in Québec and French in the rest of Canada – we see two contrasting situation (Figure 2, panels A and D). Whereas both groups gain from international migration, English in Québec makes large gains from language shift, while French speakers in the rest of Canada are rapidly shifting to English, thus erasing any potential gains from immigration.

	Canada		Canada outside Québec		Québec		Montréal		Québec outside Montréal		
	2006	2056	2006	2056	2006	2056	2006	2056	2006	2056	
Mother tongue	English	58.0%	54.7%	73.3%	67.2%	8.2%	8.8%	17.6%	16.6%	5.1%	6.2%
	French	21.8%	16.4%	4.1%	2.4%	79.5%	67.8%	49.8%	38.3%	89.2%	77.5%
	Others - E	18.7%	25.2%	22.6%	30.4%	5.8%	8.6%	16.1%	19.1%	2.4%	5.1%
	Others - F	1.4%	3.3%	0.0%	0.0%	5.8%	13.4%	14.6%	22.9%	3.0%	10.2%
	Others	0.2%	0.4%	0.0%	0.0%	0.7%	1.5%	1.9%	3.1%	0.3%	0.9%
Language spoken at home	English	66.9%	68.0%	84.2%	83.2%	10.6%	12.0%	25.2%	26.1%	5.9%	7.3%
	French	21.2%	17.6%	2.5%	1.5%	81.8%	77.0%	54.2%	48.8%	90.8%	86.3%
	Others	11.9%	14.4%	13.2%	15.3%	7.6%	11.1%	20.6%	25.1%	3.3%	6.4%
Knowledge of official languages	English	67.9%	69.3%	87.3%	86.5%	4.6%	5.7%	11.6%	14.0%	2.3%	2.9%
	French	13.0%	9.0%	0.5%	0.3%	53.7%	41.1%	29.8%	25.6%	61.6%	46.2%
	Both	17.4%	20.7%	10.2%	12.0%	40.7%	52.5%	56.0%	58.6%	35.7%	50.4%
	None	1.7%	1.1%	1.9%	1.1%	1.0%	0.8%	2.6%	1.8%	0.4%	0.4%

Table 5: Results of projection for various language characteristics and regions, base scenario, Hermès. Numbers in red indicate a decrease with respect to 2006.

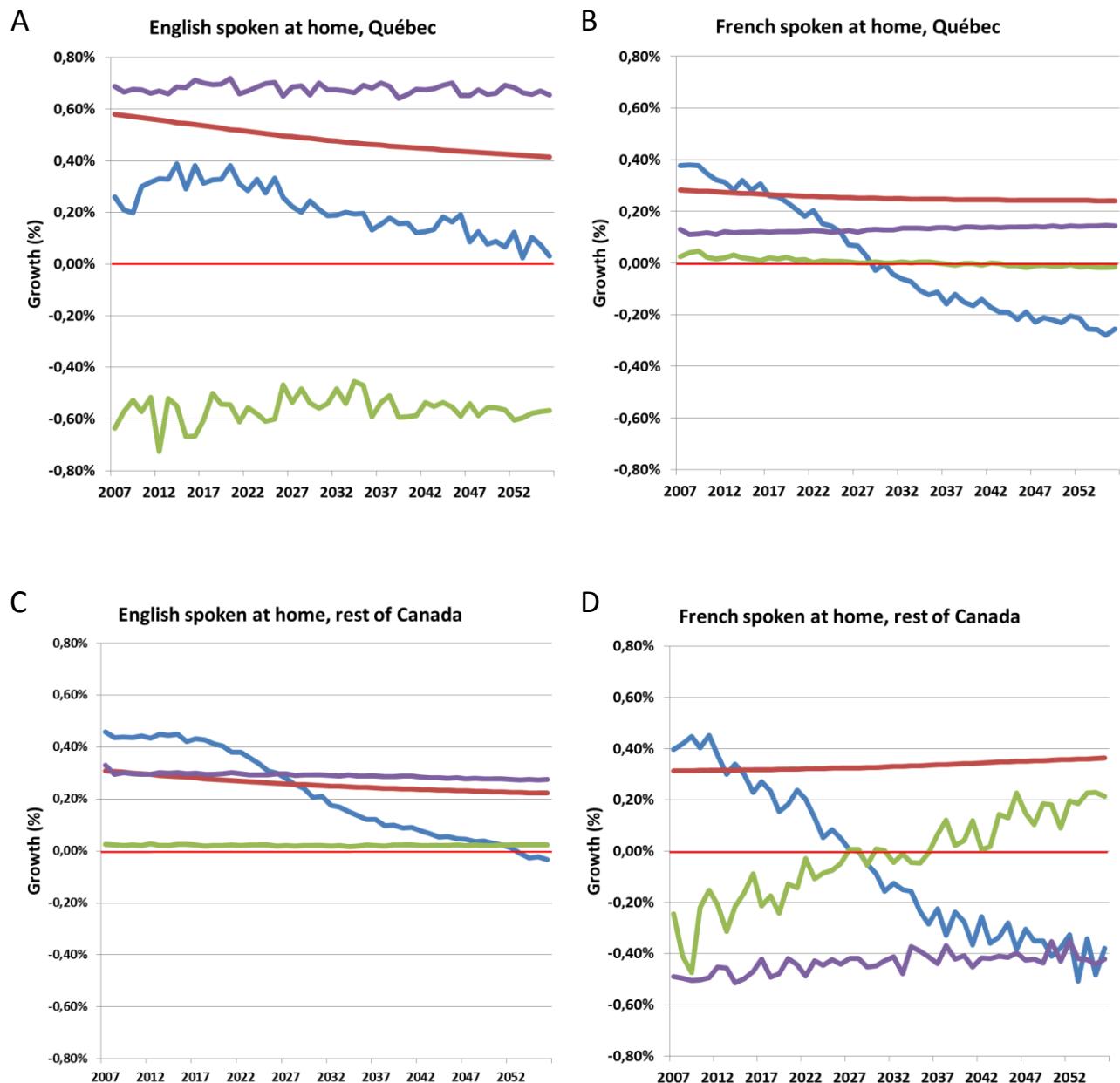


Figure 2: Components of growth for Québec and Canada, population groups by language spoken at home, base scenario, Hermès.

For Québec's English minority, internal migration is the only source of decline. This demographic trend is well-known and explains part of the community's constant decline in Québec throughout the past decades. Internal migration for French in the rest of Canada is negative at the beginning of the simulation, but turns positive around midway. This is to be expected as the decline of the French population outside Québec reduces the number of French speaking migrants to Québec, whereas the number of French Quebecers moving to the rest of Canada is increasing. Finally, as was observed for majority language communities, natural growth for French minorities in the rest of Canada declines steadily and becomes negative at the middle of the simulation. Despite having similar net reproduction rate, natural growth for English in Québec is declining very slowly and never becomes negative.

We can now turn to the effect of the different scenarios on language spoken at home. Figure 3 below shows the proportion of French speakers among official language speakers in Québec. All but one scenario show a decline of the relative weight of French among official languages in Québec.

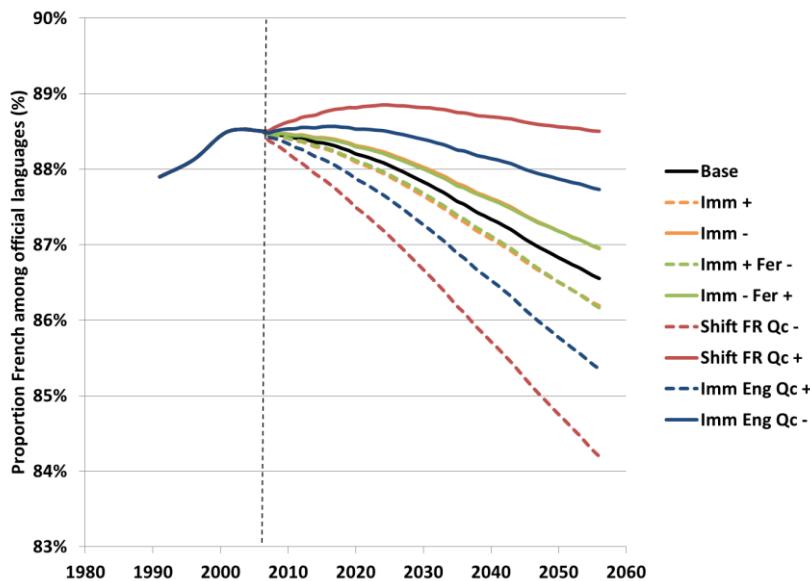


Figure 3: In Québec, proportion of French speakers among speakers of an official language, various scenarios, Hermès.

The two scenarios showing the most important effects are the ones affecting language shift behaviours of individuals with non-official mother tongue. This is to be expected as those scenarios are rather unlikely in the short term and are mainly implemented to establish the range of possible outcomes. The second most noteworthy scenarios are the ones where the linguistic composition of immigration is modified. Increase or decrease of immigration, with no change in language behaviour or language composition of immigration, have little impact on the projection outcomes. Finally, changing fertility levels doesn't significantly shift the balance between the two official languages.

Figure 4 below shows the proportion of English speakers among official language speakers in the rest of Canada. Contrary to what is observed in Québec, the share of majority language speakers is increasing steadily for all scenarios, although less (in %) than French is declining in most scenarios in Québec. This is due to the fact that, outside Québec, French and third language speakers are rapidly assimilating to English. Clearly, even increasing French speaking international migration cannot compensate for this loss. Even the scenario where French immigration is doubled has hardly any effect: it slightly reduces the progression of English with respect to French. Contrasting with what was observed in the Québec situation, English is an absorbing state in the rest of Canada as far as language shift is concerned, and changing immigration levels, fertility, or linguistic composition of newcomers has virtually no effect on the evolution of its increasingly dominant position.

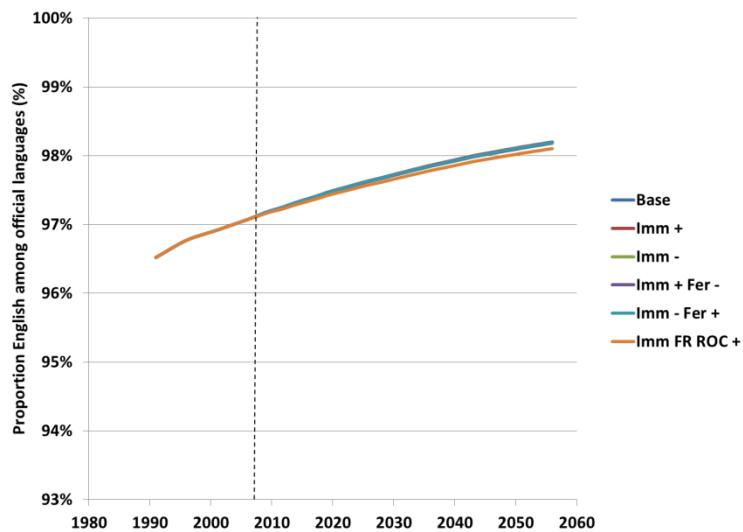


Figure 4: In Canada outside Québec, proportion of English speakers among speakers of an official language, various scenarios, Hermès.

Looking at non-official language speakers in Canada outside of Québec, we find that most scenarios predict that their proportion will plateau in the next decades. In some scenarios, it is also possible to observe a small decline in their proportion at the end of the simulation. This is due to the increasing importance of language shifts with respect to the flux of immigrants, and to the increasing proportion of second generations among non-official language speakers, which

tend to shift and adopt English even more often. This demonstrate that in a mostly monolingual region, despite the fact that an increase in immigration levels can significantly change the current linguistic composition of the population, in the longer term, the effect of high immigration is dampened by the language shifts operated by the second generation of immigrants (Rumbaut, Massey, and Bean 2006). It also constitutes a form of rebuttal of the alarmist point of view on language integration (Hungtinton 2004).

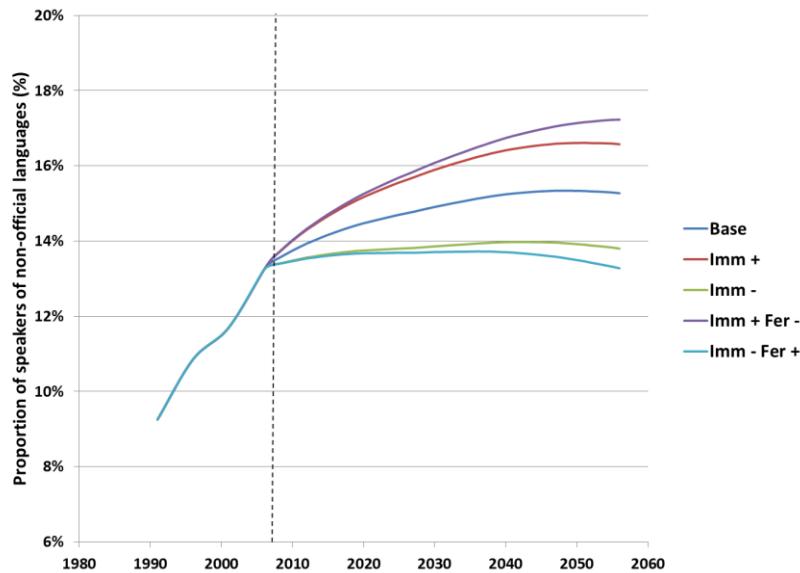


Figure 5: In Canada outside Québec, proportion of non-official language speakers, various scenarios, Hermès.

In Québec (Figure 6), the non-official language population increases throughout the whole simulation period for all scenarios, but reaches only about the level observed in the rest of Canada at the beginning of the projection period. This is because immigration rates in Québec are lower than in the rest of Canada and because the increase of immigration influx is more recent. A slight deceleration in this increase may be observed at the end of the simulation for the scenario with lower immigration intakes and higher fertility, but a longer projection period would lead to a deceleration for all scenarios, in a manner similar to what can be observed on Figure 4 for the rest of Canada.

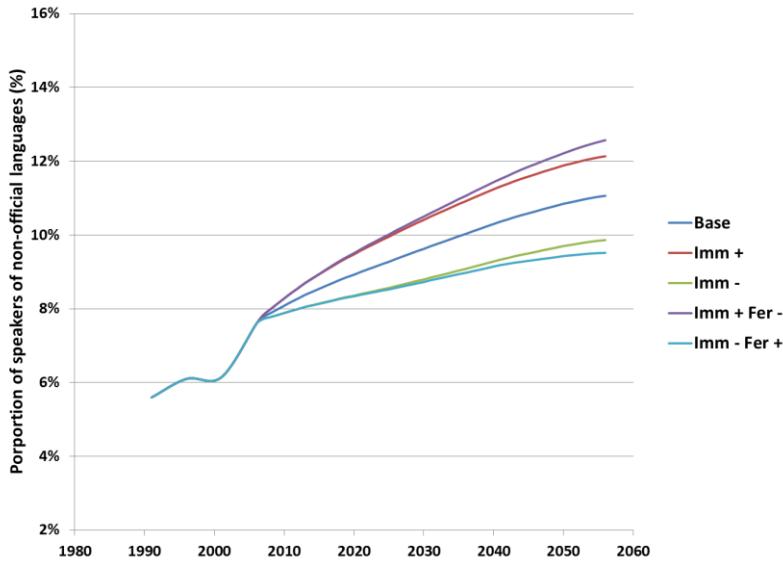


Figure 6: In Québec, proportion of non-official language speakers, various scenarios, Hermès.

As shown in the introduction, language proficiency and literacy is closely linked to economic success. In order to estimate the evolution of the workforce's linguistic composition, we projected an Official language proficiency indicator derived from all three language variables (see also table 1), for the population aged 15 to 65. Results are shown for Canada outside Québec in Figure 7 below.

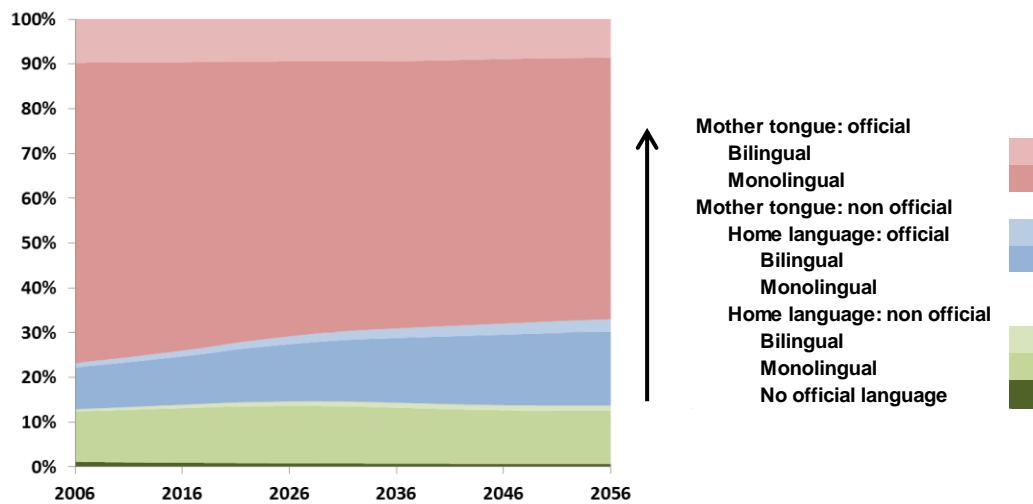


Figure 7: Distribution of population aged 15 to 65 according to Official language proficiency, base scenario, Canada outside Québec, Hermès. Arrow indicates increasing level of proficiency.

Figure 7 shows that there is an increasing proportion of individuals having a non-official mother tongue in the group speaking an official language at home (red and blue sections). The proportion of the population aged 15 to 65 having a non-official mother tongue and speaking a non-official language at home (green section) grows slightly in the first half of the projection and

then declines slowly to a level a little over the 2006 value. This is interesting as it means that the growth of the population speaking a non-official language at home, the group less favored economically (see table 1), is relatively stable. Nevertheless, the economically most favoured group, that is the group comprising individuals having a mother tongue which is an official language, is declining relatively fast. Finally, we can also see that in general, groups speaking both official languages grow slightly, but remain small; most people remain monolingual, as far as official languages are concerned.

The situation in Québec is shown in Figure 8 below. As observed in the rest of Canada, an increasing proportion of individuals speaking an official language at home will have a non-official mother tongue. On the other hand, the monolingual groups, which tend to earn less than their bilingual counterparts (see table 1), are generally decreasing. The monolingual population having an official language as a mother tongue – mostly composed of French speakers – is the group declining most rapidly.

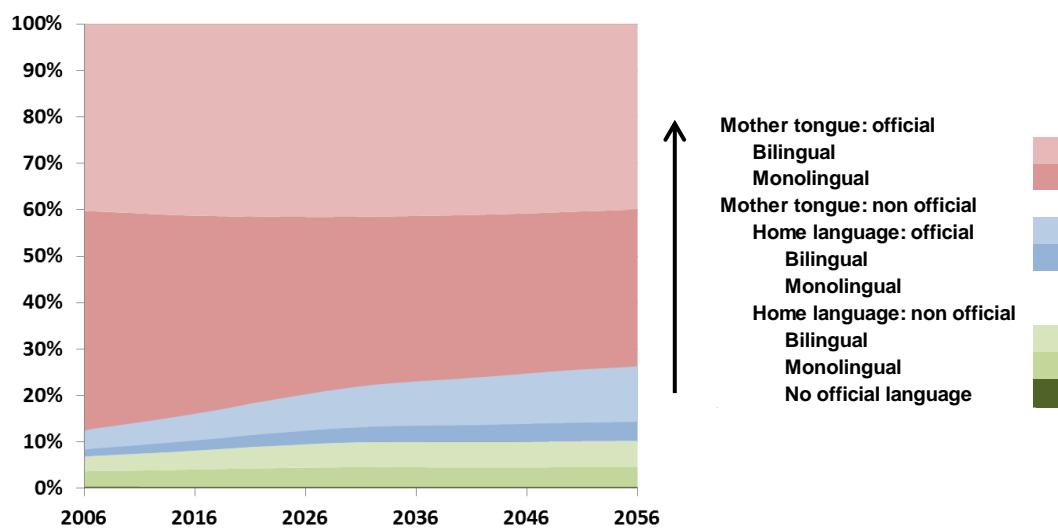


Figure 8: Distribution of population aged 15 to 65 according to Official language proficiency, base scenario, Québec, Hermès. Arrow indicates increasing level of proficiency.

We now look at the effect of different scenarios on the Official language proficiency indicator in 2056 in comparison with 2006. Since scenarios modifying language behaviour or language composition of immigration don't have a big impact on this derived variable, they will be excluded from this part of the analysis.

		2006	Base	Imm +	Imm -	Imm + Fer -	Imm - Fer +
Québec	MT-NO ; LS-NO ; KOL-0	0.4%	0.4%	0.4%	0.3%	0.4%	0.3%
	MT-NO ; LS-NO ; KOL-1	3.2%	4.2%	4.6%	3.7%	4.9%	3.5%
	MT-NO ; LS-NO ; KOL-2	3.2%	5.7%	6.3%	5.0%	6.5%	4.8%
	MT-NO ; LS-O ; KOL-1	1.6%	4.2%	4.6%	3.8%	4.7%	3.7%
	MT-NO ; LS-O ; KOL-2	4.0%	11.8%	12.8%	10.7%	13.2%	10.4%
	MT-O ; LS-O ; KOL-1	47.3%	33.8%	32.6%	35.2%	32.0%	35.7%
	MT-O ; LS-O ; KOL-2	40.3%	39.9%	38.8%	41.2%	38.3%	41.5%
Rest of Canada	MT-NO ; LS-NO ; KOL-0	1.2%	0.7%	0.8%	0.6%	0.8%	0.6%
	MT-NO ; LS-NO ; KOL-1	11.2%	11.8%	13.0%	10.5%	13.6%	10.1%
	MT-NO ; LS-NO ; KOL-2	0.5%	1.2%	1.3%	1.0%	1.3%	1.0%
	MT-NO ; LS-O ; KOL-1	9.3%	16.6%	17.6%	15.4%	18.1%	15.0%
	MT-NO ; LS-O ; KOL-2	1.0%	2.7%	2.9%	2.5%	3.0%	2.5%
	MT-O ; LS-O ; KOL-1	67.2%	58.4%	56.2%	61.0%	55.1%	61.9%
	MT-O ; LS-O ; KOL-2	9.7%	8.6%	8.3%	8.9%	8.1%	9.0%

Table 6: Distribution of population aged 15 to 65 according to Official language proficiency, various scenarios, Hermès. MT = mother tongue; LS = language spoken at home; KOL-X = knowledge of X official languages; NO = non official; O = official. Arrows indicate increasing level of proficiency.

Results are qualitatively similar to the ones obtained from the base scenario. All scenarios show a significant increase in the proportion of official language speakers having a non-official mother tongue. The increase is smallest for the Imm-Fer+ (from 10.3% to 17.5%) and largest for the Imm+Fer- scenario (from 10.3% to 21.1%), with Imm+ and Imm- falling in between. High immigration scenarios also further increase the proportion of the population speaking a non-official language at home and having a non-official mother tongue, which is the economically less favoured group.

DISCUSSION AND CONCLUSION

Results of the projections show that immigration has a much larger impact on the linguistic equilibrium of a multilingual region like Québec than in a largely monolingual region like the rest of Canada. Competition between French and English in Québec adds further complexity to the language dynamics.

Globally and locally, French is declining in Canada, for all projected variables. In Canada outside Québec, French will over time represent a negligible portion of the population. This may lead to difficult political situations as the demographic justification to maintain a nationwide policy of institutional bilingualism will get ever thinner. Even in Ontario, where the second largest population of French speakers is located, the dispersion and decrease of the minority population prompted the government to close the only French hospital in the province. The hospital was finally kept open after the Ontario Court of Appeal ruled in favour of the French communities at the end of a judiciary fight that lasted four years.

Increasing French immigration in Canada outside Québec doesn't appear to be a suitable policy to maintain French vitality, at least country-wide. Perhaps some specific regions where the

French minority is more important can benefit from it. Further analysis might shed light on this important issue.

In Québec, most scenarios show a decline in French relative to English as well as in absolute terms. The population is also getting more and more bilingual, as knowledge of English increases fast, especially in regions outside of Montréal. The English minority sees its proportion of the population increase, regardless of the language variable used to define them. Their right for services in their language doesn't appear to be in jeopardy in Québec, even outside of Montréal where they are less concentrated.

Projection results for a derived variable, the “official language proficiency”, shows that the proportion of individuals relatively less favoured economically – in part because of increased difficulties to fully integrate the labor market due to lower language skills – will be growing in the next decades, although important nuances need to be made regarding these findings. First, the weight of the least favored groups, speakers of a non-official language having a non-official mother tongue, is stabilized in the projection period and doesn't increase much overall (a little more in Québec than in the rest of Canada). Second, the proportion of bilingual speakers, which tend to have higher incomes, is increasing fast in Québec and a little bit in the rest of Canada. In any case, this increase in the proportion of people having a non-official mother tongue calls for increasing investment in language training in order to maximize their contribution to the country's future prosperity.

The model has been thoroughly tested but still needs some fine-tuning: small discrepancies with respect to recent trends need to be investigated. The proportion of bilingual individuals in Canada outside Québec is increasing slowly in the model, but the 2011 census data showed an actual decline in bilingualism. This may be due to an overoptimistic hypothesis as to the rate of French learning by native non-French speakers. It is also possible that the data from the 2006 and 2011 censuses are not comparable, as questionnaires and sample sizes were different (Corbeil and Houle 2013)⁹. The model also shows a decline in the proportion of individuals unable to sustain a conversation in French or English. Although this might appear like good news, it seems unlikely that this will hold true in a high-immigration regime.

More scenarios must be run in order to produce projections comparable to the *Demosim* results. Annual immigration in *Hermès* is fixed to a certain number whereas it is a proportion of the population in *Demosim*.

Additional scenarios could also modify rates of language learning and language shifts (current scenarios only affect language choice parameters). It might be possible that the increasing concentration of non-official language speakers decreases the rate of language shifts, as individuals could remain relatively functional without having to speak an official language.

⁹ Three questions related to language were transferred from the long-form questionnaire to the short-form questionnaire, after the long-form census was abolished in 2010.

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