

The immigration option to population aging in Canada

Marcel Mérette

As is the case for many major industrialized countries, population aging is an inevitable and central feature of Canada in this first half of the twenty-first century. Population aging is explained by a combination of demographic factors such as rising life expectancy, declining fertility rates and migration. The demographic shift in Canada will be significant. According to United Nations (UN) demographic projections (UN Population Division, 2005), the proportion of the Canadian population aged 65 and over is projected to more than double over a 50-year period, from 12.5% in 2000 to 26% in 2050.

Population aging of the magnitude projected for Canada is likely to have sizeable implications for intergenerational equity (public debt and pensions), government budgets (health care and public pension spending), trade and international capital flows, and the regional and sectoral reallocation of resources. In this paper, I focus on the implication of population aging for the workforce, namely, the rising average age of the Canadian workforce and the relative scarcity of workers.

♦ I would like to thank Herbert Grubel for valuable advice, Yuan Liu for helpful assistance, and the participants at the Canadian Immigration Policy Conference for relevant suggestions. All errors are mine.

One of the major challenges associated with workforce aging is the reduction in the growth of the labor force. A slowdown in the workforce growth rate may increase the elderly dependency ratios (population 65+ / population 15–64), which in turn results in a reduction in living standards. One method available for preventing such a rise in this ratio is increasing the number of immigrant workers. It is important to note that these immigrant workers will have to be highly skilled and educated if developments in the world economy force Canada to shift into more knowledge-intensive production activities.¹

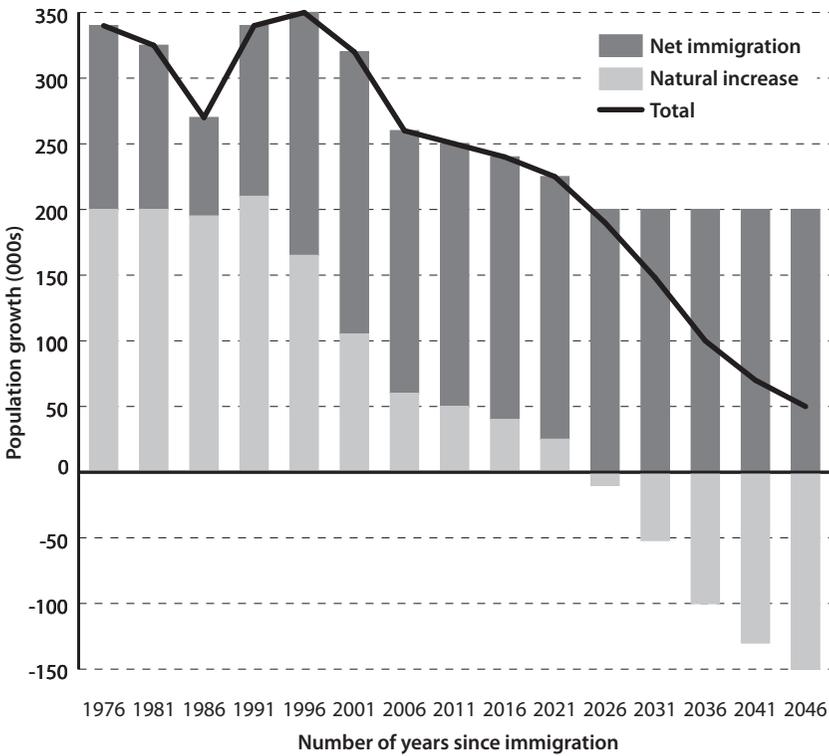
This chapter analyzes issues raised by the prospective increase in elderly dependence and need for more workers and the opportunity to deal with the resultant problems through immigration policies. The analysis starts in the next section with an elaboration of the demographic facts about aging populations in Canada and potential labor shortages. The following section presents the results of simulations I have made to quantify the impact of increasing the flow of immigrants on the workforce and on the performance of the economy. Then I use general equilibrium arguments to discuss the potential economic consequences of using alternatives to increasing immigration for the solution of Canada's problems of aging and pending worker shortages.

Demographic and labor-force facts in Canada

Natural population growth has been declining in Canada since 1991. Figure 8.1 shows that the natural population increase was around 200,000 in 1976, was under 100,000 in 2006 and is predicted to turn negative in 2026. After 2026, immigration is projected to be the only contributing

1 ♦ Storesletten (2000) demonstrates that selective immigration policies that involve increasing the inflow of highly skilled and medium-skilled immigrant workers would remove the need for fiscal reform in the United States. Fehr, Jokisch, and Kotlikoff (2004) also examine the effects of increasing the number of skilled immigrants in the United States, Europe, and Japan with a CGE model. They find that doubling the number of highly skilled immigrants would mitigate significantly future tax increases expected with population aging in the US, Europe, and Japan.

Figure 8.1: Population growth in Canada (1976–2045)



Source: Léonard and Rainville, 2006.

factor to Canada’s population growth. The figures shown are based on the assumption that 200,000 new immigrants arrive in Canada annually.

The projected demographic changes in Canada hide the fact that the changes will affect regions of the country differently. For example, the Atlantic region and, in particular, the province of Newfoundland currently has one of the lowest fertility rates in the world, while the rates in the provinces of Manitoba and Saskatchewan are much higher. In addition, regional differences will be accentuated by the fact that the vast majority of immigrants choose the provinces of Ontario and British Columbia as their regional location, although these two provinces represent just a little more than 50% of the Canadian population.

The regional impact of the differing fertility and immigration rates is summarized in table 8.1, which shows the changes in projected regional elderly dependency ratios between 2000 and 2045. As can be seen, the

Table 8.1: Projected regional elderly dependency ratio (population 65+ / population 15–64)

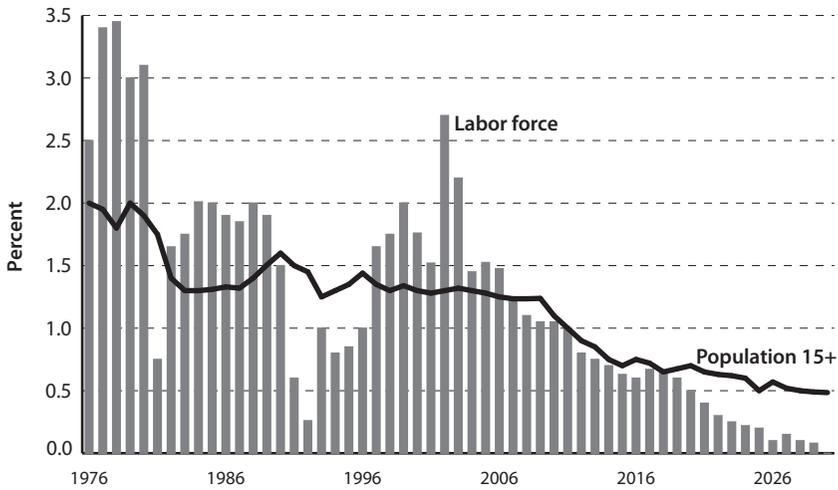
	2000	2030	2045
Canada	18.4	36.5	40.4
Atlantic	18.9	48.9	61.2
Quebec	18.6	40.6	44.8
Ontario	18.4	32.9	37.0
Prairies	21.8	35.6	35.5
Alberta	15.6	32.3	37.0
British Columbia	19.4	40.2	44.6

Source: Léonard and Rainville, 2006.

Atlantic region and Quebec will exhibit the largest increases in their elderly dependency ratios, while the Prairies and Ontario will have the smallest increases. The increases in Alberta and British Columbia fall in between the two extremes.

Turning to labor force growth, figure 8.2 shows that the growth rate of the population 15 years and older in Canada has been declining since 2000 and will continue to decline over the next decades, assuming a continuation of net immigration of 200,000 annually. Consequently, total labor-force growth rate is expected to reach zero by 2030. The size of new cohorts of workers in the next few years will thus be much smaller than what we usually observe in the Canadian labor market. The workers will also be older on average.

The effects of a rise in the proportion of older workers due to population aging depend on retirement decisions. If the average age of retirement remains unchanged, retirement rates will rise as older cohorts reach retirement age. This in turn will reduce aggregate labor supply, result in excess demand, and increase the cost of labor. In addition, there may also be shortages of workers with special skills. However, if the present trend towards early retirement continues, the impact of population aging on the labor market and the economy will be aggravated. If, on the other hand, older workers decide to retire later the effects of aging on labor markets would be significantly reduced. I will return to this last argument in the section on alternatives to immigration.

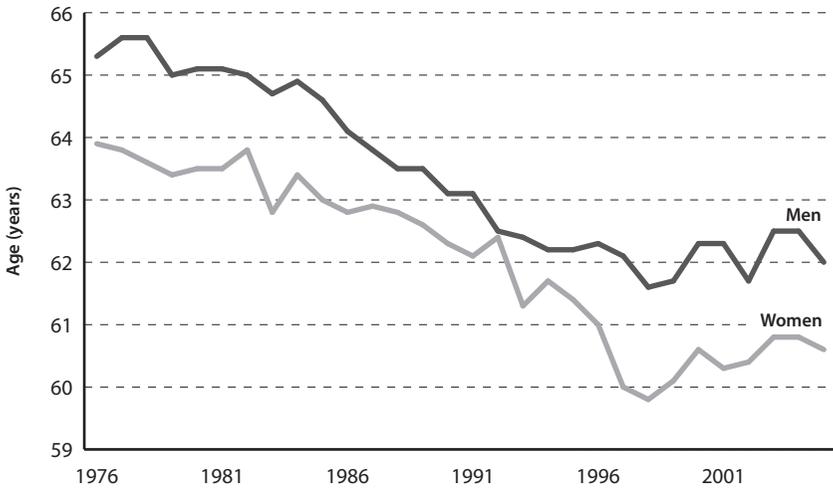
Figure 8.2: Growth in the Canadian labor force (1976–2030)

Source: Léonard and Rainville, 2006.

The effects that recent trends in retirement and labor-force participation of older workers have on the labor market have been examined by Statistics Canada (2007), the results of which are summarized in figure 8.3. As can be seen, the average age of retirement has declined steadily in Canada over the period from 1976 to 1998 for both men and women, from around 65 for men and 64 for women during the second half of the 1970s to 61.5 years for men and 60 for women in the late 1990s.² However, since 1998, this trend in retirement seems to have halted. In fact, from the bottom level observed in 1998, the average retirement age has tended to increase somewhat, ranging between 62 and 62.5 in 2003 to 2005 for men and around 61 for women.

To assess likely future trends, it is useful to consider the determinants of the average age of retirement. It turns out that the age of retirement is sensitive to institutions and to current economic conditions. For instance, the decline in the effective retirement age during the late 1970s and 1980s is correlated with reforms to the Canadian Income Security programs. The Spousal Allowance (SA) program was introduced in 1975 and designed to bridge certain individuals who are not yet eligible to

2 ♦ We shall see later in this chapter that a one-year change in the average age of retirement has a significant impact on the economy.

Figure 8.3: Average age of retirement, by sex (1976–2005)

Source: Statistics Canada, 2007.

receive the Old Age Security (OAS) and Guaranteed Income Supplement. The SA is paid to 60-to-64-year-old spouses of OAS recipients, widows, and widowers. According to Baker (2002), the introduction of the SA has reduced the labor-force participation of older men in eligible couples by 6 to 7 percentage points. Another institutional factor that likely played a role in lowering the average age of retirement is the introduction of the early retirement provision in the QPP in 1984 and in the CPP in 1987.³ However, the influence of these factors is not settled. Baker and Benjamin (1999) have found that, while these reforms led to an increase in pension benefits, they had little immediate effect on labor market behavior because men who initially took advantage of early retirement provisions had limited labor-market attachment in any case.

3 ♦ The Canada and Quebec Pension Plans (CPP/QPP) provide earnings-based pensions funded through payroll taxes paid by both employers and employees. The normal uptake age for the CPP/QPP is 65. Since 1984 in Quebec and 1987 in the rest of Canada, individuals may apply for early benefits starting at age 60, subject to an actuarial reduction of 0.5% for the number of months until the individual's 65th birthday (6% per year). Conversely, individuals who delay receiving CPP/QPP benefits after age 65 are entitled to a 0.5% per month actuarial increase.

The drop in the effective retirement age during the first half of the 1980s is in part explained by the 1981–1982 recession. Rising unemployment during that period provided incentives for older unemployed workers to exit the labor market. Canada was hit by another major recession in 1990 to 1991, followed by a slow recovery. During the first half of the 1990s, the Canadian unemployment rate averaged more than 10%, compared to 7.5% in 1989, which helped lower the overall participation rate and possibly led to involuntary retirement. Finally, according to Kieran (2001) and Fortin and Fortin (2004) the significant drop in the retirement age that occurred during the middle and second half of the 1990s is due to restructuring and downsizing in the public sector, which encouraged many public servants to take early retirement packages and leave the labor market.

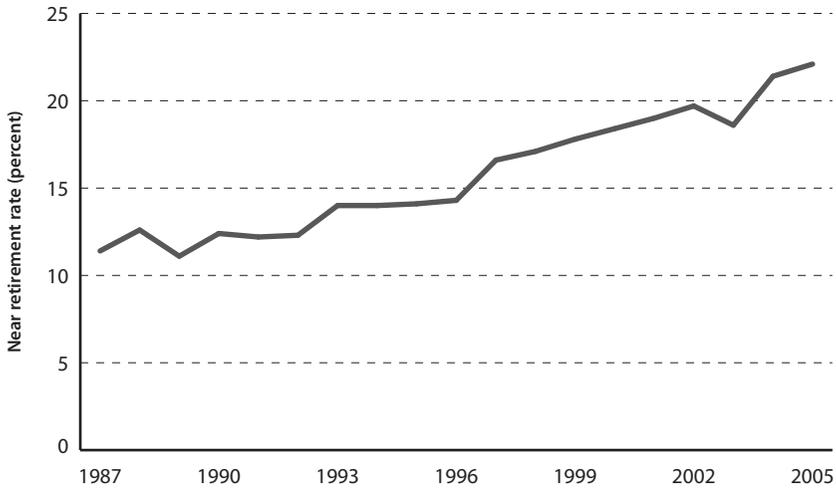
The near-retirement rate

The coming pressure of population aging on the labor force can be approximated by the near-retirement-rate (NRR) indicator, which measures the percentage of workers who are within 10 years of the median retirement age. The NRR is influenced by two factors, the median age of retirement and the age distribution of the workforce. An increase in the median retirement age reduces the NRR, while a rise in the proportion of workers within 10 years of the median retirement age raises the NRR.

As shown in figure 8.4, the NRR has increased continuously over the past 18 years. From 11.4% in 1987, the NRR reached 22.1% in 2005. Between 1987 and 1998, the rise in the NRR is due to both a reduction in the median retirement age and an increase in the proportion of older workers. After 1998, the median retirement age has stabilized or risen somewhat, thus contributing to a reduction in the NRR. However, despite this, workforce aging has remained a dominating factor, leading to a continued increase in the NRR. Over the next decades, it is evident that the rising proportion of older workers will continue to exert upward pressures on the NRR. What is less certain, however, is how retirement behaviors will evolve in the future. A gradual increase in the median retirement age, for example, might reduce labor-market pressures by softening the rise in the NRR.

Finally, a look at the retirement pattern by province suggests that regional differences in demographics and retirement behavior also generate important labor-market pressure differences at the provincial level.

Figure 8.4: The near retirement rate (1987–2005)



Note: The near retirement rate is defined as the percentage of the workforce within 10 years of the median retirement age.

Source: Statistics Canada, 2007.

According to table 8.2, between 1987 and 2002 the Atlantic provinces (Newfoundland & Labrador, Prince Edward Island, Nova Scotia, New Brunswick), Quebec, and British Columbia have led the reduction in the retirement trend in Canada while, in Saskatchewan and Alberta, the median retirement age has risen. Ontario and Manitoba are in between.

Labor-force participation by older workers

It is important to stress that historic data discussed above concerning the NRR and the median and average age of retirement may change in the future as workers retire later. This trend is beginning to show up in figure 8.5. As can be seen, in the earlier years between 1976 and 1998, the participation rate of men from 55 to 59 fell from 84.2% in 1976 to 70.6% in 1998, while the participation rate of men from 60 to 64 fell even more, from 66.5% to 44.6%. Since 1998, however, the participation rate of men from 55 to 59 and 60 to 64 has increased, reaching 76.2% and 54%, respectively, in 2005. Notice as well that the participation rate of women aged 55 to 59 has increased continuously during the past 30 years, while the participation rate of women aged 60 to 64 has remained virtually flat

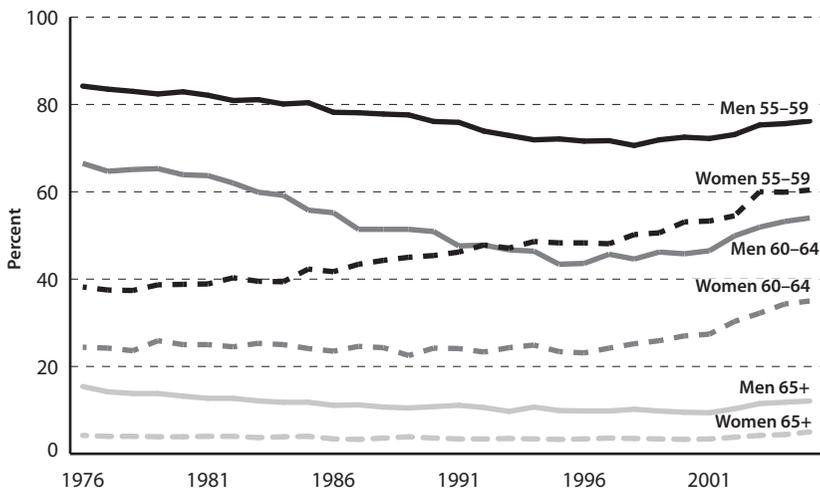
Table 8.2: Median retirement age and percent of workforce near retirement, by province

	Near-retirement rate (percent)*			Median retirement age (years)	
	1987	2002	Diff.	1987	2002
Canada	11.4	19.8	8.4	64.3	60.6
Newfoundland & Labrador	9.6	21.6	12.0	63.3	59.6
Prince Edward Island	10.0	24.9	14.9	65.7	59.4
Nova Scotia	10.2	21.6	11.4	63.7	59.8
New Brunswick	9.2	20.9	11.7	64.6	59.6
Quebec	10.4	21.6	11.2	64.0	59.8
Ontario	10.8	19.6	8.8	64.7	60.8
Manitoba	11.5	20.3	8.8	64.6	61.2
Saskatchewan	15.3	13.8	-1.5	64.1	65.1
Alberta	11.4	15.0	3.6	63.1	63.4
British Columbia	11.3	23.6	12.3	64.3	60.3

Note: The near retirement rate is defined as the percent of the workforce within 10 years of the median retirement age.

Source: Statistics Canada, 2007.

Figure 8.5: Labor force participation rate of older workers, by sex (1976–2005)



Source: Statistics Canada, 2007.

between 1976 and 1998 and increased since. Therefore, the participation-rate numbers not only suggest that early retirement trends halted in 1998 but also that the participation rate of older workers has increased since. As I explain later, this may be great news for the economy of Canada.

Temporary retirement and later return to the workforce

The preceding conclusion needs to be modified by the fact that a significant proportion of retirees eventually return to the labor market. Thirty percent of older workers who ended a full-time job voluntarily between 1993 and 1997 began a new job within 24 months (Pyper and Giles, 2002). A large longitudinal sample from 1995 to 2002, found that 18% of retirees eventually, and for some time, returned to the labor market (Léonard and Rainville, 2006).

These results suggest that older individuals remain a potential source of labor even after they have retired from their job for a time. This phenomenon might become stronger if employers adjust their human resources strategy and allow a greater share of older individuals in their workforce. This change in strategy will be encouraged because retirees tend to be healthier and better educated than they were in the past and have more experience than new employees. Market forces should override implicit barriers to the adoption of these strategies, such as agism (Lagacé and Tougas, 2006).

An economic analysis of population aging

The economic implication of population aging is not limited to the labor force. Savings and investment, trade and international capital flows, and fiscal policy are likely to be significantly affected as well. Moreover, both the macroeconomic and fiscal effects will influence wages, the returns to physical and human capital, consumer and producer prices, the terms of trade and real-world interest rates.

The complexity and dynamics of demographic, fiscal, and economic influences associated with population aging can be studied though the use of large-scale economic models using appropriate theoretical models. Especially, dynamic life-cycle (overlapping-generations) computable

general equilibrium (CGE) models can be used for this task because they allow modeling the behavior of agents over their lifetimes.⁴ In this section, I report and discuss the results from various simulation experiments for Canada using this modelling framework.

Impact of population aging on the productive capacity of the Canadian economy

In theory, population aging affects productive capacity through several key channels. The first channel is the change in effective units of labor, which combines the impact of population aging on the labor force participation and the quality of the workforce. The second channel works through aging of the “baby boom” generation as it retires. This retirement reduces the relative size of the active population, the total labor-force participation, and thus lowers real per-capita GDP relative to a situation with no population aging. Third, during the period preceding retirement of the “baby boom” generation, labor productivity may rise due to an increase in the proportion of experienced workers. Fourth, more recent cohorts of workers are better educated and thus raise the proportion of skilled workers. According to the standard overlapping generations CGE model (with no change in labor supply behavior) developed by Fougère et al. (2005a, 2004), total effective labor supply, which combines both quantity and quality of labor, is expected to fall sharply over the next several decades (table 8.3). This decline takes place in spite of a projected increase in the quality of labor.

Real GDP in the future will be reduced by lower national savings and investment caused by aging. This result is based on the life-cycle theory of savings, which implies that households during their working life, save and accumulate wealth, which they spend and use up during retirement. Accordingly, the rise in the proportion of older people reduces aggregate net private savings and hence the country’s stock of physical capital eventually declines.⁵

4 ♦ See, for example, Ferh et al., 2005; Börsch-Supan et al., 2001; Équipe INGENUE, 2001; Hviding and Mérette, 1998.

5 ♦ This is an argument from a closed economy model. But as population aging is a common feature of all industrialized countries, the closed economy framework is a

Table 8.3: Simulated economic impact of population aging in Canada (percent deviations from initial steady state of no population aging)

	2006	2014	2018	2026	2034	2038	2042	2050
Real GDP per capita	0.5	0.8	0.7	-0.3	-2.5	-4.0	-5.9	-10.5
Effective labor supply	1.9	2.3	0.6	-5.9	-15.8	-21.3	-26.8	-41.1
Physical capital	4.0	9.3	10.3	8.4	1.8	-3.2	-9.2	-24.3
Capital-labor ratio	2.1	6.9	9.6	15.3	20.9	23.0	24.1	20.1
Real wage rate	0.8	2.7	3.7	5.8	8.2	9.3	10.2	10.2
Rate of interest	-0.1	-0.3	-0.7	-1.0	-1.5	-1.7	-1.8	-1.8

Source: Fougère et al., 2005a.

It is important to observe here that population aging also has positive economic implications. The negative labor-supply shock leads to increased labor-market pressures and to an increase in real wages, which induces employers to use more labor-saving capital and technology. The decrease in the size of the labor force will facilitate this process as it leads to an increase in the supply of capital per worker and a reduction in the price of physical capital. I will return to the rise in the real wage rate in discussing alternatives to immigration as policy measures in the context of aging.

Table 8.4 shows the results of our estimates using the theories outlined above in a dynamic computable general equilibrium model. The first line shows the decline in per-capita incomes for all of Canada, while the following lines show those of the country's different regions. As can be seen, the Atlantic provinces and Quebec will experience the largest reductions in per-capita incomes, followed by Manitoba, Saskatchewan, and British Columbia. Ontario and Alberta are estimated to enjoy higher per-capita incomes, at least during the first few decades.

The results for the different regions are explained by differences in the variables discussed above. The populations of the Atlantic region and Quebec are aging most rapidly and have the strongest trend toward

good approximation for Canada with respect to aging issues. Mérette and Georges (2009) demonstrate that, in a multicountry framework, however, globalization through international trade may generate a significant increase in Canada's terms of trade, which would sustain real consumption per capita.

Table 8.4: Simulated impact of population aging on regional real GDP per capita (percent deviations from initial steady state of no population aging)

	2006	2014	2018	2026	2034	2038	2042	2050
Canada	0.5	0.8	0.7	-0.3	-2.5	-4.0	-5.9	-10.5
Atlantic provinces	0.1	-0.5	-1.4	-4.8	-11.2	-15.4	-19.9	-28.5
Quebec	-0.3	-1.9	-3.1	-6.9	-12.3	-15.2	-18.0	-22.8
Ontario	0.6	1.2	1.0	-0.1	-1.5	-2.1	-2.8	-5.5
Prairies	-0.3	-1.1	-1.7	-2.3	-2.4	-2.7	-3.7	-8.0
Alberta	1.3	2.5	2.7	2.8	0.8	-1.4	-4.5	-12.0
British Columbia	-0.4	-0.8	0.1	0.1	-0.5	-2.2	-5.0	-13.6

Source: Fougère et al., 2005a.

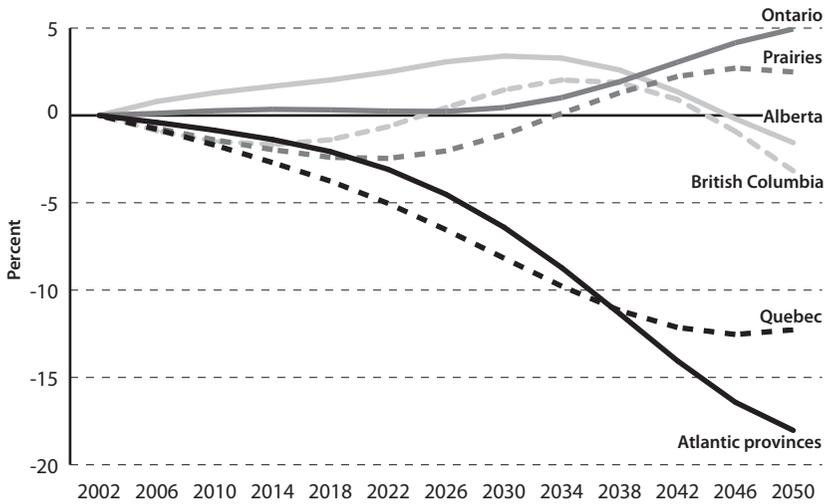
earlier retirement. The provinces of Alberta and Ontario are expected to enjoy an increase in effective units of labor due to both an increase in the number and quality (experience) of their workforce, until 2018 for Ontario and 2026 for Alberta.

Other factors explaining the different experiences of provinces are as follows. Ontario receives the greatest share of immigrants, a significant proportion of which is highly skilled and contributes to the projected rise in per-capita income. Alberta's population has a higher fertility rate than other provinces and its workforce retires later than that of the rest of Canada. However, as the "baby boom" generation eventually retires, in the long run real per-capita GDP falls more significantly than in Ontario. The Prairies experience a more moderate decline in real per-capita GDP than the rest of Canada because, like Alberta, in these provinces fertility rates and effective retirement ages are relatively higher.

Large immigration flows also affect Ontario and British Columbia by making their populations age less rapidly and keeping real per-capita GDP virtually unaffected by population aging until 2034. Over the long run, the magnitude of the impact is similar to that experienced by Alberta due to its higher fertility rate.

Figure 8.6 shows the long run impact of population aging in Canada on regional income disparity. As can be seen, disparity will increase substantially over the next decades. The gap in real GDP per capita increases substantially for the Atlantic region and Quebec especially, while it fluctuates within a tighter margin in the rest of Canada.

Figure 8.6: Gap in provincial and regional real GDP per capita relative to Canadian GDP (percent difference 2002–2050)



Note: All real GDPs per capita are normalized to 1 in 2002 and the regional GDP gap is measured as the percent change in regional GDP relative to the national level.

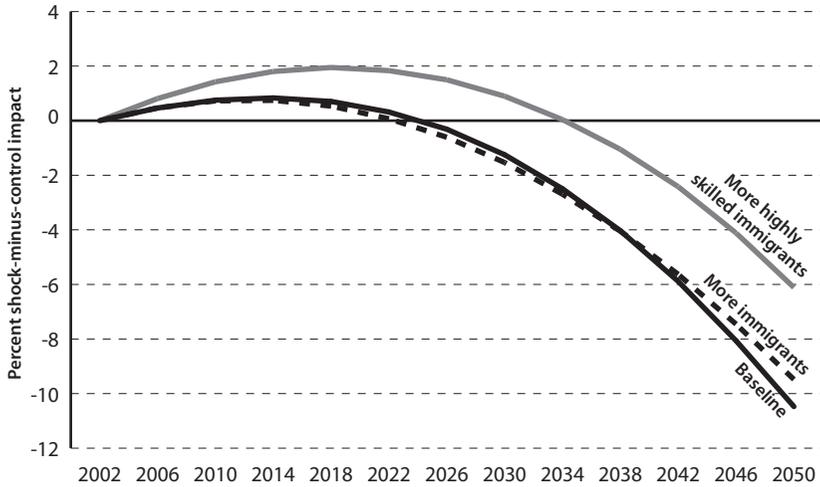
Source: Fougère et al., 2004.

Can we moderate the impact of aging by selecting more immigrants?⁶

Since 2000, recent immigrants equal about 0.75% of the population per year and, since the early 1990s, the immigrants were more highly educated than before. To explore the economic effects of selecting more immigrants, I analyze the effect of increasing immigration from 0.75% to 1% of the population, beginning in 2002, under two alternative assumptions about their skill-levels. In the first simulation, the skill-composition of the additional flow of new immigrants is proportionally the same as the first 0.75%, which in the period from 1997 to 2000 consisted of highly skilled (24%), medium-skilled (13%), low-skilled (28%), and individuals without labor force attachment (35%) (as in Fougère et al., 2005b). In the second simulation, the additional flow of new immigrants is composed of highly skilled immigrants only. The impact on real GDP per capita is presented in figure 8.7.

6 ♦ The analysis here is mostly taken from Fougère et al., 2004, 2005b, 2007.

Figure 8.7: Impact of population aging on real GDP per capita according to alternative immigration policies (% shock-minus-control impact, 2002–2050)



Source: Fougère et al., 2005b.

The solid line in figure 8.7 shows the annual percentage decline in real per-capita income under the assumption that the present rate of immigration is maintained in the future. The broken line shows the effects of increasing the immigration rate from 0.75% to 1.0% while maintaining the recent mix of skills. As can be seen, this line differs only very little from the solid line, suggesting that increasing the immigration rate has negligible effects on per-capita income and only in later years will show a small positive effect. The effect of a rise in labor supply on productive capacity is more than offset by a reduction in the capital-to-labor ratio and a fall in labor productivity. On the other hand, the third line in the graph shows that attracting more highly skilled immigrants generates substantial benefits relative to the other two scenarios. This favorable development is due to the fact that the highly skilled immigrants have strong labor-market attachment and raise the quality and productivity of the labor force.

However, raising the number of immigrants with high skill levels has a drawback shown in table 8.5. The increased supply of highly skilled immigrants lowers the difference in earnings between those with low and high skills. As a result of such a development, fewer Canadians would invest in human capital and acquire the high skills that bring high

Table 8.5: Impact of selecting more high-skilled immigrants on skill premium relative to the baseline scenario

Skill premium for ...	1998	2010	2022	2030	2042	2050
<i>high over medium skill</i>	-0.8	-2.8	-4.6	-5.6	-7.1	-8.0
<i>high over low skill</i>	-0.8	-3.1	-5.1	-6.3	-8.0	-9.1
<i>medium over low skill</i>	-0.1	-0.3	-0.5	-0.7	-0.9	-1.0

Source: Fougère et al., 2005b.

incomes and other satisfaction. This effect is not included in the simulations that produced the figures in figure 8.7.

It is worth noting that Fougère et al. (2004) show that the distribution of recent immigrants according to the provincial share of the population in the total population would generate significant economic benefits to regions like the Atlantic provinces, the Prairies, and Quebec in the long run relative to the base scenario. Moreover, it would also significantly contribute to a reduction in regional differences in real wage levels and growth.

Bruno et al. (2007) extend this model by taking into consideration the reduction in the premium that high skills earn over lower skills brought about by the larger inflow of skilled immigrants. This reduction would induce fewer Canadians to invest in higher education, which would lower productive capacity in the long run. This effect could be eliminated if firms developed at the same time a greater preference for the hiring of highly skilled workers. Under this scenario, the immigration policy would increase labor quality, boost labor productivity, and raise the productive capacity of the Canadian economy.

Without any change in firms' demand for highly skilled workers, larger flows of young, highly skilled immigrants have a positive effect on labor productivity through a rise in labor quality in the short run. However, in the longer run they lower real GDP per capita because they reduce incentives for young Canadians to invest in human capital. Politically, the larger inflow of highly skilled immigrants reduces earnings inequality; however it does so by making highly skilled workers worse off rather than by raising income for lower skilled workers.⁷

7 ♦ Please note that the above studies do not take into consideration the cost of integration of new immigrants either.

Alternatives to immigration

What would happen if older workers retire later?

This section simulates the implications of assuming that the effects of Canada's aging population on the labor market are offset by policies that induce workers to stay in the work force longer. Such a change in the behavior of workers can be achieved by eliminating early retirement incentives in Canada's public pension system, eliminating retirement ages mandated by provincial governments, income tax incentives, and others.⁸

Before considering effective policies to increase the retirement age, however, it is useful to estimate the marginal effect on Canada's productive capacity resulting from an increase in the average age of retirement from its present 61.2 to 62.2 and then to 65, the latter increase taking effect gradually over the period ending in 2014. The first policy of increasing the average retirement age by one year has the same marginal effect as an increase in the rate of immigration from 0.75% to 1% of the population, in which the additional flow of new immigrants is composed of highly skilled immigrants only (Fougère et al., 2005a). Increasing the average age of retirement to 65, however, would basically triple the economic benefits and would be equivalent to a 9% rise in the labor supply in 2030 relative to the baseline.

Under these simulations, real per-capita GDP would rise 8.4% in 2030 and nearly 10% by 2050 (table 8.6). The substantial increase in labor supply would also lead to a 1.2% reduction in real wages before tax by 2050 but a 3.3% increase after tax. Finally, a universal average retirement age of 65 would allow the governments to reduce the CPP contribution rate by 25% and the QPP rate by 38%. The QPP contribution-rate reduction would be larger since the policy would raise the effective retirement age from the relatively low level of 59.7 to 65. Simulation analysis indicates that the economic and financial costs of early retirement in terms of unused productive capacity and reduced taxation base are significant. Correspondingly, the benefits of working longer are potentially large.

8 ♦ Côté (2005) presents a number of policy recommendations to encourage older workers to work longer.

Table 8.6: Simulated impact of an increase in the effective retirement age (percent difference relative to baseline)

	2006	2010	2022	2030	2042	2050
Real GDP per capita						
<i>Working one extra year</i>	1.6	1.9	2.4	2.7	3.0	3.2
<i>Working until age 65</i>	2.7	5.0	7.5	8.4	9.3	9.9
Labour supply						
<i>Working one extra year</i>	2.0	2.1	2.4	2.4	2.3	2.1
<i>Working until age 65</i>	4.5	7.7	8.9	9.0	8.4	7.5
Real wages before tax						
<i>Working one extra year</i>	-0.3	-0.3	-0.1	-0.1	0.0	0.3
<i>Working until age 65</i>	-1.5	-2.1	-1.1	-1.1	-1.1	-0.4
Real wages after tax						
<i>Working one extra year</i>	-0.2	0.2	0.6	0.6	1.0	1.2
<i>Working until age 65</i>	-1.3	-1.3	1.0	1.4	2.2	3.3
Federal effective labor income-tax rate						
<i>Working one extra year</i>	0.0	0.0	-1.6	-1.6	-1.6	-2.3
<i>Working until age 65</i>	0.0	-0.8	-5.6	-6.4	-8.8	-10.3
Canada Pension Plan contribution rate						
<i>Working one extra year</i>	-8.3	-7.9	-7.8	-7.9	-7.8	-7.7
<i>Working until age 65</i>	-15.0	-24.6	-25.5	-25.8	-25.1	-25.1
Quebec Pension Plan contribution rate						
<i>Working one extra year</i>	-7.8	-7.2	-7.0	-6.2	-6.2	-6.0
<i>Working until age 65</i>	-24.1	-39.5	-39.3	-38.8	-38.4	-38.4

Source: Fougère et al., 2005a.

Behavioral changes of young and new cohorts

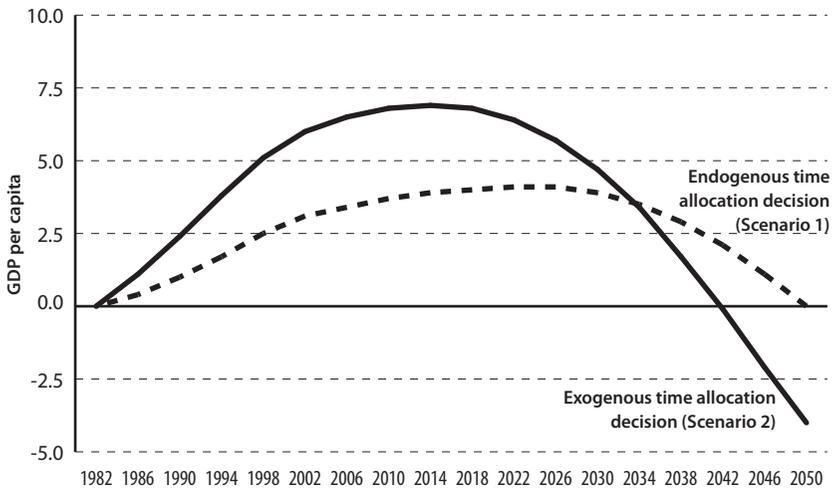
Population aging will have positive effects on wages and returns to education. This may encourage young adults to invest in human capital and older workers to offer a larger participation to the labor market. Fougère et al. (2009) entered these theoretical considerations into a simulation model to estimate their effect on productive capacity. This model is

similar to the one discussed by Mérette (2002). Its key features are that representative individuals maximize lifetime consumption of all goods and leisure, subject to their lifetime income and time constraint, while earnings depend on an individual's level of human capital. All of these determinants of productive capacity are endogenous to the model rather than assumed.

The results of simulations from this model are reported in figure 8.8 for GDP per capita from 1982 to 2050. The solid line in figure 8.8 shows what happened to income per capita during the 1970s and 1980s, when the “baby boom” generation entered the labor market, assuming that the age of retirement and education levels were not affected by these demographic changes. As can be seen, real GDP per capita increased sharply during the 1980s, 1990s, and 2000s. Later, as the “baby boom” generation gradually retires, the model forecasts that productive capacity stabilizes and begins to fall by 2014.

The dotted line in figure 8.8 shows the trend of income per capita under the assumption that the education and retirement decisions are made by individuals able to forecast correctly the changes in wages and returns to education stemming from the forecast demographic changes.

Figure 8.8: Impact of population aging on real GDP per capita according to endogenous and exogenous time allocation decision scenarios (1982–2050)



Source: Fougère et al., 2009.

As the graph shows, initially the time used in obtaining more education reduces labor supply of young adults and results in lower per-capita income relative to the base line. However, in the longer run and after 2035, this higher education more than offsets the effects of aging on per-capita income and raises it above that shown for the baseline.

Summary and conclusion

Over the next several decades, Canada will experience an accelerating process of population aging. This chapter has investigated what effects this aging will have on Canadian labor markets and per-capita real incomes and dealt with the widely held view that immigration can offer relief for the expected negative consequences of population aging.

Simple forecasts of aging based on demographic trends can overestimate its effects on labor markets and per-capita incomes because it neglects the fact that higher labor force participation rates and higher retirement ages can to a considerable degree offset the negative economic effects of aging alone. In addition, higher levels of education for new entrants to the labor market and the adoption of more labor-saving technology and investment can similarly reduce the economic impact of aging. It is encouraging that in Canada labor-force participation rates and the mean retirement age have already begun to increase.

The ability to reduce the economic impact of aging through increases in the rate of immigration was examined with the help of sophisticated, dynamic models that use computer simulations to track feedbacks and incentives driven by exogenous demographic changes. The results of these simulations show that increases in immigration rates have a marginal impact on economic developments, even if the additional immigrants all have very high levels of education.

We need to consider alternative policies for dealing with the problems raised by the aging of Canada's population. One of these involves getting new immigrants to settle throughout Canada, rather than having the present pattern that sees most of the new immigrants settle in Toronto, Vancouver, and Montreal. The second alternative, superior to higher rates of immigration, involves policies that increase the average age of retirement and raise the average level of education of Canadian workers.

References

Baker, M. (2002). The Retirement Behavior of Married Couples: Evidence from the Spouse's Allowance. *Journal of Human Resources* 37: 1–34.

Baker, M., and D. Benjamin (1999). Early Retirement Provisions and the Labor Force Behavior of Older Men: Evidence from Canada. *Journal of Labor Economics* 17: 724–56.

Börsch-Supan, A., L. Alexander, and J. Winter (2001). *Aging and International Capital Flows*. NBER Working Paper No. 8553. National Bureau of Economic Research.

Côté, S. (2005). Population Aging and Labour Market Reforms in OECD Countries. Policy Research Initiative Working Paper (July).

Équipe INGENUE (2001). *Macroeconomic Consequences of Pension Reforms in Europe: An Investigation with the INGENUE World Model*. CEPII Working Paper No. 01-17. <<http://ideas.repec.org/p/cpm/cepmap/0116.html>>.

Fehr, J., and L. Kotlikoff (2004). *The Role of Immigration in Dealing with Developed World's Demographic Transition*, NBER Working Paper No. W10512. National Bureau of Economic Research.

Fortin, M., and P. Fortin (2004). The Changing Participation Rate of Canadians: New Evidence from a Panel of Demographic Groups. Presentation at the CEA's 38th Annual Meetings, Toronto.

Fougère, M., S. Harvey, J. Mercenier, and M. Mérette (2005a). Population Ageing and the Effective Rate of Retirement in Canada. Working Paper 2005, A-03. HRSDC-IC-SSHRC Skills Research Initiative.

Fougère, M., S. Harvey, J. Mercenier, and M. Mérette (2005b). Population Ageing, High-Skilled Immigrants and Productivity. Working Paper 2005 A-07. HRSDC-IC-SSHRC Skills Research Initiative.

Fougère, M., S. Harvey, J. Mercenier, and M. Mérette (2009). Population Ageing, Time Allocation and Human Capital: A General Equilibrium Analysis for Canada. *Economic Modelling* 26, 1 (January): 30–39.

Fougère, M., S. Harvey, M. Mérette, and F. Poitras (2004). Ageing Population and Immigration in Canada: An Analysis with a Regional CGE Overlapping Generations Model. *Canadian Journal of Regional Science* 27, 2 (Summer): 209–36.

Fougère, M., J. Mercenier, and M. Mérette (2007). Population Ageing in Canada: A Sectoral and Occupational Analysis with a CGE Overlapping Generations Model. *Economic Modelling* 24 (July): 690–711.

Hviding, K., and M. Mérette (1998). Macroeconomic Effects of Pension Reforms in the Context of Ageing Populations: Overlapping Generations Model Simulations for Seven OECD Countries. OECD Working Paper No. 201 (June). OECD.

Kieran, P. (2001). Early Retirement Trends. *Perspective on Labour and Income*. Cat. No. 75-001 (Winter). Statistics Canada.

Lagacé, M., and F. Tougas (2006). Les répercussions de la privation relative personnelle sur l'estime de soi. Une étude du rôle du désengagement psychologique auprès de travailleurs de la santé de plus de 45 ans. *Les Cahiers Internationaux de Psychologie Sociale* 69: 59–69.

Léonard, A., and B. Rainville (2006). Retraite anticipée et retour sur le marché du travail. Mimeo. Human Resources and Social Development Canada.

Mérette, M. (2002). The Bright Side: A Positive View on the Economics of Aging. *Choices IRPP* 8, 1.

Mérette, M., and P. Georges (2009). Demographic Changes and the Gains from Globalisation: A Multi-Country Overlapping Generations CGE Model. Department of Economics Working Papers No. 0903, University of Ottawa.

Pyper, W., and P. Giles (2002). À l'approche de la retraite. *Perspective on Labour and Income* 14, 4 (Winter). Cat. No. 75-001. Statistics Canada.

Statistics Canada (2007). *Labour Force Survey*. Cat. 71-001-XIE.

Storesletten, K. (2000). Sustaining Fiscal Policy through Immigration. *Journal of Political Economy* 108, 2: 300–23.

United Nations Population Division (2005). *World Population Prospects: The 2004 Revision*. <<http://esa.un.org.unpp>>.

