The Economic Benefits of Working Longer and the Financing of Social Security in Canada

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Key words: Aging, retirement, social security, overlapping generations model

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Abstract

Although the population is living longer, the trend in Canada and most OECD countries is towards older workers to retire at an earlier age, which raises public policy challenges in the context of population aging. This paper evaluates the economic cost of earlier retirement, the benefits of working longer in Canada and the consequences for the financing of social security. The analysis is conducted using a computable overlapping generations model calibrated on the Canadian economy. The paper's key finding indicates that a gradual increase in the average effective retirement age from 61 in the early 2000s to 65 by 2014 could raise real per-capita GDP by more than 8% by 2030. This in turn would give room to reduce effective tax rates and could allow a 25% reduction in the contribution rate to Canada's Pension Plan. Therefore, policies to encourage older workers to remain longer in the labour market, if successful, could generate large economic and fiscal benefits over the long run.

1. Introduction

As documented in many studies, despite the substantial increase in longevity, the trend towards early withdrawal of older workers from the labour force has become more widespread in OECD countries.[1] A large body of research has identified alternative explanations for early retirement trend in OECD countries associated with both labour supply and demand factors.[2] On the labour supply side, incentive effects such as wealth, accrual rates, earnings test, taxes and defined-benefits versus defined-contributions employer pension systems would play a significant role in the retirement decision of older workers. On the labour demand side, the rising gap between the actual wage rate due to seniority and the marginal product of older workers is a factor that may provide incentives for firms to opt for early retirement instead of dismissals. Another possible factor is the increasing difficulty for older workers to find another job when they are unemployed, because of their shorter remaining labour market tenure.

The trend towards early retirement raises important public policy challenges as it reduces labour supply and output. Moreover, in the context of population aging, the negative labour supply shock due to early retirement will intensify given that there will be more people in the 55-64 age group. According to the conventional view, population aging may trigger important socio-economic, labour market and fiscal consequences in the future, as well as rising challenges for the financing of social security and health care.[3] Early retirement trend may in turn exacerbate the situation. In light of these challenges, many countries plan to adopt new policies to remove the disincentives to work for older workers.[4] According to the proponent of these policy reforms, the economic costs of early retirement in terms of output loss, reduced social security benefit payments and lower tax base are substantial.[5] However, too few studies have attempted to quantify the economic benefits of working longer. In addition, most of the analysis done so far has either used an accounting approach or partial analysis framework and has therefore not considered the general equilibrium implications of early retirement.

[1] See for example, OECD (2002).
[2] For a summary of alternative theories, see for example, Herbertsson (2001).
[3] See for example, Group of Ten (1998) and OECD (2000) for a discussion on the potential economic consequences of aging.
[4] For a summary of recent reforms across OECD countries, see for example, Casey et al. (2003).
[5] See for example, the arguments raised by Pestieau (2003).

To help address this question, this paper uses a computable general equilibrium model (CGE) with overlapping generations (OLG) to evaluate the economic impact of an increase in the effective retirement age by estimating the forgone benefits or reduction in "unused productive capacity" as proposed by Gruber and Wise (1999). We also examine the fiscal consequences and the impact on the financing of Canada and Quebec Pension Plans. These calculations also account for the fact that the Canadian population is aging and that accordingly, the cost of early retirement is expected to increase during the demographic transition as the proportion of older workers will rise.

It must be noted, however, that in this exercise, only the benefits of later retirement are considered. There may also be costs associated with working longer. For example, it can be argued that because of labour market rigidities, such as labour contracts with seniority clauses, some older workers could be paid above the value of their marginal product and therefore would be more costly for employers.[6] There are also costs associated with the retraining of older workers and in adaptability of workplace practices to accommodate older workers. These costs are not considered in this analysis. Therefore, the numbers presented here must be considered as an upper bound.

The paper is divided as follows. Section 2 presents some stylised facts on Canada's retirement trends and demographic pressures. Section 3 discusses some issues and evidence on the economic cost of early retirement. Section 4 presents the methodological issues by providing a non-technical description of the regional CGE overlapping generations model used for the calculations and the main calibration parameters. Section 5 presents the main simulation results. Section 6 raises a few caveats. Finally, Section 7 draws some conclusions.

2. Some Stylised Facts on Canada's Retirement Trend and Demographic Pressures

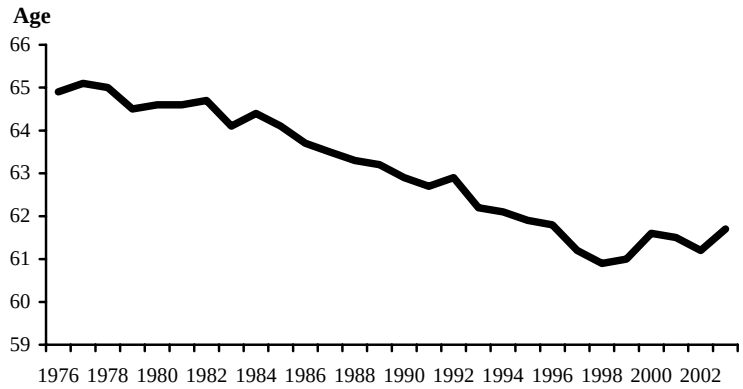
2.1 Retirement Trends

[6] See, for example, Haegeland and Klette (1999) using Norwegian data and Crépon *et al.* (2001) using French data who find that older workers are paid more relative to their productivity than younger workers. However, Aubert (2003) finds that these results may be biased because older workers are more likely to be found in less productive establishments.

In Canada, although the entitlement age for receiving old age security (OAS) pension benefits is 65, the average effective age of retirement is well below 65. To illustrate this point, Chart 1 presents the average age of retirement in Canada for the period 1976 to 2003. As indicated in the chart, during the 1970s and early 1980s, the average age of retirement was near 65. It declined more or less steadily during the mid-1980s and 1990s, to achieve 60.9 in 1998, although it has increased slightly in recent years.[7]

The drop in 1986 and 1987 is likely explained by the lowering of the minimum age at which one could receive Canada/Quebec Pension Plan (CPP/QPP) retirement benefits. In addition, the significant drop which occurred during the second half of the 1990s is likely explained by the effect of cutbacks in the public sector and by the restructuring and downsizing in the private sector. Many establishments have provided early retirement incentive packages in their workforce adjustment strategy. Another indication that Canadians retire at a younger age is that according to the Labour Force Survey, 43% of people reported having retired before age 60 over the period of 1997-2000, compared to 29% over the period of 1987-1990.

Chart 1
Average Retirement Age in Canada, 1976-2003



Source: Labour Force Survey

When we look at the provincial distribution of retirement age in Table 2, the numbers indicate that back in the 1970s, the median age of retirement was 65 across all provinces. However, since the 1990s, the median retirement age has come down very significantly in most provinces except for Alberta and Saskatchewan, whose retirement age has remained almost

[7] For more information on the methodology used to measure the age of retirement, see Gower (1997).

unchanged. The numbers for Saskatchewan are consistent with the fact that the median retirement age has remained very high across workers in the agriculture sector, the largest industrial sector in this province. By 2001, Quebec, Newfoundland and Nova Scotia had the lowest median age of retirement to about 60, followed by New Brunswick and PEI with near 61. Ontario and Manitoba have followed a similar trend and level, coming down to about 61. Finally, the median retirement age has come down only recently in British Columbia to 62.

Table 2
Median Age of Retirement by Province

	1976-1980	**1991-1995**	**2001**
Canada	**64.9**	**62.3**	61.2
Newfoundland	64.9	60.4	60.0
Prince Edward Island	65.2	62.3	60.8
Nova Scotia	65.0	60.7	60.3
New Brunswick	64.9	60.7	60.6
Quebec	64.9	61.1	59.7
Ontario	65.0	62.3	61.4
Manitoba	65.0	62.2	61.3
Saskatchewan	65.1	64.2	64.2
Alberta	64.9	63.0	64.4
British Columbia	64.8	64.1	62.3

Source: Labour Force Survey

Demographic Pressures

As indicated in introduction, the population in Canada is aging rapidly because of low fertility rate and the increase in life expectancy. As a result, the elderly dependency ratio (ratio of the population aged 65 to the working-age population) is expected to at least double over the next several decades. Moreover, because of substantial differences in provincial fertility rates, the regional location of recent immigrants and interprovincial migration flows, the pace of demographic changes is expected to vary substantially across the Canadian regions.

To illustrate the difference in future demographic pressures by region, we have used the demographic model MEDS[8] to generate a demographic projection by province. The main demographic assumptions are presented in Table 3. Chart 3 presents the projected national and regional elderly dependency ratio (the ratio of the population 65+ to the working-age population) over the period 1996 to 2046, while Table 4 compares the regional difference between 2000 and 2046. As indicated in the chart, Canada's elderly dependency ratio is expected to double over the next 40 years and the regional increase in the elderly dependency ratio is expected to vary considerably across regions over the same period. According to the calculations, the Atlantic region and the province of Quebec will experience the largest increase in the elderly dependency ratio, while Alberta will have the third largest increase, although its initial level in 2000 was well below the national average. In contrast, the Prairies and Ontario will come across a smaller increase in the elderly dependency ratio. Finally, the rising proportion of the older population in British Columbia is projected to be similar to the national average.[9]

Table 3
Main Demographic Assumptions

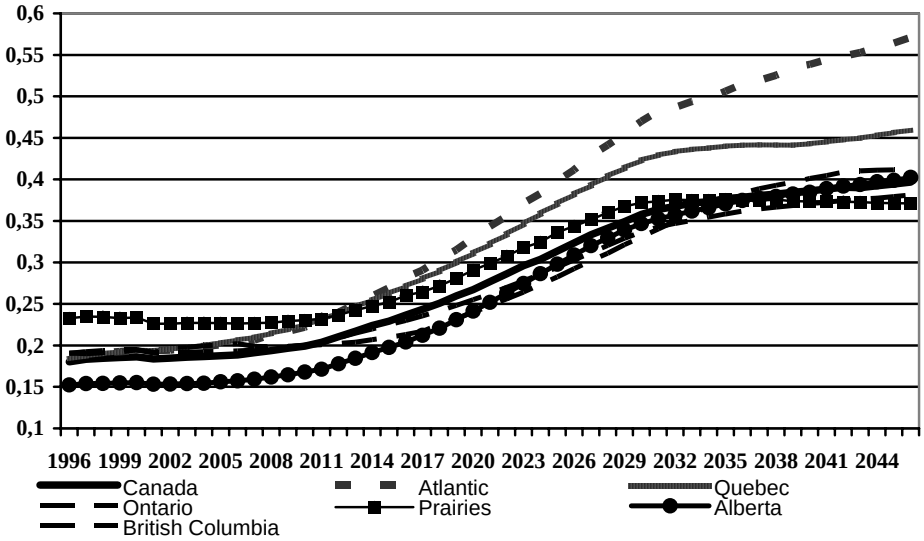
Province	**NF**	**PEI**	**NS**	**NB**	**Qc**	**Ont**	**Man**	**Sask**	**Alb**	**BC**
Fertility rate	1.21	1.56	1.42	1.45	1.47	1.53	1.81	1.81	1.70	1.45
Life expectancy (2044)										
Men	78	79	79	81	80	82	80	80	81	81
Women	82	85	85	85	85	86	84	86	84	85
Annual share of emigrants (% of Pop)	0.05	0.03	0.07	0.04	0.16	0.28	0.16	0.11	0.26	0.22
Annual share of new immigrants	0.21	0.07	1.04	0.35	14.3	55.4	1.85	0.80	6.26	19.6

Mercenier and Mérette (2002) and Fougère *et al.* (2004) have shown that the long-term macroeconomic and regional disparity implications of population aging are likely to be substantial in Canada. However, their analysis assumed that the effective retirement age in Canada is 65. Moreover, they did not account for the fact that the effective age of retirement differs quite sharply by province. In fact, according to the numbers shown in Table 2, accounting

[8] See Models of economic-demographic system (MEDS), Research Institute for Quantitative Studies in Economics and Population, McMaster University, Hamilton.
[9] For more information on Canada's demographic trends, see for example, Statistics Canada (2001, 2003).

for the regional difference in effective retirement age would likely generate a much larger negative impact on regional income disparity in the future.

Chart 3
Projected Elderly Dependency Ratio by Region in Canada



Source: MEDS

Table 4
Regional Elderly Dependency Ratio, 2000-2046

Region	Canada	Atlantic	Quebec	Ontario	Prairies	Alberta	BC
2000	0.19	0.19	0.19	0.19	0.23	0.16	0.19
2046	0.40	0.57	0.46	0.38	0.37	0.40	0.41
Difference	0.21	0.38	0.27	0.19	0.14	0.24	0.22

3. The Economic Cost of Early Retirement: Issues and Recent Evidence

As mentioned in introduction, early retirement trends is a serious concern in the context of population aging, given that the proportion of older workers will significantly increase and intensify the negative labour supply effect of early retirement. For example, according to our demographic projection, the proportion of the population aged 55-64 is expected to move from 9.2% of the total population in 2000 to 14% in 2020, before stabilizing to about 13% in the long run. Gruber and Wise (1999) emphasize the implications of the withdrawals of older employees in terms of forgone productive capacity. By reducing labour supply, early retirement decreases

the level of output, thereby reducing the resources available for consumption. It also results in a reduction of the labour income tax base to finance personal income taxes and social security contributions, such as the Employment Insurance System and Canadian/Quebec Pension Plans, thereby lowering public savings.

There are many factors that may explain the trend in early retirement behaviour. An important economic incentive to early retirement is rising wealth and increased preference for leisure. A number of studies have also indicated that institutional factors, such as the set up of pension systems in OECD countries may provide incentives for early retirement.[10] If indeed, social security systems provide a distortion to the labour-leisure choice by creating incentives for early retirement, the induced reduction in the labour supply is sub-optimal.

There is, however, mixed evidence that the Canadian public pension system provides significant incentives for early retirement. For example, Canadian residents are entitled to receive Old Age Security pensions at age 65. They can receive Canada and Quebec Pension Plan (CPP/QPP) benefits at the age of 60 but with a penalty. Compton (2001) examines the determinants of retirement and the impact of the CPP/QPP programs on retirement decision. She concludes that limited changes to CPP/QPP benefit levels will not have a large impact on the labour force behaviour of older workers. This finding is also supported by Maloney *et al.* (2003). Baker *et al.* (2003, 2004) provide an empirical analysis of the retirement incentives of the Canadian Income Security system and find that the work disincentives inherent in the Canadian Income Security system have significant impacts on retirement, especially after age 60. However, other factors, such as age-specific preferences for leisure and mandatory retirement are other important determinants of retirement decisions.

There are also costs associated to later retirement. First, in a life-cycle framework, it can be argued that by working longer, household do not need to save as much for retirement purposes. As a result, later retirement may lead to lower private savings. In addition, as mentioned in introduction, it can be argued that because of labour market rigidities, such as labour contracts with seniority clauses, older workers are paid on average above the value of their marginal product and therefore are more costly for employers. For example, in a case-study with

[10] See for example, Blöndal and Scarpetta (1998) and Gruber and Wise (1999).

two large US corporations, Medoff and Abraham (1981) have found that more experienced workers have higher than average salaries and their earnings differential cannot be explained by productivity. Also, Flabbi and Ichino (1998), Haegeland and Klette (1999) and Crépon *et al.* (2001) using Italian, Norwegian and French data files, respectively, support Medoff and Abraham's findings. However, Hellerstein, Neumark and Troske (1999) and Aubert (2003) do not support these conclusions. In fact, Aubert (2003) argues that the lack of a strong relationship between earnings and productivity for older workers found in previous studies may be biased because older workers are more likely to be found in less productive establishments.

Another cost associated to later retirement is that in the context of technological changes and innovation, maintaining an older workforce productive can be costly for individuals and firms who will need to invest in the retraining of older workers. The return to investment in marketable skills tends to decline with age as the period over which the benefits of increased productivity becomes shorter. An additional cost associated to firms is that they may have to adapt workplaces through more flexible work arrangements to retain older workers and to adjust to the needs and abilities of their aging workforce.

To our knowledge, very few studies have attempted to quantify the cost of early retirement or the benefits of working longer from an economic point of view. Among the few studies available, Gruber and Wise (1999) compare the labour force participation of older workers across countries and refer to this measure as the unused productive capacity at that age. They note, for example how enormous the difference in unused productive capacity is across fairly similar industrialized countries, in terms of labour force participation reduction. It would range from 23% for Japan to 67% in Belgium. Gruber and Wise's finding provides a useful indication about the potential magnitude but does not offer an estimate in terms of real output or income loss. In addition, the exercise does not account for the fact that the cost of early retirement will increase with an aging workforce.

Hviding and Mérette (1998) have used overlapping generations models for seven OECD countries to investigate the macroeconomic impact of possible pension reform strategies to deal with an aging society. Among the scenarios examined, they evaluate the option of raising the retirement age from 64 to 68 for all seven countries. Their results indicate that there are potential

significant macroeconomic gains associated with a rise in the retirement age. A four-year increase in the retirement age would generate a real GDP per-capita gain ranging from 11.6% for Italy to 5.7% for the US by 2050. The long-run impact averages 7% for Canada. However, in their calibration, they assume that the effective retirement age in Canada is 64 in their baseline solution, although it is 61 and varies by province. In addition, the net marginal effect of raising the retirement age after age 64 may not be the same than after age 61 if the profile of labour productivity varies by age and eventually declines after reaching a certain age.

More recently, Herbertsson and Orszag (2001) developed a simple framework to measure the unused productive capacity associated with early retirement by taking account of wages and incorporating the effect of increased employment on wages. Using this simple approach, they assess the economic cost of early retirement in OECD countries. For example, they estimate that as a share of potential GDP, the cost of early retirement was 6.3% in 1998 on average in the OECD, 6.7% in Canada, and 4.7% in the US. One weakness about using this approach is that for simplicity, the authors assume that there is no capital income. It also uses a partial equilibrium framework and therefore does not account for possible interaction effects, coming from savings, wealth, the capital stock and productivity. Finally, the analysis does not account for projected changes in the demographic structure of the population which will substantially influence the economic impact of early retirement decisions.

Rowe and Nguyen (2003) use the dynamic microsimulation model (LifePaths), calibrated on Canadian Census data, to examine the impact of early retirement from the perspective of forgone earnings. They look at two scenarios: delaying retirement by one year and delaying retirement until age 65. These scenarios are examined under alternative assumptions. The first is that older workers who delay retirement experience normal labour market transitions during the delay. The alternative assumption is that they are exempted from job loss during the delay. The results indicate that the job prospects have a large impact on family earnings potential. For example, with normal job loss probability, the median forgone earnings when delaying retirement by one year is $C17,000 per household compared to $C25,000 with no job loss probability. When retirement is delayed to age 65, the median forgone earnings achieves $C72,000 per household with normal job loss probability and $C176,000 with no job loss probability. Rowe and Nguyen provide valuable information on forgone earnings but the approach used remains an accounting

framework. It does not capture the economic and general equilibrium effects of raising the retirement age on real per-capita income, GDP and savings.

Verma and Rix (2003) use a macroeconometric model[11] of the United States to simulate the impact of raising the retirement age. In their initial scenario, they assume that the labour force participation rate for persons aged 65 and over is 15.4% by 2029 as projected by the Bureau of Labor Statistics (BLS). In the shock scenario, they assume that by 2029, the participation rate of older workers returns to the level reached in 1950 of 26.7%. The simulations reveal that the rise in retirement age has a substantial positive impact on macroeconomic variables. For example, real GDP rises by more than 10% by 2029, compared to the initial scenario. Gross private savings, labour productivity and compensation per hour also rise. The long-run equilibrium properties of the model used by Verma and Rix are derived from the neoclassical paradigm. However, the transmission effect of changes in the demographic structure to savings, consumption, wealth and physical capital works indirectly in this model since it does not use an overlapping generations framework. Therefore, the long-run effects of aging on productivity, savings and wealth and their induced effects on real per capita income in the model are questionable.

Finally, the Policy Research Initiatives (2004) provides long-term simulation scenarios of the impact of population aging on total hours worked using Lifepaths. Their analysis indicates that by extending the working life to all workers by 3 years, average annual hours worked would increase by about 6% by 2025, relative to a situation with no policy change.

4. The Dynamic Regional CGE Overlapping Generations Model

4.1 The model

The framework for the analysis is a dynamic general equilibrium model with an overlapping generations (OLG) structure (a detailed technical description of the model is available upon request). The model is calibrated to represent the Canadian economy and is composed of six regions of Canada: the Atlantic (Newfoundland, Prince-Edward Island, Nova Scotia and New Brunswick), Quebec, Ontario, the Prairies (Manitoba and Saskatchewan),

[11] Macroeconomic Advisors, LLC (MA) econometric model.

Alberta and British Columbia. In each region and at each period of time, there are 15 overlapping generations of adult agents. Younger individuals are assumed to be dependent on their parents. At any new period, a new generation is born and the eldest one dies. Each Canadian-born individual enters the labour market at the age of 17 and dies at the age of 77. Each cohort is also divided into sub-groups of heterogeneous individuals according to differences in labour force characteristics (active versus inactive/retired, skill level and immigration status). Each region in the model produces one differentiated goods and is open to trade.

The government sector is represented by a national (federal) and regional (provinces) governments. Both national and regional governments collect taxes on labour income, capital income and consumption expenditures. Government spending is divided into three components: health, education and other government expenditures. The national government distributes transfers to regional governments and both national and regional governments distribute social transfers to individuals. The public pension system is modeled as a two-tier pension program. The first-tier, the Old Age Security (OAS) system is modeled as a national transfer program to the elderly and is financed through general taxes from the national government. The second-tier, the Quebec Pension Plans (QPP) in Quebec and the Canada Pension Plan for the rest of Canada, are comprehensive contributory pension plans.

The representative firm by region produces the unique regional goods. Its production technology is represented by a Cobb-Douglas function. The regional firm hires labour and rents physical capital. Labour and physical capital are assumed to be immobile across regions, which implies that there is one market for labour and capital in each of these two factors of production in each region. The model's production and investment technologies also differ across regions. Physical capital is a composite good of the six regional final goods. The investment technology is represented by a constant elasticity of substitution (CES) function.

In each region, the representative agent optimises a CES type inter-temporal utility function of consumption and bequest subject to lifetime income. The household's optimisation problem consists of choosing the consumption and savings pattern over the lifecycle. Savings can be allocated between domestic physical capital ownership titles or regional bonds issued by

regional governments. Similarly, consumption expenditures are allocated toward the six available final goods accordingly to households' preferences represented by a CES function.

The labour market in each region is composed of workers by skill levels: high-skilled, medium-skilled and low-skilled workers by immigration status and the labour force is a CES function of labour by skill. The model is also composed of inactive adult individuals who receive transfer payments from the government.

The financial market is considered perfectly integrated across regions. This means that financial capital is perfectly mobile across regions and the interest parity condition applies. Rates of returns on savings are thus perfectly identical across regions. The model assumes perfectly competitive markets and perfect foresight agents. Moreover, output prices are flexible, so combined with the assumption of regional differentiated good, relative output prices act as if there were flexible exchange rate across regions.

4.2Calibration

The computable general equilibrium model compares two states of the six regional economies in the context of an aging population, according to alternative assumptions on the average retirement age across regions. To accomplish the comparison we first generate a baseline simulation solution with the assumptions used in the demographic model to generate similar projected regional demographic changes. As indicated in Table 5, we assume in the baseline solution that the effective retirement age remains constant in the future to the level reached in 2001 at the regional level. We then apply two alternative scenarios. Scenario 1 estimates the marginal effect of raising the effective age of retirement by one year in each region, beginning in 2002. Scenario 1 implies that the effective age of retirement in the province of Alberta is 65.4. Scenario 2 assumes that the effective age of retirement gradually increases from 62.2 in 2002 to 65 by 2014 and remains unchanged thereafter. However, since the effective age of retirement differs substantially across region in 2002, the labour force in some regions like the Prairies and Alberta reach the effective retirement age of 65 much earlier than in the rest of Canada.

Table 6 reports variable and parameter values that are imposed in the calibration procedure, while Table 7 presents government policy and program parameters at both the federal

and regional levels, which include effective tax rates, public expenditure to GDP and government debts. The inter-temporal elasticity of substitution is assumed to be the same across regions and consistent with values found in the literature. The intra-temporal elasticity of substitution is also assumed identical across the different types of consumption and investment demands and across regions. The value of the latter parameter is relatively high with respect to the literature to compensate for the fact that Canada is considered in the model as a closed economy.

Table 5
Baseline and Alternative Assumptions on the Effective Retirement Age

	2002	2006	2010	2014	Long-run
Atlantic					
Baseline	60.4	60.4	60.4	60.4	60.4
Scenario 1	61.4	61.4	61.4	61.4	61.4
Scenario 2	61.4	62.2	63.4	65.0	65.0
Quebec					
Baseline	59.7	59.7	59.7	59.7	59.7
Scenario 1	60.7	60.7	60.7	60.7	60.7
Scenario 2	60.7	62.1	63.6	65.0	65.0
Ontario					
Baseline	61.4	61.4	61.4	61.4	61.4
Scenario 1	62.4	62.4	62.4	62.4	62.4
Scenario 2	62.4	63.3	64.1	65.0	65.0
Prairies					
Baseline	62.6	62.6	62.6	62.6	62.6
Scenario 1	63.6	63.6	63.6	63.6	63.6
Scenario 2	63.6	64.1	64.5	65.0	65.0
Alberta					
Baseline	64.4	64.4	64.4	64.4	64.4
Scenario 1	65.4	65.4	65.4	65.4	65.4
Scenario 2	65.0	65.0	65.0	65.0	65.0
British Columbia					
Baseline	62.3	62.3	62.3	62.3	62.3
Scenario 1	63.3	63.3	63.3	63.3	63.3
Scenario 2	63.3	63.9	64.4	65.0	65.0

A matrix of interregional trade is calculated between the six regions and serves to estimate the ownership distribution of wealth (physical capital plus government bonds) across individuals and regions. It is assumed that regional physical capital is owned by regional residents first. This means that residents have a stock of wealth composed of local physical capital ownership titles plus bonds issued by local and outside regional governments. Given this interregional rate and the above parameter values, regional rate of time preference was calibrated as to ensure equilibrium in the Canadian financial asset market.

Table 6
Calibration Parameters

Region	Atlantic	Quebec	Ontario	Prairies	Alberta	BC
Regional Share of GDP	.062	.217	.387	.070	.137	.128
Share of capital in production	.278	.280	.280	.324	.324	.270
Intertemporal elast. of substitution	1.0	1.0	1.0	1.0	1.0	1.0
Elast. of substitution for consumption	9.0	9.0	9.0	9.0	9.0	9.0
Elast. of substitution for investment	9.0	9.0	9.0	9.0	9.0	9.0

Table 7
Government Policy and Program Parameters

Federal/Regional Gov't	Federal	Atlantic	Quebec	Ontario	Prairies	Alberta	BC
Labour income tax rate	.140	.178	.234	.173	.155	.164	.178
Capital income tax rate	.220	.165	.258	.342	.187	.164	.226
Consumption tax rate	.100	.134	.119	.100	.093	.037	.099
Public Education/GDP	0	.060	.052	.032	.039	.041	.045
Government debt	.111	.421	.431	.288	.226	.018	.110
Public Health Care/GDP	0	.077	.066	.053	.066	.045	.070

5. Simulation Results

Table 8 presents the marginal effect on key macroeconomic indicators of raising the effective retirement age by one year, from 61.2 to 62.2, at the national level compared to the baseline solution. As can be shown from the table, the one-year increase in the effective retirement age corresponds to a 2.4% increase in labour supply by 2030 relative to the baseline. It is also followed by a significant rise in real investment. As the labour supply increases, firms raise their desired physical capital stock to equip their workers and to adapt to expected rising final demand. This in turn stimulates investment. The positive labour supply and real investment shocks lead to a 2.7% increase in real GDP per-capita by 2030 relative to the baseline. The positive impact on real per-capita GDP reaches 3.2% by 2050.

Scenario 2 provides an estimate of the economic impact of a gradual increase in the effective retirement age to 65 compared to 61.2 in the baseline solution. An increase in the

effective retirement age to 65 is equivalent to a 9% rise in labour supply in 2030 relative to the baseline. In Scenario 2, the real per-capita GDP gain reaches 8.4% in 2030 and near 10% by 2050. Finally, this estimate is larger but consistent with the estimates presented for Canada by Hviding and Mérette (1998) and by Herbertsson and Orszag (2001) with a simpler approach and for the United States by Verma and Rix (2003).

Table 8
Simulated Impact of an Increase in the Effective Retirement Age
(Percent Difference Relative to Baseline)

	2006	2010	2022	2030	2042	2050
Real GDP						
Scenario 1	1.6	2.0	2.5	2.7	2.6	2.5
Scenario 2	2.9	5.5	8.3	8.9	8.9	8.8
Real GDP per capita						
Scenario 1	1.6	1.9	2.4	2.7	3.0	3.2
Scenario 2	2.7	5.0	7.5	8.4	9.3	9.9
Real investment						
Scenario 1	5.0	4.7	4.2	4.0	3.5	3.0
Scenario 2	8.5	15.5	11.2	9.8	10.0	11.5
National Savings Rate						
Scenario 1	0.7	0.6	0.5	0.5	0.6	0.7
Scenario 2	0.4	1.3	0.5	0.4	0.9	1.8
Labour Supply						
Scenario 1	2.0	2.1	2.4	2.4	2.3	2.1
Scenario 2	4.5	7.7	8.9	9.0	8.4	7.5
Real Wages						
Scenario 1	-0.4	-0.2	-0.1	0.0	0.0	0.2
Scenario 2	-1.5	-1.9	-0.9	-1.0	-1.0	-0.3
Real Wages After-Tax						
Scenario 1	-0.1	0.3	0.9	1.2	1.6	1.6
Scenario 2	-1.2	-1.1	1.6	2.4	3.4	4.8
Federal Tax Rate on Labour Income						
Scenario 1	-0.7	-1.2	-1.9	-2.2	-2.5	-2.7
Scenario 2	-0.5	-1.8	-5.9	-7.1	-8.5	-9.6
CPP Contribution Rate						
Scenario 1	-8.1	-8.2	-8.1	-8.0	-7.7	-7.7
Scenario 2	-15.8	-25.3	-26.2	-25.9	-25.5	-25.6
QPP Contribution Rate						
Scenario 1	-7.8	-7.6	-6.8	-6.4	-6.1	-5.8
Scenario 2	-23.7	-39.9	-39.5	-38.9	-38.4	-38.3

Another positive implication is that the shock leads to an increase in national savings. The positive impact on national savings is explained by very favourable fiscal effects associated with working longer. In these simulations, we assume that both levels of governments (national and regional) maintain the debt-per-capita ratio constant relative to the baseline level and adjust their effective tax rate on labour income accordingly. This leads to a reduction in effective tax rates over the simulation period compared to the baseline and stimulates private savings. In Scenario 2, the federal effective tax rate falls by about 7.1% in 2030 and by 9.6% by 2050. Regional effective tax rates also fall, but at a different pace in each region due to the regional difference in demographic changes and differences in retirement age across regions.

Alternatively, we could examine a scenario where the government maintains taxes constant and uses the extra revenue to lower the debt-to-GDP ratio. Under this alternative scenario, the net effect on national savings would likely be of similar magnitude, except that we would observe a rise in public savings rather than in private savings.

The rise in the labour income tax base also leads to a reduction in CPP and QPP contribution rates of about 8% and 6.4%, respectively in Scenario 1, by 2030, and near 26% and 38% in Scenario 2. The effect on the QPP contribution rate is larger in Scenario 2 than in the rest of Canada since in the simulation, Quebec benefits from the largest increase in the retirement age (from 59.7 to 65) and has an older working-age population than in the rest of Canada.

Following the latest reform to Canada's Pension Plan, the contribution rate was raised to 9.9% in 2003 and will be held steady thereafter.[12] This suggests that with an increase in the effective retirement age, the CPP contribution rate could be reduced to near 9% in Scenario 1 and to 7.3% in Scenario 2. Finally, as expected, the positive labour supply shock associated with the rise in the effective retirement age has a small negative impact on real wage rates. However, the reduction in both national and regional effective tax rates eventually leads to an increase in real after-tax wage rates.

7. Caveats

[12] See, The Canada Pension Plan (1997).

According to these results, we feel confident to say that the economic cost of early retirement and the benefits of working longer are potentially large. It would also provide some relief to the overall taxation base and the financing of social security. However, we would also argue that the results presented in this paper probably represent an upper bound for a number of reasons.

First, the simulations assume that all older workers remain healthy until they retire at age 65. In reality, a non-negligible proportion of older workers leave the labour force before 65 for health related factors, either because they have become disabled or because the deterioration of their health condition considerably reduces their productivity at work.

Second, independently of health related reasons, some workers may leave the workforce because they cannot adapt to increases in skill requirement without retraining. Retraining costs for older workers may be important to consider and for certain categories of workers, they may outweigh the benefits.

Third, early retirement decision can also be explained by a strong increase in the preference for leisure as we get older, especially if it is a planned decision corresponding to consistent wealth accumulation behaviours during the working life. Therefore, it may be unreasonable to assume that these individuals would remain longer in the workforce if it is undesired.

Fourth, the simulations assume that the increase in the effective age of retirement will correspond to full-time jobs only. It is well known that the incidence of part-time employment increases among older workers. Therefore, a significant proportion of older workers may be willing to work more years at the condition that they can gradually move from full-time to part-time jobs. So, unless they are willing to work past age 65, the net labour supply increase would likely be smaller than the one simulated here.

Fifth, the relationship between earnings, experience and productivity has an important influence on the sensitivity of the results. Consistent with the neoclassical framework, the CGE model assumes that real wages are equal to the marginal product of labour across all age groups. Earnings by skill also rise with experience, reaching a maximum around age 52 and declining

slightly thereafter. A change in the profile of earnings and productivity for older workers may have a significant influence on the magnitude of the results. For example, under a scenario where productivity continues to increase, the impact of raising the retirement age would be more beneficial for the economy and the labour market. On the other hand, if the profile of earnings for older workers does not reflect labour productivity, it would reduce the long-run benefits of increasing the retirement age.

Alternatively, the simulations assume in the baseline solution that the effective retirement age will remain unchanged in the future from current levels. However, it is possible that with the increased relative scarcity of workers, market forces will play an incentive role for older workers to remain in the labour force longer. The return to wealth may also decline and force older workers to work longer to accumulate more savings for retirement. Finally, we can also anticipate that future cohorts of women will be more strongly attached to the labour market when they get older than current older cohorts.

8. Conclusion

This paper evaluates the cost of early retirement and the economic and fiscal effects of working longer in Canada, in the context of population aging, with a regional CGE overlapping generations model. According to the results, the marginal effect on real GDP and income of working one extra year is substantial. Correspondingly, since the effective age of retirement has diminished quite substantially in Canada over the past 20 years, the economic and financial costs of early retirement in terms of unused productive capacity and reduced taxation base are large.

Finally, these results suggest that an increase in the effective retirement age could significantly offset the consequences of aging through increases in real income and GDP, a reduction in labour market pressures an improvement in the financing of social security and an increase in the overall tax base. However, an issue that needs to be explored in future research and simulation exercises are the factors that distort labour-leisure decisions of older workers, leading to early retirement behaviours. There is also a need to better address the economic cost of later retirement, such as retraining cost for older workers and the issues whether the life-cycle profile of earnings reflects the profile of productivity by age to make a more comprehensive costs/benefits analysis.

References

Aubert, Patrick. 2003. *Salaire, productivité et demande de travailleurs âgés.* INSEE. Mimeo.

Baker, Michael, Jonathan Gruber and Kevin Melligan. 2004. "Income Security Programs and Retirement in Canada." in *Social Security Programs and Retirement around the World*., edited by J, Gruber and D.A. Wise, NBER, The University of Chicago Press.

Baker, Michael, Jonathan Gruber and Kevin Melligan. 2003. "The Retirement Incentive Effects of Canada's Income Security Programs." *Canadian Journal of Economics* 36(2): 261-290.

Blöndahl, S. and S. Scarpetta. 1998. *The Retirement Decision in the OECD Countries*. Economics Department Working Paper No. 202, Paris: OECD.

Casey, Bernard, Howard Oxley, Edward Whitehouse, Pablo Antonin, Roman Duval and Willi Leibfritz. 2003. *Policies for an Aging Society: Recent Measures and Areas for Further Reform*. Economics Department Working Papers no. 369, Paris: OECD.

Compton, Janice. 2001. *Determinants of Retirement: Does Money Really Matter* Department of Finance Working Paper no, 2001-02. Ottawa.

Crepon, Bruno, Nicolas Deniau and Sébastien Perez-Duarte. 2001. "Productivité et salaire des travailleurs âgés", in Congrès de économistes Belges de langue française, Commission no. 4, Chapitre 10.

Flabbi, L. & Ichino, A. 1998. *Productivity, Seniority and Wages: New Evidence from Personnel Data*. CEPR discussion paper 1966. London, UK: Centre for Economic Policy Research.

Fougère, Maxime, Simon Harvey, Marcel Mérette and François Poitras. 2004. "Aging Population and Immigration in Canada: An Analysis with a Regional CGE Overlapping Generations Model." *Canadian Journal of Regional Science* 27(2) Forthcoming.

Gower, Dave. 1997. "Measuring the Age of Retirement.", *Perspectives on Labour and Income* 75-001-XPE: 11-17.

Group of Ten. 1998. *The Macroeconomic and Fiscal Implications of Aging Populations*, Basle: Bank of International Settlements.

Gruber, Jonathan and David A. Wise. 1999. *Social Security and Retirement Around the World* NBER Volume, Chicago, University of Chicago Press.

Hægeland, Torbjorn et Tor Jacob Klette. 1999. "Do Higher Wages Reflect Higher Productivity? Education, Gender and Experience Premiums in a Matched Plant-Worker Data Set". In *The creation and Analysis of Employer-Employee Matched Data* Edited by J. Haltiwanger, J Lane, J. R. Spletzer J. Theeuwes and K. Troske, Amsterdam: North Holland.

Hellerstein, Judith K., David Neumark and Kenneth R. Troske. 1999. "Wages, Productivity and Worker Characteristics: Evidence from Plant-Level Production Function and Wage Equations." *Journal of Labor Economics* 17(3): 409-446.

Herbertsson, Tryggvi Thor and J. Michael Orszag. 2001. *The Economic Cost of Early Retirement in the OECD*, Institute of Economic Studies, Working paper no. 01:02.

Herbertsson, Tryggvi Thor. 2001., *The Economics of Early Retirement*, Institute of Economic Studies, Working paper no. 01:01.

Hviding, Ketil and Marcel Mérette. 1998. *Macroeconomic Effects of Pension Reform in the Context of Aging : OLG Simulations for Seven OECD Countries* OECD Working Paper no. 201. Paris: OECD.

Maloney, Greg, Mashood Mirza and François Paris. 2003. *Canadian Retirement Behaviour: A Microeconomic Examination*, Paper presented at the CEA 37th annual meetings, Carleton University, June.

Medoff, J and K Abraham. 1981. "Are Those Paid More Really More Productive? The Case of Experience." *Journal of Human Resources* 16(2): 186-216.

Mercenier, Jean and Marcel Mérette. 2003. "The Inter-Regional Consequences of Population Ageing in Canada.", in Reinhard Neck, *Modelling and Control of Economic Systems 2002*, Elsevier Pergamon Press: 175-181.

OECD. 2002. "Increasing Employment: The Role of Later Retirement." *OECD Economic Outlook* 72, Paris.

OECD. 2000, *Reforms for an Aging Society*, Paris, 215 p.

Pestieau, Pierre. 2003. *Raising the Age of Retirement to Ensure a Better Retirement*, Paper presented at the 4th International Research Conference on Social Security, Antwerp, May 2003

Policy Research Initiative. 2004. *Population Aging and Life-Course Flexibility: The Pivotal Role of Increased Choice in the Retirement Decision*. PRI Discussion paper prepared for the PRI-SSHRC Roundtable on Life-Course Based Policies, Ottawa, January 2004.

Rowe, Geoff and Huan Nguyen. 2003. *Early Retirement in Perspective: Insights from the LifePaths Microsimulation Model*, Report prepared for Human Resources Development Canada.

Statistics Canada. 2003. *2001 Census: Analysis Series, the Changing Profile of Canada's Labour Force*, Cat. 96F0030XIE2001009, Ottawa

Statistics Canada. 2001. *Report on the Demographic Situation in Canada*. Ottawa, 136 p.

The Canada Pension Plan. 1997. *Securing the Canada Pension Plan*, Ottawa, Statistics Canada.

Verma, Satyendra and Sara Rix. 2003. *Retirement Age and Social Security Reform : The Macroeconomic Effects of Working Longer*. Paper presented at the 4th International Research Conference on Social Security, Antwerp, May 2003