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A microsimulation analysis of public and private policies aimed at increasing the age of retirement[1]

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[1] All the analysis reported in this paper is the responsibility of the authors and does not represent the opinion of HRSDC or the Government of Canada

DRAFT

1. Introduction

This paper presents a new microsimulation model geared towards the analysis of policies aimed at older workers in Canada. The population of older workers is of particular interest for a number of reasons. First, a large number of federal policies are age and employment status specific (CPP, OAS, GIS) and targeted towards older Canadians. As a result, exploring the impact of changes in these policies is interesting. Second, Canada has an ageing population and there are concerns regarding the impact this will have on labour supply in the future. Extending the working lives of older Canadians is one way that might be used to address these labour supply pressures – exploring the relative impact of various policies on labour supply, and the happiness of these workers is thus particularly important. Finally, the division of the government where this work is being performed (The Policy Research Directorate of HRSDC) operates a suite of Computable General Equilibrium models (CGE). These models are very valuable in providing a comprehensive macro level analysis of potential policies. A microsimulation model, focused on distributional analysis, allows for an important complimentary piece of analysis. This paper will outline the microsimulation model that is employed as well as analyse a set of nine different potential federal government policies geared at extending the working lives of Canadians.

2. The model

2.1 Presentation of the model

The model used for the analysis in this paper is a static microsimulation model. In this model individuals make decisions that maximize their lifetime utility (from age 55 to death) based on their income and leisure flows. It is static in the sense that the individual agents do not suffer feedback effects from their actions or the actions of other agents in the model. Essentially, if a person retires this affects their flows of income and leisure but it does not affect the income and leisure of others nor does it affect conditions in the market such as wage or tax rates.

The model is family-based; that is, the individual agents who make decisions take into account not only their income and leisure flows but also those of their spouse (if they have one). In the current model, income flows and leisure values are treated identically whether they come from the individual decision maker or the spouse though this restriction could be relaxed in a future version of the model if desired. A further restriction imposed on the model is that individuals and their spouses make the same employment decisions. Essentially, both the decision maker and their spouse will retire at the same point in time. This is certainly a simplifying assumption that does not correspond exactly to reality but it is necessary for the operation of the model and there is some indication that "leisure time" spent in retirement is a complementary good and has the most value when spouses partake of it together[2].

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[2] **Hamermesh, Daniel** (2000). *Togetherness: Spouses' Synchronous Leisure, and the Impact of Children. NBER Working Paper No. W7455*

The model takes each of the individual agents and calculates their utility based on their level of income and leisure from the age of 55 until death. Individuals choose their employment level from among part-time work (three days per week), full-time work (five days per week), and retirement) from the age of 55 to the age of 70. A further restriction is imposed that individuals do not increase their work effort from one year to the next, that is they do not move back to full-time work after changing to part-time nor do they return to work after opting for retirement. The combination of full-time work, part-time work, and retirement with the greatest level of utility is selected by the individual and the effective age of retirement (part-time counts as 0.6 years of full-time work) and level of utility are the main model outputs.

The purpose of the model is to explore the labour supply and utility impacts of various public policies. The model uses over 1500 different "types" of individuals (details can be found in the data section below) in its calculations. For this paper, the model was run for nine different policy scenarios (see section on scenarios) and the changes in the effective age of retirement and the level of utility measure the policy impacts. It is worth noting that the main value of the model arises from comparisons of policy changes to the baseline. It is the measure of the variation in retirement age and utility caused by policy changes that provides value, not the baseline case itself. The model is not a forecast of the future – it is an estimate of the potential impact of policy changes relative to a baseline, status quo, case.

2.2 Data

The LifePaths model was used to simulate relevant employment and pension data for the individual agents in the microsimulation model. LifePaths is a demographically driven microsimulation model that incorporates diverse data sets to generate a synthetic, but representative, Canadian population. The model is calibrated such that historical benchmarks in aggregate indicators are matched by the individual behaviour in the model. The model can be used to project what the future might look like if these behavioural patterns continue, or to run 'what if' types of simulations where policies or behaviours are assumed to change in particular ways.

To generate data for the simulation model, a LifePaths simulation was run for 12 million individuals. The outcomes of these runs were used to generate the 1567 individual agents in the microsimulation model. Data collected from LifePaths included pension plan membership, years of pensioned service, years of CPP eligible service, and average earnings for both individuals and their spouses if a spouse existed.

Several categorical variables were used to divide the 12 million individuals into the individual agents in the model. The categorical variables are:

- Gender
- Education level (Less than high school, high school/college graduate, University degree)
- Family Type (unattached, 0-earner couple, 1-earner couple, 2-earner couple)

- Income level (10 deciles)
- Pension plan type (DB plan, no DB plan)
- Employment status (all paid employment, all self employment, mix of paid and self employment, no employment)

The above divisions create 1920 (2*3*4*10*2*4) possible individual agents. However, certain combinations were incredibly rare. Given the large initial sample of 12 million individuals, any combination for which there were less than 50 observations was excluded from the microsimulation model, leaving 1567 agents.

The income level distinction created a problem in that a point in time needed to be chosen for the division to be made. Furthermore, choices of individuals in the model affect their flows of income causing each possible set of choices to result in different income flows over the period studied. As a result, income at age 55 was used to construct the income categories. Employment income (both individual and spouse were assumed to work full-time if they had been working at age 54), as well as incomes flowing from investments, RRSPs and defined contribution (DC) pension plans were used. Public and private DB pensions were not included in the calculation.

There was also a different division of the 12 million individuals into individual agents that replaced the income level division with a provincial division. These results were used for comparison but were not chosen to be the area of focus for a number of reasons. First, the distributional impact across income levels seemed to be a more interesting area than that by province. Second, individual characteristics related to the key pension variables did not show significant variation by province causing the added provincial dimension to add little value. Finally, the large relative size of Ontario makes the overall model results very sensitive to the choices of the Ontario agents and thus less reliable.

2.3 Utility function

The utility function used for the bulk of this paper is the constant elasticity of substitution utility function (CES) written below. It allows a reasonable amount of flexibility in preferences, without adding too much complexity. One limitation it has is that it does not account for an individual's intertemporal elasticity of substitution (an individual's preference for utility today compared to some future date). This assumption is relaxed in one of the sensitivity tests, which introduces a different utility function, and it is found to have little impact.

The individual's total level of current utility is the discounted sum of all the utility the individual experiences between the current time (t=0) and death (t=d). It is this total utility that the individual maximizes.

$$U = \sum_t [\alpha(Y_t - Y_{\min,t})^{1-\frac{1}{\sigma}} + (1-\alpha)(l_t - l_{\min,t})^{1-\frac{1}{\sigma}}]^{\frac{1}{1-\sigma}} (1+r)^{-t}$$

Where:

Y = level of after-tax income (sum of decision maker and spouse where applicable)
Y_{min} = minimum level of after-tax income
l = level of leisure (sum of decision maker and spouse where applicable)
l_{min} = minimum level of leisure
α = relative weight applied to income and leisure
σ = elasticity of substitution between income and leisure
r = discount rate
t = time period

As has been mentioned, this model is family based. As a result, income and leisure values from both the decision maker and their spouse (if they have one) are summed together for purposes of the utility function. Furthermore, family income is adjusted based on Statistics Canada's family size modifier of 1.4[3]; that is, couple have their income divided by 1.4 to account for the greater need for money to provide necessities – it is not divided by 2 as there are some economies of scale that allow a comparable standard of living to be achieved by a couple with less money than would be required for two single individuals.

One fact is important to note. As a general rule, individual preferences should depend on trade-offs between leisure and consumption, not leisure and income as we have modeled here. Income is a reasonable first approximation for consumption, particularly with the fixed price levels in this model, causing it to be used.

2.4 Assumptions on Parameter Values

The major assumptions for parameter values are found below. Most of these assumptions were tested with alternate values to determine the model's sensitivity to the assumed values. More detail on the impact of the assumptions can be found in the sensitivity section later in the paper.

$Y_{min,}$ the minimum level of after-tax income, was assumed to be zero. In reality, this is not accurate as there are several government programs that assure income is greater than zero. However, it was not felt that the complexities of modeling all of these programs was worth implementing. Other minimum income levels were tested.

$l_{min,}$ the minimum level of leisure was also assumed to be zero to be consistent with the assumption on minimum income. Like minimum income, other levels were tested.

σ, the elasticity of substitution between income and leisure, was assumed to be 0.8, consistent with the literature. As with the other parameters, other values were tested.

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[3] Carson, Jamie (2002). "Family Spending Power." *Perspectives on Labour and Income 3(10).* Statistics Canada

r, the real discount rate, was set at 4%, again consistent with the literature. As with the other parameters, other values were tested.

Life expectancy was set at 85.6 for females and 82.1 for males based on the 2001 life expectancy at age 65 values from cansim. Thus, d, the date of death, was set at the level of life expectancy less the individual's initial age.

α, the relative weight applied to income and leisure, was a calibrated value in the model and not set by assumption. α was calibrated to ensure that the rate of retirement of individuals in the baseline run matched that seen in Cansim data. α was calibrated separately for males and females with the values being .190 for males and .174 for females. α could conceivably have been calibrated for other groups but the male/female split in the preference for leisure was thought to be the most important.

2.5 Income Included

The model includes the majority of income sources available to older Canadians. Employment income is included for paid employees and self-employed individuals for the years in which the individuals decide to work. Private retirement income in the form of private DB pension plans, investment income, RRSP withdrawals, and DC plan payments are included. In terms of the public sector pensions, the Canada Pension Plan (CPP) payments, Old Age Security (OAS), and the Guaranteed Income Supplement (GIS) are all included in the model. The main omissions from the model are the lack of any savings accumulation between the ages of 55 and retirement, though previous savings in terms of investment income, RRSPs and DC plans are all included. Furthermore, there is no measure of wealth in the model so implicit rent due to home ownership is not included.

All income is taxed at a flat rate of 31% when after-tax income is generated. This is a major simplification of the marginal tax rate system that we have in Canada but was thought to be a decent first approximation.

2.6 Policies Tested

A series of nine different policies are tested in this paper. These policies are drawn from two papers[4] and cover changes to a range of programs including the CPP, OAS, GIS, and private Defined Benefit (DB) pension plans. These are not intended as specific policies that the government is actually considering implementing but rather an exploration of the relative impacts of a range of possible policies. This section will provide a brief overview of each policy.

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[4] **Maxime Fougère, Simon Harvey, Yu Lan, André Léonard, and Bruno Rainville** (2008) *Incentives to Early Retirement in Canada's Defined-Benefit Public and Private Pension Plans: An Analysis with a Dynamic Life-Cycle CGE Model,* Policy Research Directorate, HRSDC and
Carr, Jeff (2008). *Bridge Payments, Phased Retirement and Employment Choices.* Policy Research Directorate, HRSDC

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Changing the CPP actuarial Adjustment

Currently, when the CPP pension is taken before the age of 65, a 0.5% per month reduction in pension value is applied. Similarly a 0.5% per month bonus is paid on pensions claimed after the age of 65. This pension adjustment is called the CPP actuarial adjustment and it represents a significant incentive regarding the choice of retirement date. One possible policy change would be to adjust the CPP actuarial adjustment to favour remaining in the labour force to a greater extent. The policy tested in this paper raises the actuarial adjustment to 0.8% per month.

Eliminating the early receipt of CPP

Another CPP focused policy aimed at increasing the labour force attachment of older workers would be to restrict the receipt of the CPP pension to individuals aged 65 or older. Currently, individuals can receive the CPP starting at age 60 provided that they retire from their current employment. The CPP represents a significant portion of the retirement income of many individuals and restricting its receipt could result in increased labour force attachment for workers aged 60 to 65.

Changing the age of entitlement

Currently, the age of entitlement to government pensions (OAS, GIS, full CPP) is 65. This provides a strong incentive to retire at that age. One potential policy to extend the working lives of Canadians is to extend the age of entitlement to 66. In this simulation the age of eligibility for early CPP is raised from 60 to 61 as well.

Eliminating the OAS Clawback

Under the existing policy, OAS payments begin to be clawed back at the rate of 15% for each dollar of income earned in excess of $66,335. This represents a significant disincentive for those earning in excess of the OAS clawback threshold to continue working. The elimination of this clawback is one potential policy that could cause high earning individuals over the age of 65 to continue in the workforce.

Eliminating CPP pension from the GIS clawback

Currently all income, excluding the OAS, causes a 50% clawback of GIS payments for those receiving GIS. As CPP benefits are often a large source of income for retirees, particularly those at the lower end of the income scale, the interaction of CPP benefits and the GIS clawback can pose a significant barrier to further work as any earned increases in CPP benefits from additional work essentially face a 50% tax rate due to the clawback. Eliminating the GIS clawback associated with higher CPP payments is one way to encourage additional work among older workers.

Eliminating CPP actuarial adjustment from the GIS clawback

A second similar potential policy involves changing the CPP-GIS interaction in a slightly different manner. By eliminating the actuarial adjustment from GIS clawback calculations the incentive to increase work effort will be increased in two ways. Those retiring early receive fewer GIS benefits than they otherwise would as the GIS clawback assumes they took their CPP pension at age 65 providing an incentive to work longer. Those retiring after the age of 65 also receive an additional incentive as their increased CPP pension due to the actuarial adjustment is not considered when calculating their GIS benefits.

Assuming CPP taken at age 60 for purposes of the GIS clawback

A third similar policy involves assuming that the CPP was taken at age 60 for GIS purposes. This will eliminate the disincentive related to higher CPP payments from working from age 60 to 65. Unlike the above policy which essentially assumes that the CPP is taken at age 65, this policy assumes that the CPP was taken at age 60 (with the actuarial adjustment) by all workers for GIS clawback purposes.

Private Option A (focused on part-time workers)

This policy aims at facilitating the bridge employment of workers with DB plans by allowing them to receive a partial pension while also receiving employment income, something that is currently prohibited. This plan allows for part-time work coupled with bridge payments designed to replace the public benefits (OAS, GIS, CPP) that are not available until the age of 65, and a pension top-up proportional to the reduction in work (eg. 40% of pension entitlement for part-time work). This policy should provide an incentive for workers to choose to work part-time where they may have chosen to retire without this policy.

Private Option B (available to full-time and part-time workers)

Private option B also aims at facilitating the bridge employment of workers with DB plans by allowing them to receive a partial pension while also receiving employment income. It focuses on eliminating the negative work incentive provided by existing bridge payment plans that do not provide benefits to full and part-time workers. Unlike the previous option A, private option B extends the bridge payments (but not the pension top-up) to full-time workers with DB plans.

3. Results from policy scenarios

3.1 Description

This section describes the results from the various scenarios outlined earlier. We will report changes from the baseline scenario in terms of changes (in years) in the effective age of retirement and changes in utility. An increase of one year in part-time work is seen as an increase of 0.6 years in the effective age of retirement. As mentioned earlier, utility depends on both leisure and income. If a particular policy change increases work hours, the decrease in utility caused by a smaller leisure time could be offset by an increase in income. However, as will be seen, this is generally not the case: when a policy increases career hours, it usually decreases utility. Utility changes will be presented as a percentage change relative to the baseline scenario.

The nine policy changes can be divided into four categories: 1) policies mainly affecting the CPP, which encompasses the change in the actuarial adjustment rate from 0.5% to 0.8% a month, and the elimination of early entitlement to CPP (all CPP starts at 65); 2) policies mainly affecting the GIS, such as the exclusion of CPP in the calculation of GIS entitlement, taking the unadjusted value of the CPP to calculate GIS entitlement and taking the value of CPP at age 60 to calculate GIS entitlement; 3) Other public pension changes, such as the elimination of the OAS clawback, and extending the start of all public pension programs by one year (early CPP at age 61, other programs at 66); 4) the two policies related to private pensions and bridge payments (either bridge to part-time – option A or to both part-time and full-time work – option B).

The next sub-section will briefly show descriptive statistics of the baseline scenario; the following sub-section will analyse the impacts of policy changes for a representative (or average) worker, in terms of effective age of retirement and utility. The final sub-section will analyse the results for different sub-groups of the population.

3.2 Baseline scenario

As seen in Table 1, the effective age of retirement in the baseline scenario is 61.6 years old. It is greater for men than for women, which reflects what is observed in Canada.

Individuals who are members of a defined-benefit plan, or those unattached to the labour market or not employed, tend to retire earlier on average. Retirement age seems to be higher among income groups 2 to 8, a little lower for income groups 9 and 10, and approximately two years smaller than average for individuals in the lowest income group.

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Table 1 Effective age of retirement and actual number of full-time and part-time work

	Effective age of retirement	Years working full-time (after 55)	Years working part-time (after 55)
Gender			
Male	62.1	4.8	3.8
Female	61.0	2.7	5.6
Highest educational level			
Less than high school	62.2	5.2	3.4
High school / college	61.4	3.9	4.2
University	61.4	2.3	7.0
Private pension plan			
Defined-benefit	58.8	2.6	2.0
Other / none	62.2	4.1	5.1
Family type			
Unattached	61.1	4.6	2.6
Zero-earner couple	59.0	3.3	1.2
One-earner couple	61.9	3.6	5.5
Two-earner couple	61.8	3.8	5.0
Employment status			
All paid	61.7	3.7	5.0
All self-employed	62.4	5.2	3.7
Mix of paid and self-employed	62.2	4.2	4.9
Not employed	56.8	1.5	0.5
Income groups			
1 (lowest)	59.5	4.4	0.1
2	62.0	6.9	0.3
3	62.7	7.0	1.1
4	62.1	5.2	3.0
5	62.0	5.2	2.9
6	61.6	3.8	4.7
7	62.2	4.2	5.1
8	61.7	1.8	8.2
9	61.4	0.2	10.2
10 (highest)	61.3	0.0	10.5
Total	**61.6**	**3.9**	**4.6**

3.3 General results

Table 2 summarizes the results of the different policy scenarios from the microsimulation model in terms of utility changes and effective age of retirement relative to the baseline scenario. In order to have a point of comparison, the last columns show the results from Fougère et al. (2008) for the impact of the same policy scenarios (except the private pensions) on labour supply and the relative impact of each scenario.

Of all policy scenarios, the ones concerning changes to the CPP have the greatest impacts on both the effective age of retirement and utility. In both cases, the effective age of retirement increases by roughly eight months. Utility decreases by approximately a quarter of one per cent. The greatest impact comes from the elimination of early CPP.

The various scenarios concerning the way GIS entitlements are calculated have mixed impacts on the effective age of retirement. When CPP income is excluded from the calculation of GIS entitlement, the impact is negative; when CPP at age 60 is used to calculate the GIS entitlement, the impact is positive but very small; when the unadjusted value of the CPP is used to calculate GIS entitlement, the effect is positive, but still five times smaller than that of CPP policy changes. Changes to utility are just reversed: the negative effect of the first of the three scenarios on age of retirement has a positive impact on utility; the second scenario has a small negative effect while the third one has a positive effect on utility.

Table 2 Summary of changes in utility and effective age of retirement from different policy scenarios

Policy scenario	Microsimulation model			Fougère et al. (2008)	
	Change in utility	Change in effective age of retirement (years)	Relative impact on age of retirement (no early CPP=1)	Change in labour supply, 2018	Relative change in labour supply, 2018 (no early CPP=1)
CPP					
No early CPP	-0.34%	0.68	1.00	0.55%	1.00
Increase actuarial adjustment	-0.21%	0.63	0.92	0.43%	1.28
GIS					
CPP excluded from GIS entitlement calculation	0.54%	-0.27	-0.40	-0.38%	-0.88
Unadjusted CPP is used to calculate GIS entitlement	-0.05%	0.13	0.19	0.40%	0.93
CPP at age 60 is used to calculate GIS entitlement	0.10%	0.01	0.01	-0.20%	-0.47
Other public reforms					
No OAS clawback	0.04%	0.06	0.09	0.07%	0.16
Extending age of entitlement to programs by one year (61 and 66)	-0.20%	0.19	0.28	0.42%	0.98
Private					
Option A (PT only)	0.31%	-0.13	-0.20	NA	NA
Option B (PT and FT)	0.39%	-0.10	-0.15	NA	NA

The two remaining public pension scenarios have small positive impacts on the effective age of retirement. Extending the age of eligibility by one year had the greatest impact, increasing the effective age of retirement by 0.2 years and decreasing utility by 0.2%. Eliminating the OAS clawback had only a minor effect on work hours and utility.

Finally, changes to private pensions that allow bridge payments both have negative effects on age of retirement, the greatest impact being option A (bridge to part-time only). In both scenarios, there is an increase in part-time hours that is more than compensated by a decrease in full-time hours. The impact on utility is positive.

We can also see from Table 2 that the relative impact of the various policy scenarios (where the impact from the elimination of early CPP is set to one) on age of retirement is generally similar to the relative impact on labour supply found in Fougère et al. (2008).

DRAFT

In both cases, CPP reforms have the largest impacts, although GIS reforms and extending the age of entitlement to public pension of one year have greater relative impacts in Fougère et al. (2008). Differences can arise for many reasons. The microsimulation model derives short-term impacts, while CGE models take into account more variables: agents adapt, wages and capital-labour ratios or time spent in school vary in response to policy changes.

3.3 Results for specific groups

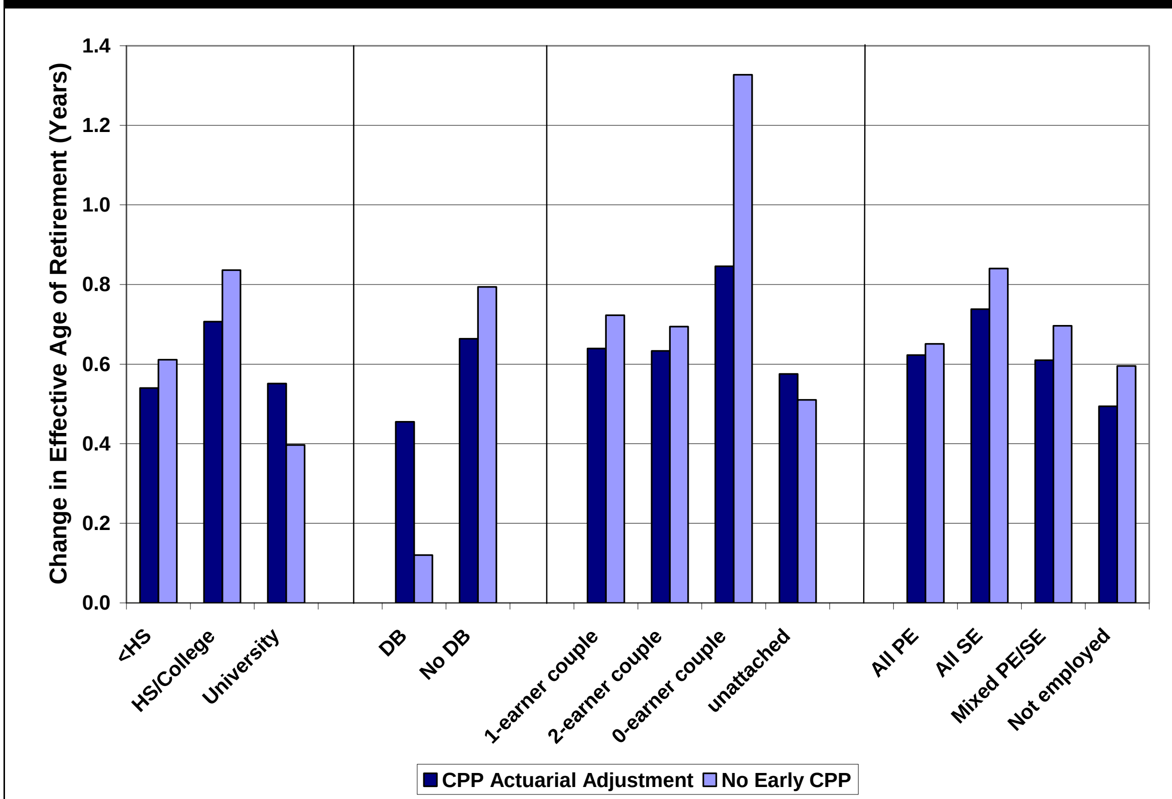
This sub-section analyses the impact of the various policy scenarios on the effective age of retirement for different groups of older workers. The impact on utility generally just goes in the opposite direction (figures containing results for utility are shown in Annex A). We will analyse in greater detail changes to the CPP, since they are the policies with the greatest impact on age of retirement.

CPP reforms

On average, the two policies related to the CPP have a similar impact on effective age of retirement, adding roughly eight months.

The distributional effects are somewhat similar in the two scenarios, as seen in Figure 1. In both cases, couples with no earner are the most affected, with an increase of 0.85 to

Figure 1 Change in Effective Age of Retirement, by Various Characteristics, CPP reforms



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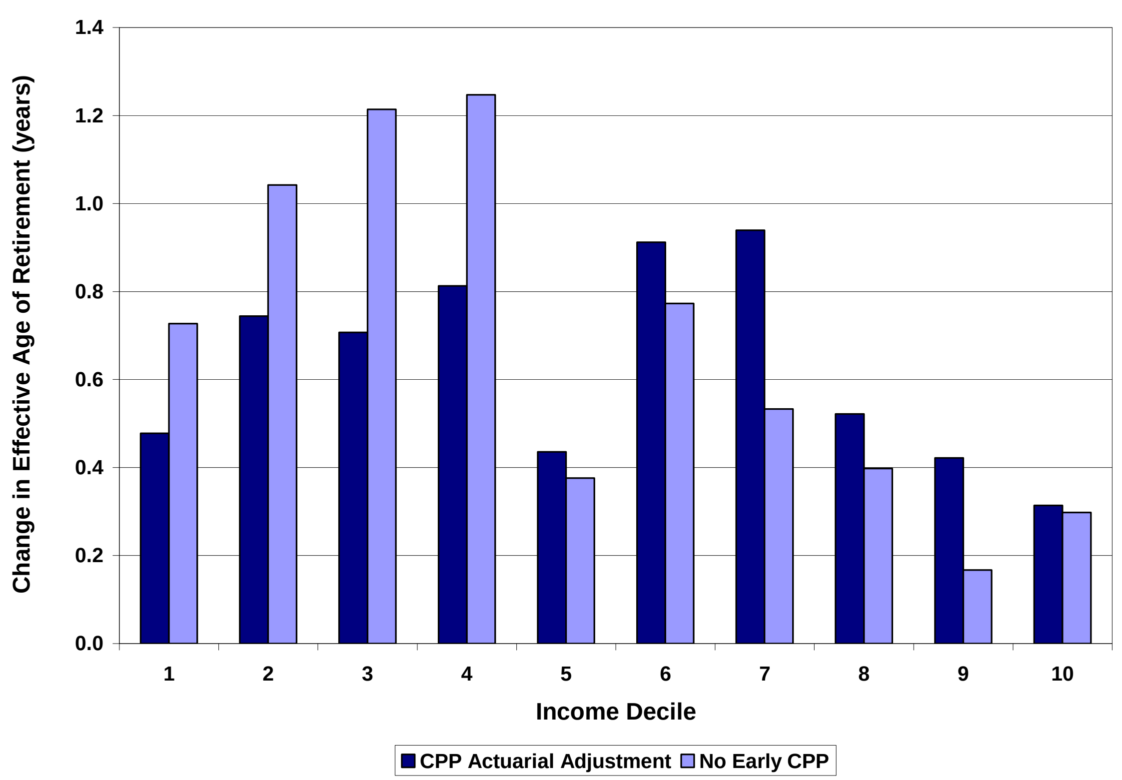
1.3 years in the effective age of retirement. In terms of education level, the most affected by the policy changes are those with a high school or college diploma. The self-employed also seem to be more affected than paid employees. It is also worth noticing (not shown in this figure) that the unemployed, who increase their working hours by less than average, are those who suffer the largest decrease in utility, probably because this group derives more of its income from early CPP receipt.

The elimination of early CPP has almost no impact on members of DB plans and a large impact on non-members: this is because most DB members retire before age 60. In addition, they receive pension income in the period CPP is no longer received. Therefore, they are less affected by this change. When we increase the actuarial adjustment rate, members of DB plans are also less affected, but the difference is much smaller. This is probably because DB members do lose significant income from the actuarial adjustment as they retire quite early.

Figure 2 Change in Effective Age of Retirement, by Income Deciles, CPP reforms



GIS reforms

The only GIS reform with a moderate positive impact on age of retirement is the scenario where the unadjusted value of the CPP is used to calculate GIS entitlement. In this case, as shown in Figures 3 and 4, the impact is larger for those with a lower level of education, who are not members of DB plans, couples with no earner, unemployed or self-employed individuals and those at the bottom of the income distribution. This is as expected since the GIS is intended for older Canadians with lower income.

Other reforms of the GIS don't have quite the same positive impact on the age of retirement. This is because, although they have a positive impact on the unemployed and the very bottom of the income distribution, they have a negative impact on the rest of the population. This is especially the case when CPP is excluded from the calculation of the GIS. This is because CPP is a large share of income. Therefore, eliminating it from GIS calculation causes many more people to be entitled to GIS, which increases their income and makes them retire earlier.

Figure 3 Change in Effective Age of Retirement, by Various Characteristics, GIS reforms

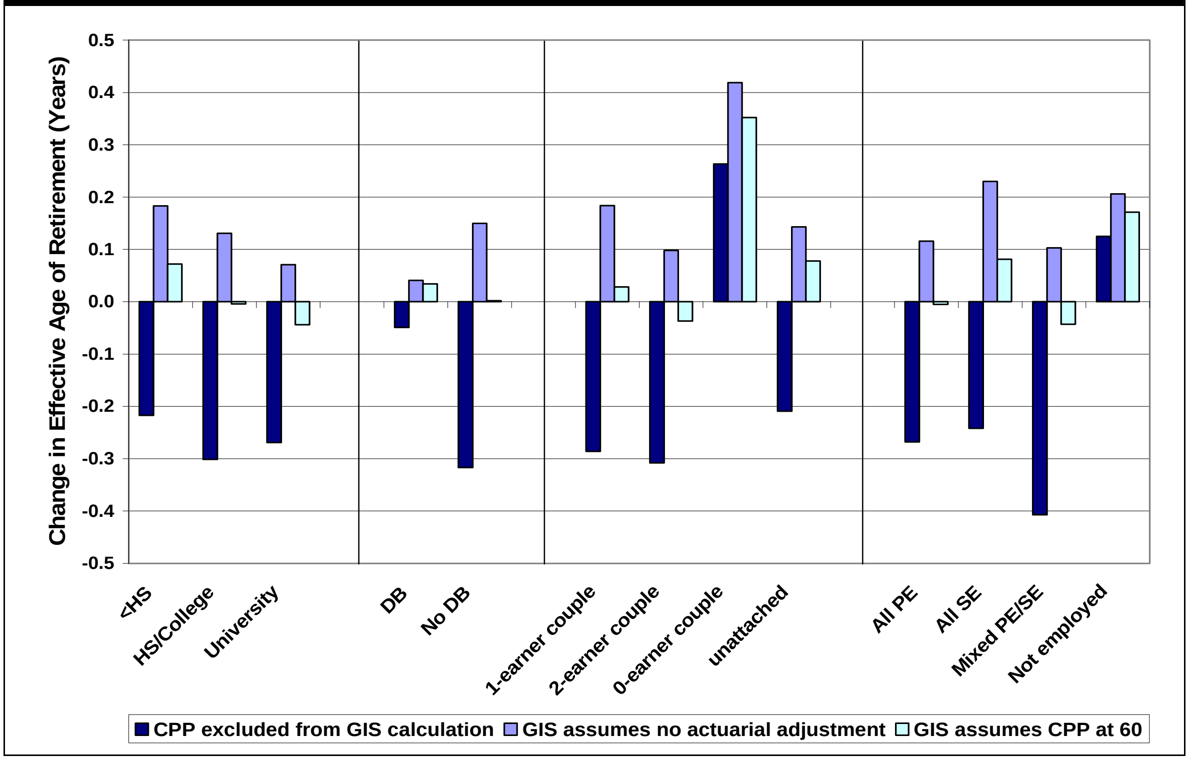


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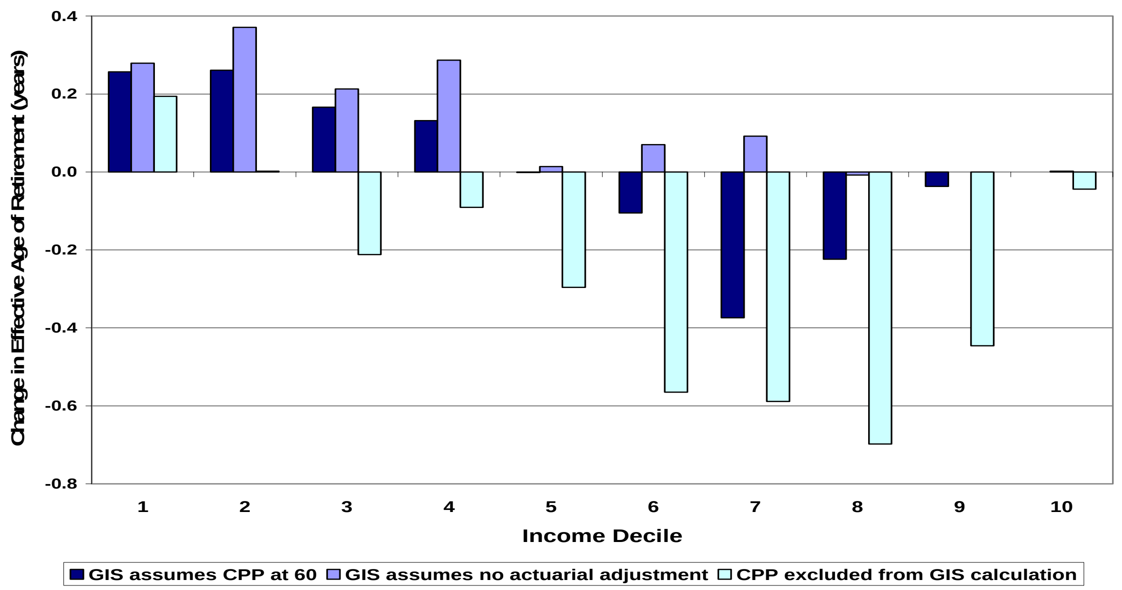
Figure 4 Change in Effective Age of Retirement, by Income Deciles, GIS reforms



Other public pension reforms

The two remaining changes to public pensions have a small positive impact on age of retirement, the delay of one year in eligibility to public pensions having a greater impact than the elimination of the OAS clawback. Unsurprisingly, the elimination of the OAS clawback affects more deeply the high-income individuals, with a higher level of education. Conversely, extending the entitlement age of one year has more impact on individuals with a low level of education, couples with no labour income earner and those at the lower end of the income distribution.

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Figure 5 Change in Effective Age of Retirement, by Various Characteristics, Other Public Reforms

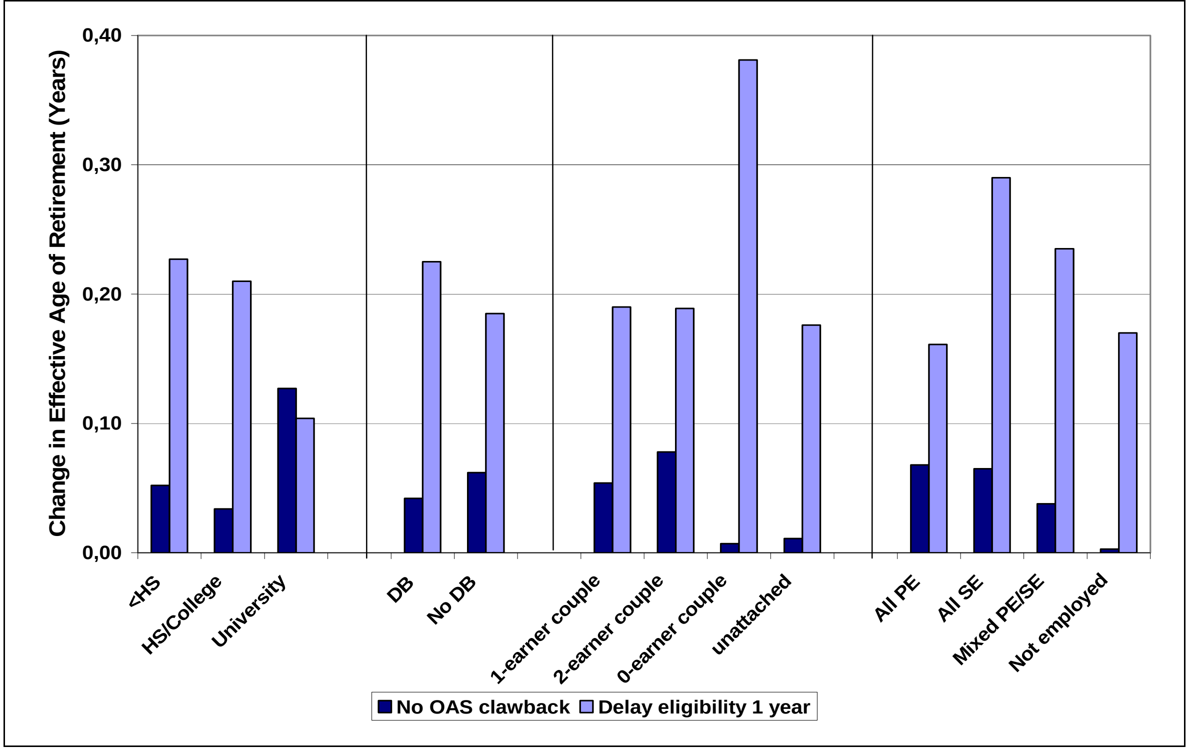
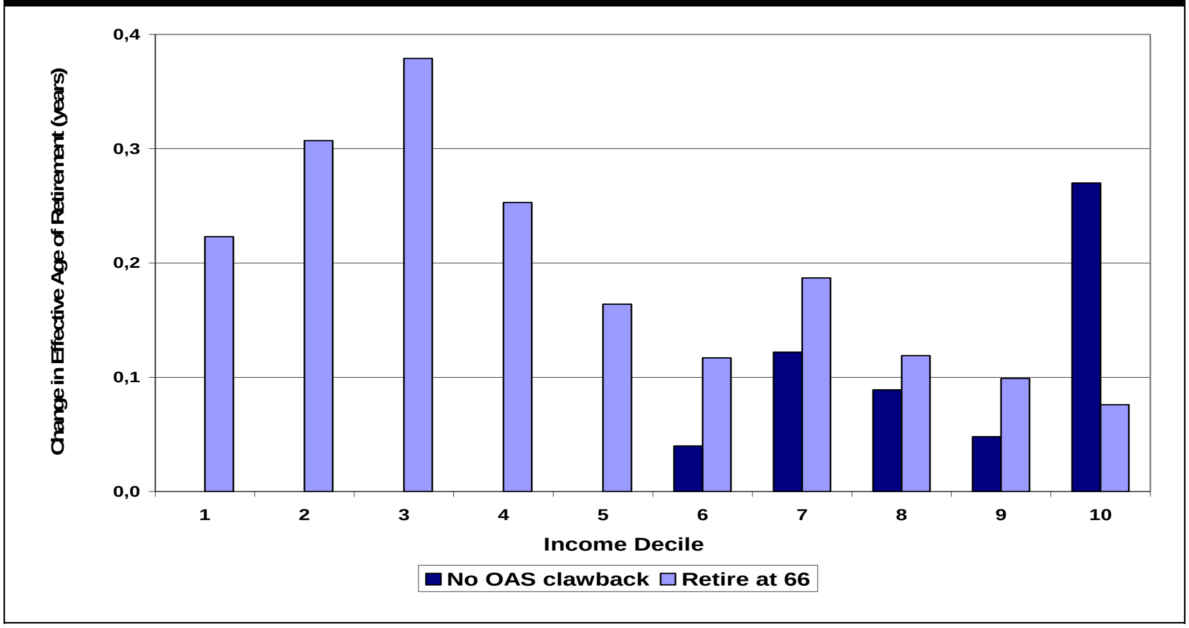


Figure 6 Change in Effective Age of Retirement, by Income Deciles, Other Public Reforms



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Private options

The policies aiming at facilitating the bridge employment of workers with DB plans have very similar impacts, both overall and when looking at the distributional impacts. Overall, the impact on retirement age is slightly negative in both cases. By definition, members of DB plans are the only ones affected by these changes. Individuals with a lower level of education and one or two earner couples are more affected. Those with very low or very high income are less affected.

Figure 7 Change in Effective Age of Retirement, by Various Characteristics, Private Options

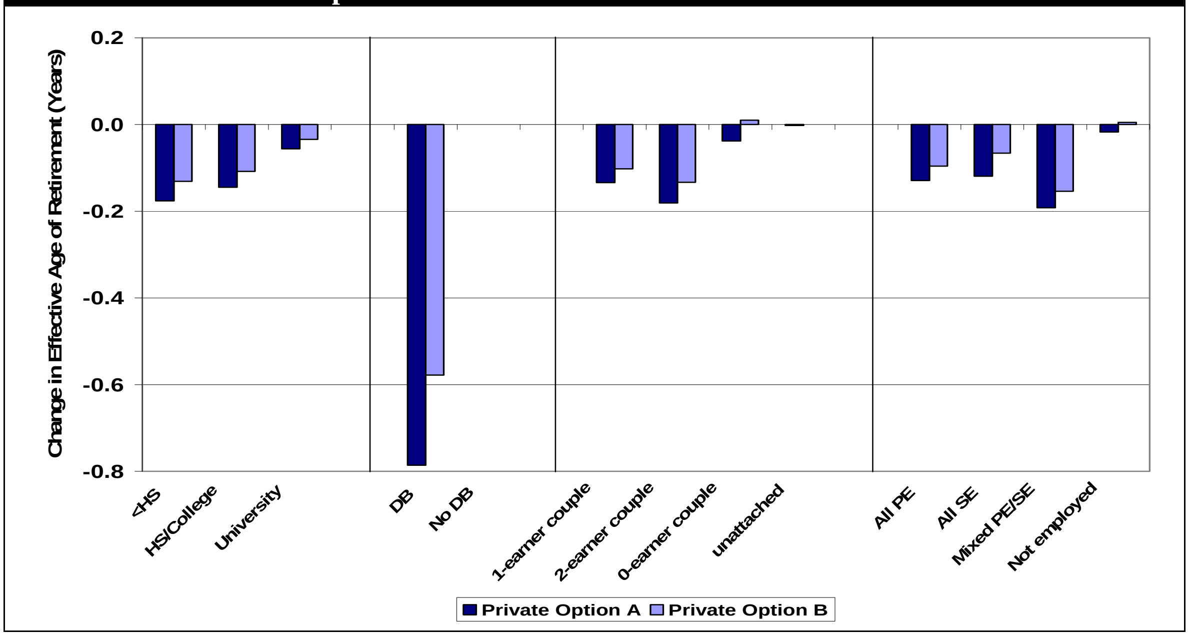

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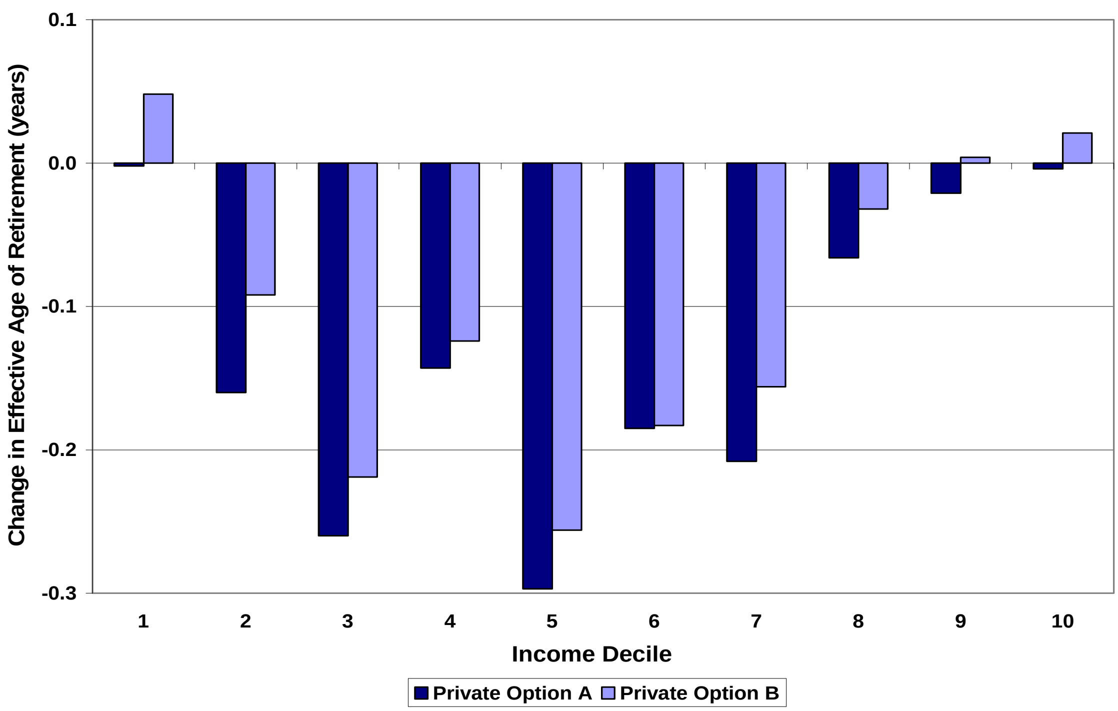
Figure 8 Change in Effective Age of Retirement, by Income Deciles, Private Options



4. Sensitivity

To test the reliability of the model results, the simulations were repeated using a variety of different assumptions. This section will provide an overview of the sensitivity tests. Overall, the model seems to be quite stable and the results do not vary a great deal across alternative assumptions. Only the results of one policy simulation are reported (the change in the CPP actuarial adjustment) for the sensitivity tests.

The most major revision made to the model to test its sensitivity was the introduction of an alternative utility function. As the model's results are driven by individual choice and the choice of that function is somewhat arbitrary, testing an alternative utility function was thought to be important. A Cobb-Douglas utility function was used for the alternative specification of utility. The Cobb-Douglas arises from the CES function used in the main paper when σ, the elasticity of substitution between income and leisure is equal to 1.

Overall, there were not significant variations in results between the original utility function and those described here. The change in hours of work was an increase of 1466 hours instead of 1256 in the CES case and the decrease in utility was only 0.03% instead of 0.21%. These are definitely variations from the original model but they do not change the overall story.

It was also reassuring that assumptions around parameter values did not have a significant impact on results. Changing the interest rate from 4% to 2% caused the career hours of work to increase more in response to the change in CPP actuarial adjustment (1378 hours instead of 1256) though not dramatically. Utility fell by 0.13% instead of 0.21%, again a noticeable difference but not one that changes the overall story told by the simulation. Similarly, changing the elasticity of substitution between income and leisure from 0.8 to 0.5 caused some change in behaviour (hours of work increased by 1090 instead of by 1256 and utility fell by 0.18% instead of by 0.21%) but the overall story remained unchanged.

5. Conclusions

Population ageing is a reality in Canada and will accelerate in coming years. From 1981 to 2005, the proportion of seniors in the Canadian population increased from 10 to 15%. This proportion could rise to 25% by 2031[5]. This paper analysed the impact of nine possible policy changes on the effective age of retirement and utility of older workers. The use of a microsimulation model allowed us not only to determine the overall effects of such policies but also to capture their distributional effects.

Overall, changes to the CPP, such as the elimination of early CPP and an increase in the actuarial adjustment from 0.5% to 0.8% a month had the greatest impact of all policies, increasing the effective age of retirement by approximately eight months. Extending the age of entitlement to public pensions by one year (from 60 to 61 for early CPP and from 65 to 66 for all other public pensions), and using the unadjusted value of CPP to calculate GIS entitlement had a positive but limited effect on the average age of retirement. Other reforms concerning the GIS, the elimination of OAS clawback, and options facilitating the bridge employment of workers with DB plans had small positive or even a negative effect on age of retirement. Generally speaking, the impact on utility was opposite to the impact on the age of retirement.

As for distributional effects, the results vary depending on the type of policy change. In the case of changes to the CPP, individuals who are not members of DB plans and couples with no earner are more affected. In the case of GIS reforms, the only reform with a positive impact on the age of retirement is the use of unadjusted CPP to calculate GIS entitlement, which mainly affects those with a lower level of education and at the bottom of the income distribution. For other GIS reforms, this positive impact is more than offset by a negative impact for those in the middle or at the top of the income distribution and those with a higher level of education. Extending the age of entitlement to public pensions by one year has a small positive impact, mainly on those with a lower level of education, no-earner couples and those at the bottom of the income distribution, while the elimination of the OAS clawback affects more deeply those with the highest income. Finally, private options only affect members of DB plans. Individuals in the middle of the income distribution, with no university education, are more affected.

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5 Statistics Canada, Population projections for Canada, provinces and territories, 2005-2031, catalogue no. 91-520-XIE.

Changes in utility from the various policy changes

Figure 9 Change in Utility (%), by Various Characteristics, CPP Reforms

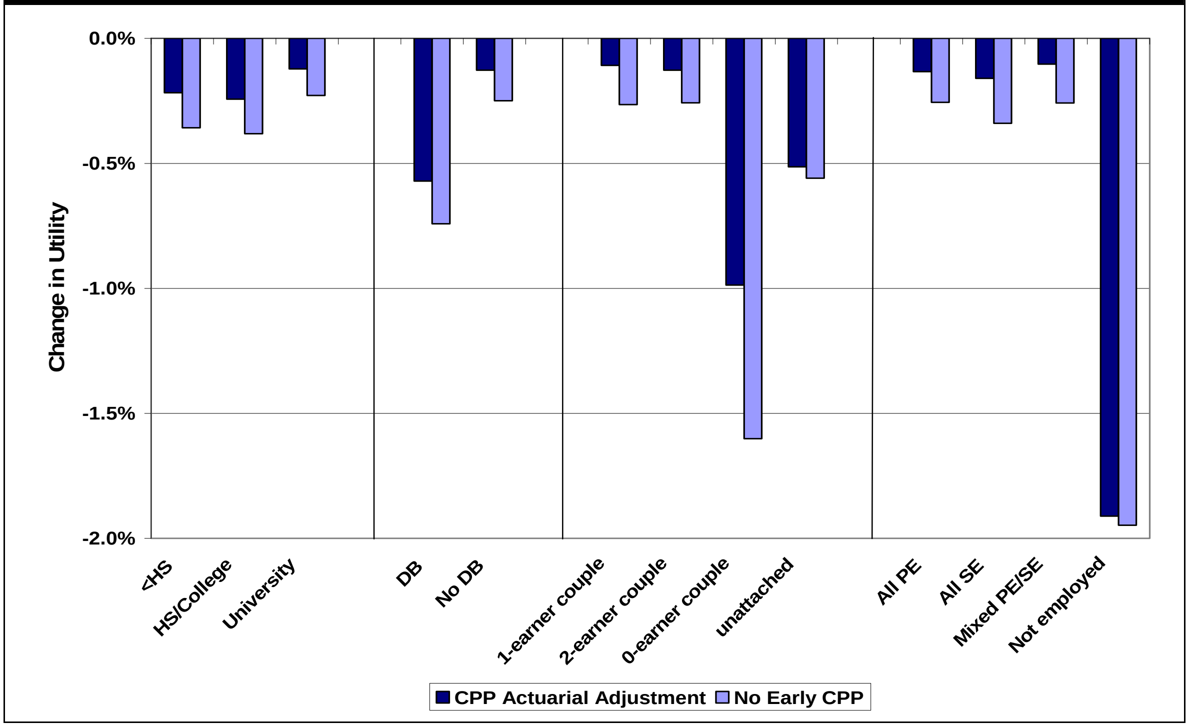

Figure 10 Change in Utility (%), by Income Deciles, CPP Reforms

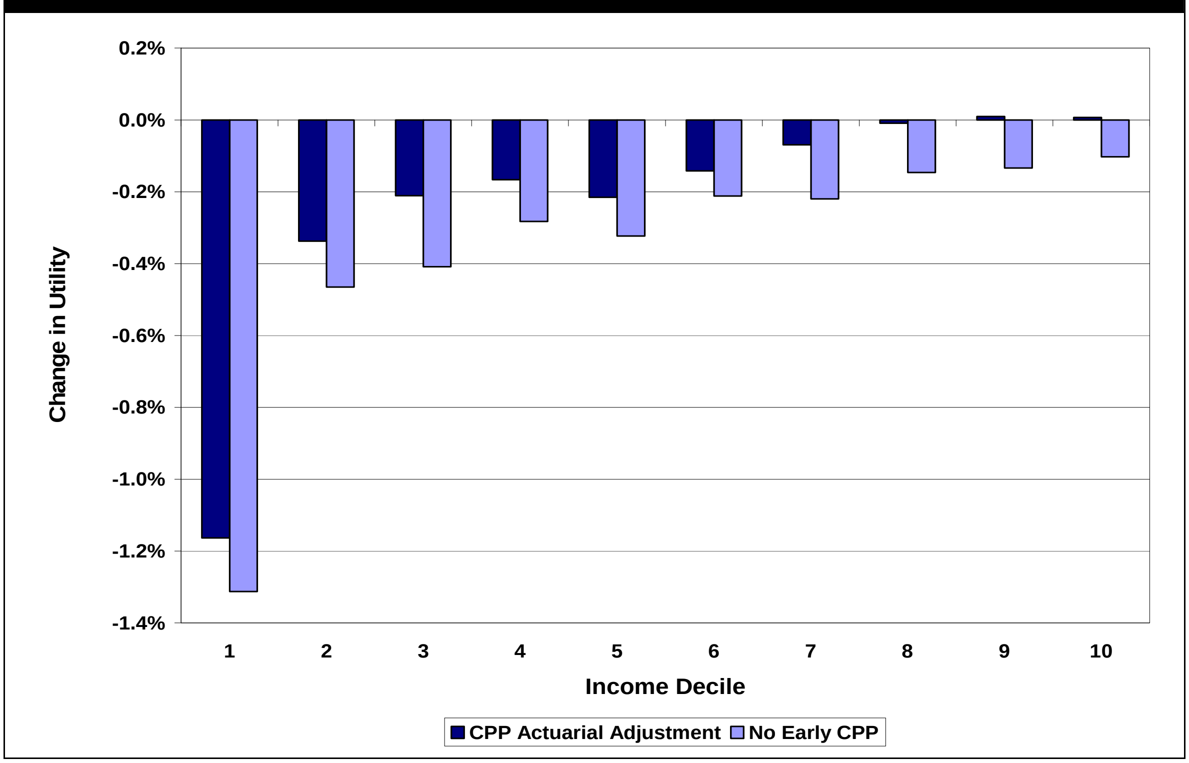

Figure 11 Change in Utility (%), by Various Characteristics, GIS Reforms

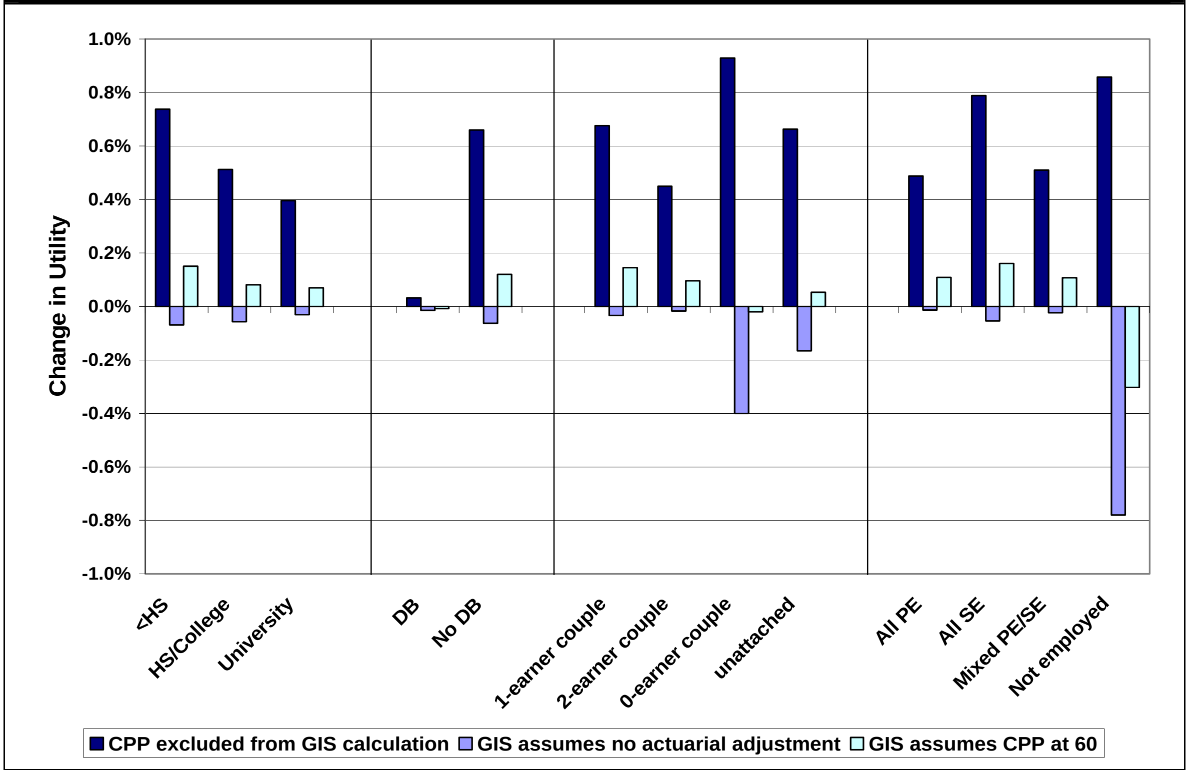

Figure 12 Change in Utility (%), by Income Deciles, GIS Reforms

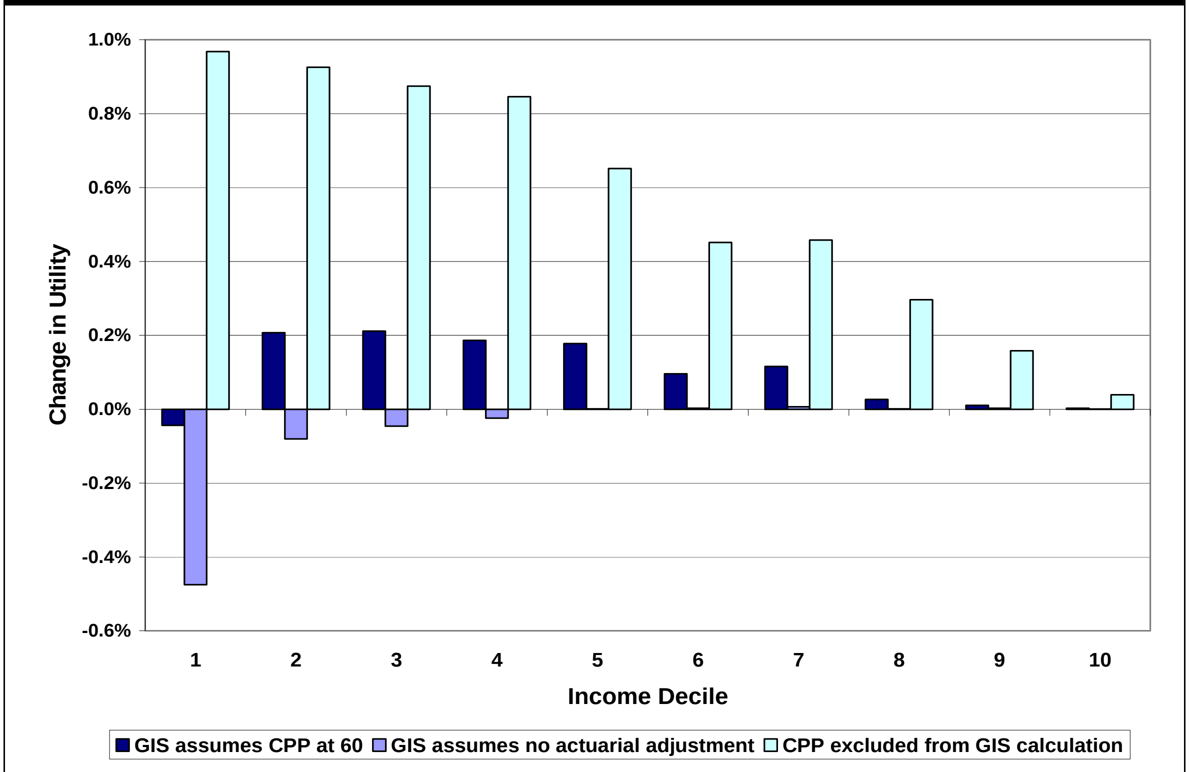

Figure 13 Change in Utility (%), by Various Characteristics, Other Public Reforms

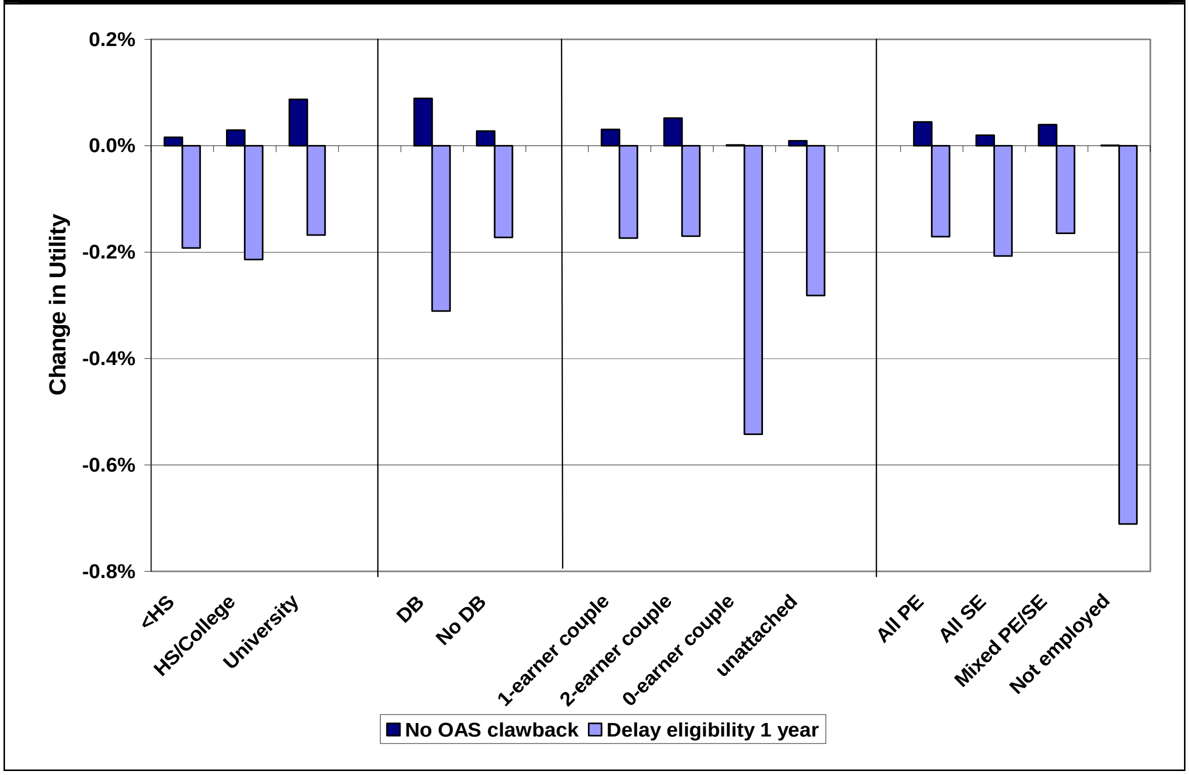

Figure 14 Change in Utility (%), by Income Deciles, Other Public Reforms

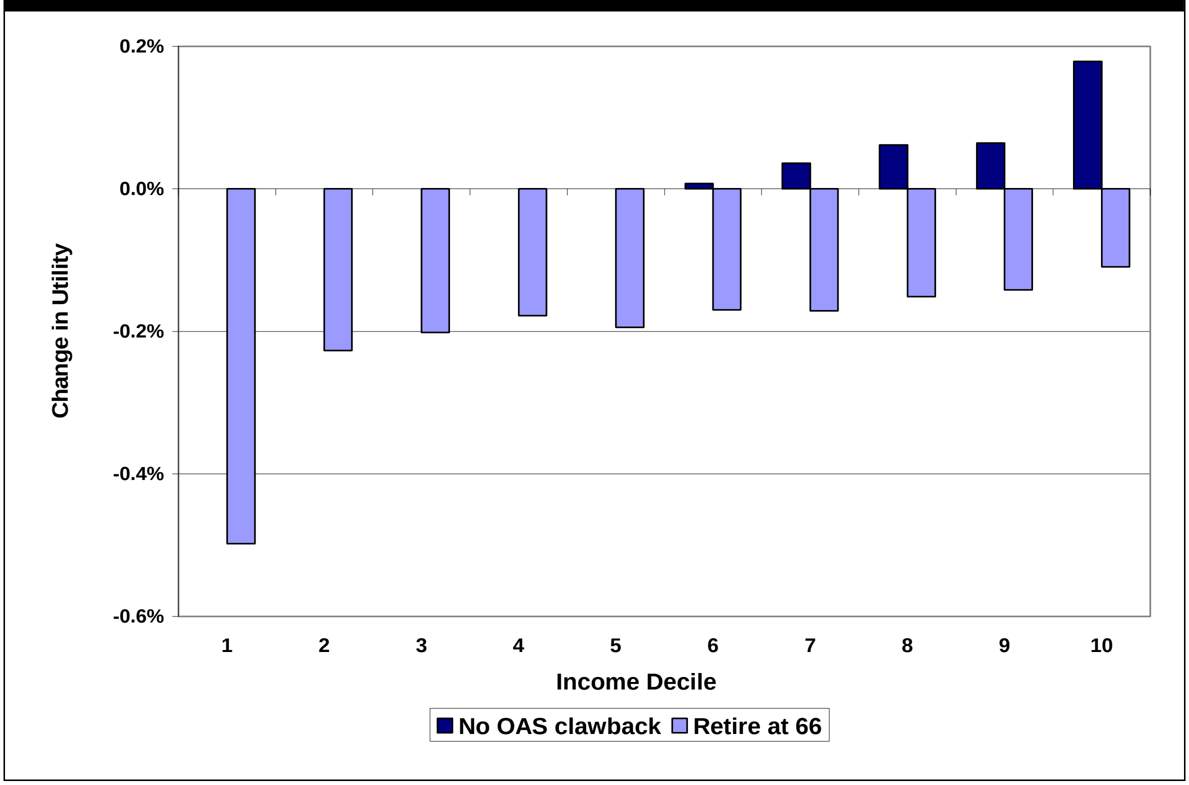

Figure 15 Change in Utility (%), by Various Characteristics, Private Options

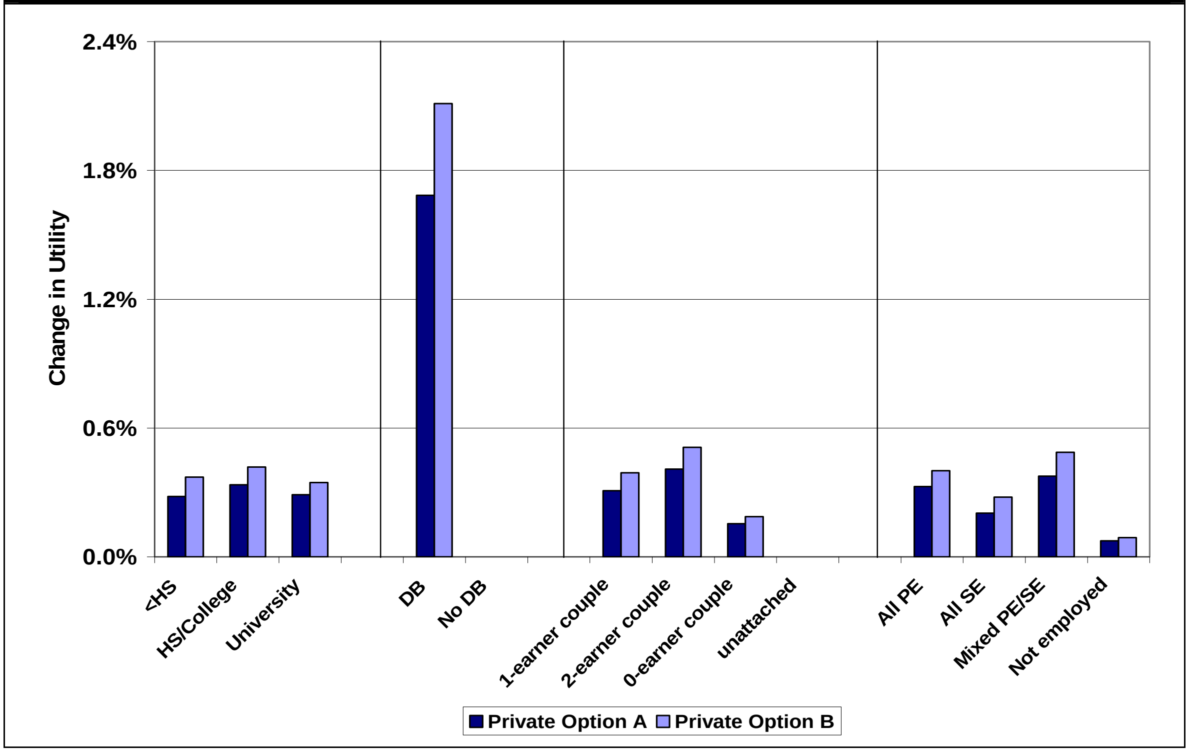

Figure 16 Change in Utility (%), by Income Deciles, Private Options