Simulated Replacement Rates for CPP Reform Options

Kevin Milligan
Vancouver School of Economics
University of British Columbia
kevin.milligan@ubc.ca

Tammy Schirle
Department of Economics
Wilfrid Laurier University
tschirle@wlu.ca

Draft: Comments Welcome*

November, 2013

This paper has been prepared for the Symposium on CPP Reform organized by the University of Calgary School of Public Policy and CIRANO.

* This draft may be cited as “Draft as circulated on November 28, 2013.”
1. Introduction

The previous round of reform to the Canada Pension Plan in the 1990s resulted in several critical changes to the financing of the Plan, but only minor changes to the benefit formula. In recent years, concerns over the soundness of Canadians’ retirement savings and pension adequacy have led to a series of proposals and discussion of ways to build on the financing reform of the 1990s by expanding Canada Pension Plan benefits. In his chronicle of the 1990s reform, Little (2008) describes the lengthy and complicated process that led to an agreement. The current round of reform discussions has followed a similar winding path, but we now seem to have arrived at a point when decisions among the various options may soon be made.

We have two goals for this paper. First, we set out the current state of retirement income adequacy by drawing on new and existing evidence on retirement incomes in Canada. We find that there is a group of Canadians—middle and higher earners without employment-based pensions—that is at higher risk for inadequate pension income. We then simulate several proposals for reform in order to assess how they might change the pattern of retirement income across the earnings distribution. Our findings suggest that proposals such as the PEI proposal and the Wolfson Wedge do a good job at targeting the impact of CPP reform where it might be most needed. We also show that a simpler reform—an upward expansion of the pensionable earnings cap—would yield very similar results with less complication. We conclude by noting that the case for reform depends critically on how one views the role of government in alleviating undersaving by middle and high earners.
2. What is the Problem we’re trying to fix?

The calls for Canada Pension Plan (CPP) reform centre on the future retirement incomes of working Canadians without a workplace pension plan. In this section, we review and assess the evidence that underlies these calls for reform. We look first at overall trends in the income of seniors over the past four decades, then turn our attention to evidence on the adequacy of income in retirement compared to earnings when working. Finally, we examine pension coverage rates in Canada.

2.1 Trends in Elderly income

Elderly incomes in Canada have been growing steadily over the last forty years.\(^1\) The growth has occurred across the income distribution. This can be seen readily in Figure 1, which graphs percentiles of after-tax family incomes for those aged 65 and older from 1973 to 2010 using data drawn from household surveys. All data is adjusted to 2012 dollars using the consumer price index. The percentiles we show are the 10\(^{th}\), 50\(^{th}\), and 90\(^{th}\). For comparison, we also show the median income for families headed by a person aged 25 to 54, which we refer to as ‘prime’ age.

While there has been growth at all parts of the distribution, there are some different trends at the bottom and top ends. Incomes at the 90\(^{th}\) percentile for the elderly and for the 50\(^{th}\) percentile prime aged didn’t make much progress through the 1980s and 1990s, but have since seen steady growth. The 90\(^{th}\) percentile touched over $70,000 in 1982, and then stayed close to that number.

---

\(^1\) Further information on the trends in Canadian elderly income can be found in Baker and Milligan (2009), with analysis of low-income in particular in Milligan (2008) and Schirle (2013).
until 2005 when it broke strongly upwards. For the 50th percentile prime earners, incomes declined until the mid-1990s, when growth resumed. In contrast, those at the 10th and 50th percentile of the elderly income distribution saw steady growth over the whole period. At the 10th percentile, income in 1977 was $9,127. Thirty years later in 2007, this had more than doubled to $18,473. The growth of incomes at the 50th percentile for the elderly was modest, but continued over the entire period.

Figure 1: Income Trends, 1973-2010

Notes: The data are drawn from the Survey of Consumer Finances for 1973 to 1997, and the Survey of Labour and Income Dynamics for 1998 to 2010. We graph the 10th, 50th, and 90th percentile of economic family income for families with the reference person age 65 and older (elderly) and the 50th percentile for those between 25 and 54 (prime). All dollar values adjusted to 2012.

The next graph sets an index equal to 100 for each of the four income percentiles in 1995, which allows the percentage growth to be seen more clearly. Figure 2 displays the same four percentiles
as in Figure 1, but in index form. The year 1995 was chosen because it was the mid-1990s that saw a return to income growth for the 50th percentile of prime earners after 15 years of stagnation. Since 1995, there has been growth at all parts of the elderly income distribution, but the growth was stronger at the 90th and 50th percentiles than at the 10th. Moreover, growth in 50th percentile prime income was stronger still, rising about 20 percent over this period.

Figure 2: Index of Income Trends 1995-2010

Notes: The data are drawn from the Survey of Consumer Finances for 1985 to 1997, and the Survey of Labour and Income Dynamics for 1998 to 2010. For all data, we set an index equal to 100 in 1995. We graph the 10th, 50th, and 90th percentile of economic family income for families with the reference person age 65 and older (elderly) and the 50th percentile for those between 25 and 54 (prime).

The final graph looking at incomes examines those below two different low-income lines. We use the after-tax Low Income Cut-Off (LICO) line that was set in 1992, and has since been
updated only for changes in the consumer price index. We also show the data for the after-tax Low Income Measure (LIM), which forms an income cut-off at half the 50th percentile of income adjusted for family size—this line moves around through time as the 50th percentile of income shifts. Figure 3 shows the proportion of elderly Canadians living in families/households that have incomes under each of the two lines.

**Figure 3: Low Income Among Elderly 1976-2011**

![Graph showing Low Income Among Elderly 1976-2011](image)

Notes: The data are drawn from CANSIM Table 202-0802. We graph the proportion of Canadians over the age of 65 living in a family with income below the after-tax Low Income Cutoff (AT LICO) and the after-tax Low Income Measure (AT LIM).

Both the LICO and the LIM show great improvements from the 1970s to the 1990s. From the mid-1990s, however, the paths taken by the LICO and the LIM for the elderly have diverged.

---

2 See Murphy, Zhang, and Dionne (2012) for a recent review of low income measurement in Canada. Note that we use the updated LIM numbers that account for the new household rather than economic family basis.
The LIM showed less low-income in the 1990s and more in the 2000s, with the LICO showing opposite trends. The reason for these seemingly confusing trends can be seen quite clearly by looking back at Figure 1 and Figure 2. The LIM is based on the 50\textsuperscript{th} percentile of household income in Canada. In the mid 1990s, the 50\textsuperscript{th} percentile of income was dropping, meaning that the cut-off for the LIM was dropping. Even if elderly income were stagnant the proportion under the LIM would shrink as more elderly households make it over the slumping LIM line. In contrast, as the 50\textsuperscript{th} percentile of income has grown since 1995, the LIM cutoff has grown along with it. Even though elderly incomes are growing, they have not been growing as quickly as the LIM cutoff.

The clear conclusion to take away from Figure 3 is that elderly incomes at the bottom have been growing, but not as quickly as the incomes of the rest of Canadians since 1995. Whether this represents a problem depends on the degree to which it is important for the elderly to keep up with the incomes of younger Canadians, or whether the elderly care more about maintaining the lifestyle they had themselves when younger.

Overall, the incomes of elderly Canadians do not show obvious signs of distress. Compared to the 1970s, elderly incomes are much higher, and have gained relative to prime-age Canadians. However, in recent years the income growth of elderly Canadians has lagged those of other Canadians by a bit. Later in this paper when we describe policy tools, we will assess how well an expansion to the Canada Pension Plan might address this potential weakness.
2.2 Retirement income replacement rates

Beyond looking at the level of incomes of the elderly, a common way to characterize the adequacy of elderly incomes is to compare the income when retired to the income of the same family when working, and ask what proportion of the working income is ‘replaced’ by retirement income. The resulting so-called ‘replacement rates’ are often calculated and compared to benchmarks to assess the adequacy of retirement income.

How high replacement rates need be is an open question.\(^3\) It is commonly assumed that the elderly need not have 100 percent of the income they had when younger for a number of reasons. For example, work expenses (commuting, clothing) are no longer necessary. Also, retirement affords more time for shopping and doing work around home, reducing household expenses. Mortgages and children no longer take the centre of family budgets at these ages, and the consumption flow from a lifetime of durable purchases can be enjoyed. While every family might have a different view on the adequate replacement rate, the range of 50% to 70% comprises what most would consider to be adequate replacement.

We do not conduct our own analysis of overall replacement rates here. Instead, we draw on the work of Ostrovsky and Schellenberg (2010) who produce replacement rates for a cohort in which the men reached age 55 to 57 in 1991 using a large longitudinal administrative data set.\(^4\) Their analysis compares the replacement rates of families characterized by whether or not either spouse has income from an employment-based pension. This is quite important for

---

\(^3\) See Baker and Milligan (2009) for an extensive discussion and references on replacement rates.

\(^4\) They use the Longitudinal Administrative Database, which is based on the tax forms of a 10 percent sample of Canadians. See also LaRochelle-Côté, Myles, and Picot (2008) for similar analysis and findings.
understanding the role of any expansion to the Canada Pension Plan, since it is those who lack an employment-based pension who would see the largest potential gain from any such expansion.

In Table 1, we create replacement rates based on the data appearing in Ostrovsky and Schellenberg (2010). The table splits the sample of elderly Canadian couples into five quintiles, based on their earnings when working. These quintiles range from the lowest earnings quintile at the top of the table to the highest earnings quintile at the bottom. For each quintile, the shaded row reports the proportion of couples in which neither spouse has a workplace pension and the proportion in which at least one of the spouses does have a workplace pension. Below that, we report the distribution of couples across three replacement rate categories: those under 50 percent; between 50 and 69 percent; and 70 percent or more.

The data show that 77.3 percent of couples in the lowest quintile have no workplace pension income from either spouse. However, 95.6 percent of these couples maintain a replacement rate of 70 percent or more. For the 22.7 percent of couples in the lowest income quintile with a workplace based pension, the proportion with a replacement rate of 70 percent or more is 96.6 percent. These high replacement rates reach the standard benchmark of adequacy, likely because most of these families receive substantial income from the public pension system.

---

5 We take the distribution of couples across the different replacement rate cells for each quintile in their Appendix Table 1. We then combine this with the proportion of families of each type as appearing in their Table 2 to form the data we present here.
### Table 1: Replacement Rates from Ostrovsky and Schellenberg (2010)

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Whether couple has pension or not</th>
<th>Neither spouse</th>
<th>One or both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest</td>
<td>Percent with pension</td>
<td>77.3</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td>Replacement rates:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>0.8</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>50-69</td>
<td>3.7</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>95.6</td>
<td>96.6</td>
</tr>
<tr>
<td>2nd</td>
<td>Percent with pension</td>
<td>46.7</td>
<td>53.3</td>
</tr>
<tr>
<td></td>
<td>Replacement rates:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>5.5</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>50-69</td>
<td>38.9</td>
<td>28.2</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>55.6</td>
<td>69.7</td>
</tr>
<tr>
<td>3rd</td>
<td>Percent with pension</td>
<td>31.0</td>
<td>69.0</td>
</tr>
<tr>
<td></td>
<td>Replacement rates:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>23.9</td>
<td>9.4</td>
</tr>
<tr>
<td></td>
<td>50-69</td>
<td>33.0</td>
<td>39.9</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>43.2</td>
<td>50.8</td>
</tr>
<tr>
<td>4th</td>
<td>Percent with pension</td>
<td>22.1</td>
<td>77.9</td>
</tr>
<tr>
<td></td>
<td>Replacement rates:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>27.9</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>50-69</td>
<td>26.8</td>
<td>41.2</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>45.3</td>
<td>43.0</td>
</tr>
<tr>
<td>Highest</td>
<td>Percent with pension</td>
<td>23.0</td>
<td>77.0</td>
</tr>
<tr>
<td></td>
<td>Replacement rates:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>38.9</td>
<td>17.8</td>
</tr>
<tr>
<td></td>
<td>50-69</td>
<td>23.0</td>
<td>38.3</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>37.9</td>
<td>43.9</td>
</tr>
</tbody>
</table>

Notes: For each quintile, the shaded row reports the proportion of couples for which neither has a pension and for which one or both has a pension. Below that, we show the distribution of couples in each quintile across three ranges of replacement rates. The source for all the data appearing here is Ostrovsky and Schellenberg (2010).
Looking further down Table 1, those in the 2nd quintile also appear to have fairly adequate income replacement, with very few falling under the 50 percent replacement rate benchmark. Upon reaching the 3rd quintile, however, things begin to change, with 23.9 percent of those without workplace pensions falling under the 50 percent replacement rate level. In the 4th and 5th quintiles, the proportion of couples under a 50 percent replacement rate is 27.9 percent and 38.9 percent. In some contrast, those with one or both couple members having a workplace pension look much better.

This analysis provides a summary of some of the pension inadequacy issues that have raised the demands for expansion of the Canada Pension Plan. It is important to point out that the adequacy problem revealed by the analysis is not widespread, but targeted. It affects a portion of those in the top three quintiles of lifetime earnings and is much more of a problem for those without an employment-based pension.

### 2.3 Proportion of Canadians Covered by Registered Pension Plans

An important motivation for expanding the Canada Pension Plan is the concern that future generations of Canadians will not enjoy the same income security and replacement rates as current retirees, and this is in part due to an expected decline in registered pension plan coverage over time.\(^6\) With respect to income security, an important concern is the relative increase in the portion of registered pension plans that are defined contribution pension plans instead of defined

\(^6\) See for example Baldwin (2010).
benefit pension plans. More generally, as demonstrated in Table 1, income replacement rates tend to be lower among those who do not have registered pension plan income.

Unfortunately Canadians have very little publicly available data for judging the extent to which future generations will be covered by registered pension plans and what their replacement rates might be.\(^7\) We know that the portion of the elderly receiving income from a registered pension plan is higher now than ever in Canadian history. According to tabulations by Schirle (2012), in 1977-79 only 33% of men and 17% of women age 65 and over received employer pension income. In 2006-08, 71% of men and 61% of women age 65 and over received employer pension income. This dramatic increase in pension coverage has played an important role in raising the incomes of seniors across the income distribution, including the incomes of seniors in the lower half of the senior income distribution.

Moore et al. (2010) have developed projections for replacement rates using the Statistics Canada LifePaths model and available information regarding income, pensions, savings, and other economic behaviour and circumstances. Their results indicate that while few current retirees face a substantial reduction in consumption post-retirement, future retirees may face greater difficulties. In particular, while only about 16% of recent retirees face inadequate replacement rates upon retirement, about 44% of current 25-30 year olds are expected to have inadequate replacement rates. There are several factors driving these projections, but the authors point to two key factors – (i) an expectation that productivity-driven increases in earnings will be higher

\(^7\) It is possible to estimate pension coverage by age and birth cohort from the Longitudinal Administrative Database. However, the data is not yet readily available to researchers outside Statistics Canada.
than expected increases in Old Age Security benefits and (ii) a declining share of private sector workers participating in registered pension plans affecting primarily new membership in RPPs.

In Figure 4 we present information on registered pension plan coverage in Canada. The historical series from 1976-2011 shows the total number of registered pension plan members as a portion of all employed individuals or individuals in the labour force, aged 15 and over. The overall trend is not clearly declining after the late 1990s. However, there are important demographic changes in the labour market over this period that are easily masked here.

Figure 4: Registered Pension Plan Coverage

Source: 1976-2011 coverage rates based on CANSIM Table 280-0008 (Total members of registered pension plans in the public and private sector) and Table 282-0002 (Employment or Labour force participants, age 15 and over). The 1996-2009 rates are based on the Survey of Labour and Income Dynamics PUMF files, representing the portion of individuals by age reporting they have a pension plan with their employer.
Unfortunately, comparable statistics for plan membership are not readily available for smaller age groups. So, we create our own series using information from individual-level data in the Survey of Labour and Income Dynamics that allows us to break down pension coverage by age group. These data can also be seen in Figure 4, where we graph the self-reported pension coverage of individuals, representing paid workers’ main job during the years 1996-2009. Interestingly, pension coverage appears to increase for the youngest members of the workforce over this period while remaining stable for more experienced workers.

In Figure 5, we separate the 1996-2009 trends for private and public sector workers. The first two panels (A and B) demonstrate that coverage for the youngest workers (aged 25-29) has increased for both private and public sector workers. The trends diverge for older groups of public and private sector workers. In the private sector, the largest declines in coverage are observed for those aged 40-59 and this likely reflects a persistence of the large declines in RPP coverage of the 1990s. This is also the group that would dominate the aggregate trends in pension coverage presented in Figure 4, given the relative size of the baby boom cohort currently at these older ages. The general increase in pension coverage for public sector employees, particularly younger employees is important for future trends in pension coverage given the general increase in the portion of paid workers that are working in public sector jobs (Panel C of Figure 5).
Figure 5: Registered Pension Plan Coverage by Sector and the Proportion of Workers in the Public Sector, 1996-2009.

A. Private Sector Workers

B. Public Sector Workers

C. Proportion of Workers in the Public Sector

Source: Authors’ tabulations, Survey of Labour and Income Dynamics.
Overall, it is not clear that we should expect lower registered pension plan coverage in the future. Pension coverage among the employees aged 25-29 is rising in both the private and public sectors while coverage for 30-39 year olds appears stable in the private sector. An increasing portion of workers is appearing in the public sector and public sector pension coverage rates are generally increasing. Following the retirement of the baby boom cohort, it is not obvious that we should expect declining pension coverage among future cohorts of retirees.

3. Policy Options

The previous section provided evidence indicating the source of the pension problem in Canada. The current system appears to do an adequate job replacing income for the majority of Canadians. However, those in the upper three quintiles without a workplace pension do seem to be at elevated risk of arriving in retirement with inadequate resources.

The Canada Pension Plan does seem to be the right policy tool for this task. The Old Age Security Pension and the Guaranteed Income Supplement are appropriate tools if one aims to increase redistribution, as they are most important income sources for lower earners. However, for targeting those in the upper earnings quintiles, the Canada Pension Plan is best placed among the existing public pension programs to provide extra earnings replacement.

With that in mind, we examine three proposals for reform to the Canada Pension Plan. Below, we describe each of them in turn. First, however, we describe the core functioning of the existing status quo Canada Pension Plan, as well as the other main public pension plans.
3.1 Current Canada Pension Plan

While working, individuals and their employers make contributions to the Canada Pension Plan on all earnings between the Year’s Basic Exemption (YBE) and the Year’s Maximum Pensionable Earnings (YMPE). In 2013, the YMPE was $51,100 and the YBE is at $3,500.

The annual benefit received from the Canada Pension Plan upon benefit take-up will depend on individuals’ average earnings based on the relevant years of their earnings history an only covers earnings up to the YMPE. To calculate benefits, an individual’s earnings in each month of work are compared to the YMPE. The ratio of earnings to YMPE are then averaged, and we refer to this average ratio as AVGEARN. If, for example a person always earned ½ of YMPE, their average ratio would be 0.5. If a person always earned more than the YMPE, their average ratio would be 1. The CPP replacement rate is set at 25%. In the calculation of benefits, an average of the previous five years’ YMPE is used in the following formula:

\[ \text{CPP Pension} = 25\% \times \text{AVGEARN} \times \text{YMPE}^{5} \]  

Along with the CPP, most Canadian seniors are also eligible for the Old Age Security pension (OAS), and its component the Guaranteed Income Supplement (GIS). The OAS pension is a flat, taxable benefit paid to all Canadians age 65 and older who satisfy a lifetime residency test. The monthly amount as of September 2013 is $550.99 per month. There is an income test, which

---

8 See Milligan and Schirle (2008) for more details on years that are included in a person’s earnings history for the purposes of determining average earnings. Individuals have the opportunity to omit years spent at home with young children, years of disability, and some years of low-earnings from that history.

9 Full details can be found at [http://www.servicecanada.gc.ca/eng/services/pensions/oas/payments/index.shtml](http://www.servicecanada.gc.ca/eng/services/pensions/oas/payments/index.shtml)

10 One must have lived in Canada for ten years to receive any OAS. For those who have lived in Canada for fewer than 40 years, a reduced OAS pension is paid.
reduces OAS payments by 15 cents per dollar of income above $70,954. The GIS is a non-taxable supplement paid to OAS recipients who have lower incomes. The maximum benefit for GIS is $747.11 for single recipients. The income test is performed by reducing GIS benefits by 50 cents for each dollar of non-OAS income.\textsuperscript{11} Those singles with non-OAS income above $16,704 will not receive any GIS.

The OAS and GIS are important for understanding the CPP for two reasons. First, OAS income is taxable, so getting the tax liability correct for the CPP benefit requires assessing the OAS income amount. Secondly, there is an important interaction between GIS and CPP benefits, as documented in Milligan and Schirle (2008). Any extra CPP benefits an individual receives will result in the loss of GIS benefits for those who are in receipt of the GIS. This means that lower income elderly Canadians who receive the GIS would on net receive only half of any expansion to the CPP.

\textbf{3.2 Big CPP}

Earlier proposals for CPP expansion called for a doubling of the CPP’s replacement rate to 50\%.\textsuperscript{12} This requires a simple adjustment to the CPP pension formulas as follows:

\[
\text{CPP Pension} = 50\% \times \text{AVG EARN} \times \text{YMPE}^5.
\]

(2)

This proposal focuses attention on those up to the current YMPE, rather than expanding coverage to those at higher earnings ranges.

\textsuperscript{11} $3500$ of employment earnings are exempt from the GIS income test.
\textsuperscript{12} For example, the Canadian Labour Congress had proposed this in 2010. See http://www.canadianlabour.ca/action-center/retirement-security-everyone/retirement-security-reform-1-double-cpp-benefits
3.3 Wolfson Wedge

Economist Michael Wolfson proposed a refinement to the ‘Big CPP’ proposal to shift the focus away from those at lower lifetime earnings (few of whom have inadequate replacement rates) and onto those in the middle and upper quintiles of lifetime earnings. Those with earnings up to half the YMPE would see no change to the replacement rate. Those with earnings from half the current YMPE up to two times the current YMPE would see an enhanced replacement rate of 40% for earnings in that range. Above the two-times-YMPE level, there would be no further CPP coverage. This plan inserts a ‘wedge’ with the higher 40% replacement rate for middle and higher earners.

\[
\text{CPP Pension} = 25\% \times 0.5 \times \text{YMPE}^5 + 40\% \times (2\times\text{YMPE}^5 - 0.5\times\text{YMPE}^5) \tag{3}
\]

3.4 PEI plan

The proposal made by the Minister of Finance for Prince Edward Island has some of the features of the Wolfson Wedge, but with a lower replacement rate for higher earners. This plan maintains replacement rates for average earnings up to half the current YMPE, provides a 40% replacement rate on earnings between half and the current YMPE and then provide additional coverage with a replacement rate of 15% on earnings between 100% of the current YMPE and 200% of the current YMPE. The full CPP pension formula then depends on individuals’ average earnings. For an individual with high earnings above twice the existing YMPE, we have the following:

\[
\text{CPP Pension} = 25\% \times 0.5 \times \text{YMPE}^5 + 40\% \times (\text{YMPE}^5 - 0.5\times\text{YMPE}^5) + 15\%(2\times\text{YMPE}^5 - \text{YMPE}^5) \tag{4}
\]

\[13\] See Wolfson (2011) and Wolfson (2013) for the complete details.
For those with lower earnings, the AVGEARN will enter the formula in a manner similar to the current CPP formula structure.

### 3.5 Double YMPE

As an illustrative example, we also present a more modest proposal to expand the level of earnings covered by the Canada Pension Plan by doubling the YMPE without changing the replacement rates offered. The resulting CPP benefit formula is simply:

\[
\text{CPP Pension} = 25\% \times \text{AVGEARN} \times 2\times\text{YMPE}^5
\]  

(5)

Note that AVGEARN is only capped at one when a person’s average earnings exceed twice the current YMPE. This would not change the benefits received by those with average earnings below the current YMPE.

### 4. Scope, Aim, and Methodology for Simulations

We present simulations that quantify the extent to which Canada’s public pension programs (CPP/OAS/GIS) replace individuals’ earnings after retirement. We then consider the four reforms to CPP that have been proposed, and account for provincial and federal income taxes in the calculation of replacement rates.

A stylized example is presented, based on a ‘steady state’ centered in 2012. We consider unmarried individuals across the earnings distribution that are 18 years old in 2012 and plan to fully retire at the age of 65. Upon retirement the individuals plan to immediately take-up Canada Pension Plan benefits. We assume the individuals’ earnings will increase at the same rate as the
Year’s Maximum Pensionable Earnings (YMPE). We also assume that all parameters of the retirement income system and the provincial and federal income tax systems do not change in real terms after 2012. We have assumed this individual expects to receive his OAS pension at age 65, despite the policy announcement that will raise his first age of eligibility for OAS to age 67 (applicable to all those born after 1963). We make this assumption so that we can relate our results to the basic CPP benefit determined at age 65. If the retirement age of 67 were chosen to align with the first age of eligibility for OAS, CPP’s replacement rate will be slightly higher than 25% as the actuarial adjustment (0.7% per month after age 65) will be applied to benefit amounts. We provide results with an age 67 retirement in the appendix. In the tax calculations, we have assumed the individual has no other taxable income. While unrealistic to assume individuals have no other income, we have also conducted simulations that allow for other income from pensions (with a 60% replacement rate). The results are provided in the appendix.

The replacement rate at age 65 is then calculated as:

\[ R_{65} = \frac{(CPP_{65} + OAS_{65} + GIS_{65} - Taxes_{65})}{(Earnings_w - Taxes_w)} \]

The assumptions underlying our stylized example are made for two reasons. First, the assumptions simplify our calculations so that the source of any variation in the resulting replacement rates is clear. Second, for the simulation of proposed reforms to CPP, we want to consider the case of an individual who would have fully contributed to any proposed system, rather than accounting for the time required to phase-in the proposed benefits for mid-career
workers. In this way, we are comparing across fully phased-in reforms rather than the transition paths.

In previous research, we presented simulations that examine the incentives for retirement imposed by the public pension system (Milligan and Schirle, 2008). In that study, it was important to account for gender, marital status, variable earnings, work interruptions, and particularly the timing of retirement, as each of these factors would affect the present value of public pension income received over one’s lifetime and thus the incentives to retire at each age. In this present study, however, we are focussing our attention on the replacement rate achieved when a person first retires at age 65. To some extent, the timing of retirement matters for an individual’s replacement rate since an adjustment factor applies to CPP benefits if they are taken-up before or after age 65. While this would be important for examining an individual’s incentives to take-up benefits, it does not affect comparisons across income groups or potential policy reforms conditional on benefit take-up at age 65.

5. Simulation Results

Our simulation results focus on the after tax public pension replacement rates of individuals across income levels based on the current structure for the Canada Pension Plan. We begin by comparing the current CPP structure across provinces in order to get a preliminary sense of current replacement rates and also to gauge the importance of provincial income tax differences. We then proceed to comparing replacement rates across the different reform proposals, focusing
on Ontario as a benchmark case. In the Appendix, we also present results using before-tax income, age 67 retirement ages, and for individuals with pension income.

Figure 6 presents the results across provinces for the current CPP structure. The only difference across provinces is in the income tax rates. Overall, we see that the replacement rates for low income individuals are quite high. Those with average lifetime earnings around $10,000 will enjoy replacement rates upwards of 150%. This would represent a person who receives a small CPP pension, maximum OAS benefits, and some GIS benefits in retirement. The replacement rates are greater than 100% for individuals with average lifetime earnings around or below $20,000 and decline steadily thereafter. For example, for a person with average earnings between $55,000 and $60,000, the public pension system replaces roughly 50% of their income (after tax). This represents receipt of a maximum CPP pension, maximum OAS benefits, but no GIS benefits. A person with average earnings around $100,000 would be receiving a maximum CPP pension (representing much less than 25% of average earnings), a small OAS pension, and no GIS benefits.

There is not a great deal of variation across provinces in terms of the replacement rates offered and all variation is derived from provincial income tax systems. Both provincial tax rates and basic exemptions vary significantly. Someone age 65 in Alberta can earn $23,429 before facing provincial income taxation, but only $13,795 in Prince Edward Island. At higher incomes, however, these tax differences affect both the numerator and the denominator of the replacement rate, so there is less difference across provinces.
Figure 6: After Tax Public Pension Replacement Rates with Current CPP Across Provinces

Notes: Source is authors’ calculations based on the CTaCS simulator.
Figure 7: After Tax Public Pension Replacement Rates with Current CPP Across Provinces, under 20,000

Notes: Source is authors’ calculations based on the CTaCS simulator.
In Figure 7 we focus attention on the replacement rates for individuals with average earnings under $20,000 where we can see the greatest differences across provinces. Here at these lower income levels, no one faces provincial income taxation on their retirement income, but the taxes while working vary across provinces because of differing basic amounts and low-bracket tax rates. The provinces with the lowest replacement rates are those that have the highest basic amounts (BC, Alberta, and Saskatchewan), since the after-tax income when working is larger in those provinces. Overall, however, the difference across provinces is not large.

We turn now to comparing the replacement rates at each level of average annual earnings for each of the policy proposals. These are presented in Figure 8, with the replacement rates at specific earnings levels presented in Figure 9 to highlight the differences.

A first option of doubling the replacement rate for all CPP contributors is represented by the red line (Big CPP) in Figure 8. For those in the lowest part of the average earnings distribution, public pension replacement rates would be higher than before, although higher CPP benefits are partially offset by a reduction in benefits from the GIS. The largest increase in replacement rates are for those individuals with average earnings just below the current YMPE but above thresholds whereby their CPP benefits are high enough that they would be ineligible for GIS benefits. For individuals getting the maximum CPP benefit (average earnings around the current YMPE) replacement rates would rise from 55% under the current CPP to 74% under the Big CPP (see Figure 9).
Figure 8: After-Tax Public Pension Replacement Rates for Each Policy Option

Notes: Source is authors’ calculations using CTaCS simulator.
Figure 9: After-Tax Replacement Rates at Specific Earnings Levels

Notes: Source is authors’ calculations using CTaCS simulator.
The PEI proposal (grey line in Figure 8) is substantially different in that it does not raise the after-tax public pension replacement rates of individuals with low average lifetime earnings. Rather, it offers a very small increase in replacement rates for individuals with average lifetime earnings between ½ of YMPE and YMPE and then a fairly substantial increase in replacement rates for those with incomes above YMPE. For example (as shown in Figure 9), individuals with average earnings around $75,000 would see replacement rates rise from 38% to 44% if the PEI proposal replaced the current CPP structure. Individuals with earnings around $100,000 would see replacement rates rise from 30% to 39%.

The Wolfson Wedge proposal is very similar to the PEI proposal, but offers more generous replacement rates for individuals with average earnings above the current YMPE. For those with average earnings between the current YMPE and twice the YMPE, replacement rates would be above 50%.

Finally, we demonstrate the simpler proposal to double the YMPE while maintaining the 25% CPP replacement rates. The orange line in Figure 8 represents the resulting replacement rates. Here, the after-tax replacement rates are not substantially different from the PEI proposal. The exception is for earnings between ½ of the current YMPE and the YMPE where replacement rates under the PEI proposal are slightly higher, owing to higher (40% vs 25%) replacement rate over this range. When doubling the YMPE, benefits do not differ from the current CPP structure until we consider individuals with average earnings above the current YMPE. After this point, individuals (with the expanded CPP benefits, and assuming there is no other taxable income) will not be eligible for any GIS benefits. For those with average incomes of $75,000, replacement
rates rise modestly from 38% to 42% (see Figure 9). Interestingly, simply doubling YMPE has the same effect on public pension replacement rates for those earnings twice the YMPE as the Big CPP proposal – raising replacement rates from 30% to 40% and nearly the same effect as implementing the PEI proposal. However, it attains this level of replacement rate in a much simpler way, and without unnecessarily increasing the replacement rates of lower earners.

6. Discussion

In this section we raise some important points relevant to the interpretation of our simulations and the implementation of the various policy proposals.

6.1. Family replacement rates

In our simulations we present the replacement rates for an individual who is single. We might also want to consider the family unit when defining replacement rates. In this case we would need to make a distinction between dual earner families and single earner families with the same average (family) lifetime earnings. For example, a dual earner family where each spouse had contributed to CPP over their lifetime and each had average lifetime earnings around $50,000 would have a much higher family replacement rate than a single earner family with average lifetime earnings of $100,000. Under the current CPP structure, the dual earner family would have a family replacement rate of roughly 55% while the single earner family (having made $\frac{1}{2}$ the contributions) would have a family replacement rate of 30%. (refer to Figure 9). One advantage for the single earner family with $100,000 average lifetime earnings, of course, is the survivor benefits available to the non-earner in the family. Given existing caps on total retirement and survivor CPP benefits, many dual earner families are not eligible for survivor
benefits. As such, current single-earner families have a higher expected return on their CPP contributions.

6.2. Poverty reduction

The CPP proposals do not focus explicitly on poverty reduction, nor do they address redistribution. The CPP’s function in the retirement income system is an earnings-replacement tool; other policies like the OAS and GIS are better placed to handle poverty reduction or increased redistribution. Many Canadians may desire overall greater redistribution to Canadian seniors—if so, tools other than the CPP are appropriate.

For middle and upper earners, one advantage to expanding CPP’s YMPE is that it forces those able to save for their retirement to do so. Currently, many individuals whose average lifetime incomes are above the YMPE but who do not have employer pensions do not adequately save privately. (See analysis of Table 1 above). These individuals without savings may end up with incomes below low-income thresholds and ultimately will rely on the GIS for income support. As demonstrated in the simulations, simply doubling the YMPE will force these individuals to save more for their retirement and reduce reliance on those programs financed from general tax revenues.

6.3. Contributions and Variable Earnings

The simulations presented in this paper represent an individual with stable earnings over his or her lifetime. With respect to contribution rates, however, we may want to consider the implications of expanding the CPP under the proposed PEI or Wolfson reforms in cases where
individuals have fairly volatile earnings. It has been suggested that employer and employee contribution rates on earnings over half of the current YMPE would have to increase by roughly 1.5 percentage points, from 4.95% to 6.45%. Consider an individual with average lifetime earnings of $23,000, but with some volatility in annual earnings. He earns $10,000 per year for half of the 47 years in his earnings history and $36,000 per year for the other half. With current contribution rates and the 2013 YMPE, this individual will contribute $45,367 to CPP over his career. Under the proposed system his contribution rates in some years will increase, so that he pays $49,050 to CPP over his career. Under the proposed system, however, this individual will not enjoy higher CPP monthly benefit commensurate with the higher premiums paid. The differential CPP replacement rates will make it difficult to administer contribution rates in a way that ensures individuals’ contributions are closely linked to individuals’ retirement benefits.

6.4 Consequences of shifting more savings to CPP

One should expect that any expansion of the Canada Pension Plan will be met with at least some reduction of savings in alternative savings vehicles. This may involve individuals reducing the amount they save in RRSPs or TFSAs. This could involve a renegotiation of employer pension plans, particularly those pensions held in the public sector. For example, previous CPP expansions have led to ‘carving out’ contribution and benefit space from existing pension plans. That is, employers and employees agree to decrease contribution rates to their employment-based plan over the range covered by the CPP, and also adjust downward the pension benefit formula. In this way, the addition of expanded CPP coverage ends up not affecting their after-tax pay or eventual benefit receipts as their employment-based pension decreases to match the expanded CPP.
There is, however, an impact of this kind of ‘carving out’. The impact comes from the management of the pension funds. An expanded CPP would effectively transfer money from existing pension fund managers (such as the Ontario Teachers’ Pension Plan or the BC Municipal Pension Plan) into the Canada Pension Plan Investment Board (CPPIB). The CPPIB is already very large, with assets of $192.8 billion as of September 2013. Any further transfer of funds from other pension managers into the CPPIB will make it even larger.

On a risk-return after-fees basis, it is difficult to say clearly that moving funds from other large professional pension managers to the CPPIB would be a gain or a loss. A stronger case might be made for any shift of funds from individually-managed accounts to the CPPIB. Jog (2009) documents the shortcomings in investment returns of individual investors. If the CPPIB achieves higher returns with lower fees, any funds newly managed by the CPPIB would be a gain for CPP members.

Should a larger CPPIB be a concern? Little (2008) documents that the initial idea of the CPPIB in the 1990s CPP reform was very controversial for reasons ranging from political interference to taking undue risks in volatile stock markets. Since that time, we now have 16 years of experience with the CPPIB—a period which has included a very large financial crisis. To date, few of the concerns expressed in the 1990s have come to bear. However, it is possible that a still-larger CPPIB could start to expose some of the institutional weaknesses discussed in the 1990s.
6.5 Timing of CPP Expansions

Concerns have been expressed regarding the ability of employers and employees to manage the burden of additional payroll taxes associated with an expansion of the Canada Pension Plan. In this regard, there are several factors working in the favour of employers and employees. First, any change to the Canada Pension Plan will take several years to implement. This provides both employees and employers time to revise their expectations for wages and benefits and renegotiate employee compensation appropriately. Second, the more modest proposed changes will only affect the payroll taxes levied on middle and high-income earners. This will limit the impact on small and medium sized firms. More importantly, workers in this income range are not likely to alter their labour supply in response to small changes in their net wage. This is expected to facilitate the employer’s renegotiation of wage and benefit packages when payroll taxes are increased. Third, as long as any additional contributions made by workers and their employers are directly tied to higher benefits in retirement (and workers value those benefits), workers may be willing accept the full burden of the additional payroll tax in the negotiation of their compensation.

7. Conclusion

In this paper, we have laid out the current income position of the elderly in Canada, and the trends that led to today’s position. We show that the area of greatest concern is middle and upper

---

15 See Curry and Morrow (2013) citing concerns expressed by Finance Minister Jim Flaherty and the CFIB president Dan Kelly.
earners without a workplace pension plan. We then describe several options for reform to the CPP that might address these shortcomings. We find that options such as the Wolfson Wedge and the PEI plan do a good job of targeting the expansion where it might be needed most. We also show that a simpler reform—doubling the YMPE—would perform very similarly to the PEI plan, but do so in a much simpler way.

Our simulations are limited in many ways. We do not address concerns about longevity risk, poverty, or redistribution. We also don’t account for dual-earning couples and the dynamics of survivor benefits. Another limitation is that we leave out other savings, such as housing wealth.

The open question that remains is whether anything need be done to address the replacement rate concerns identified in this paper. To some extent, the answer to this question depends on the role one sees for government in the provision of retirement income.\textsuperscript{16} Using the public retirement income system to insure against the risk of outliving one’s saving is a standard ‘market failure’ argument for government involvement in pension income. However, a different defence is needed to justify boosting the replacement rates of mid and higher earners using the public pension system. Beyond market failures, there are persistent ‘decision-making failures’ in the realm of savings that can be alleviated by mandatory investing through the CPP. Decisions about saving are complicated, irreversible, and vitally important. Leaving people to make these decisions on their own will result in some proportion choosing poorly and ending up in a dire position. To the extent that government has some responsibility for alleviating decision-making failures, a modest expansion to the CPP can be justified.

\textsuperscript{16} Baker and Milligan (2009) provide a more extensive discussion of the role of government in retirement income provision.
References


Appendix

Figure A1. Before-Tax Public Pension Replacement Rates for Each Policy Option

Source: Authors’ calculations
Figure A2. After-tax Public Pension Replacement Rates, Current CPP, Retirement at Age 67

Source: Authors’ tabulations.

Notes: Retirement at age 67 requires the CPP annual benefit to be adjusted for benefit take-up after age 65 at a rate of 0.7% per month (16.8% for two years).
Figure A3: After-tax Public Pension Replacement Rates for each Policy Option, Retirement at Age 67

Source: Authors’ calculations.
Figure A4. After-tax Public Pension Replacement Rates for Each Policy Option, Retirement at age 65, With Pension Income.

Source: Authors’ calculations. Pension income is assumed to replace 60% of career average earnings.