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On the Replacement Adequacy of Canada's Retirement Income System Estimates Using Statistics Canada's LifePaths Microsimulation Model

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On the Replacement Adequacy of Canada's Retirement Income System Estimates Using Statistics Canada's LifePaths Microsimulation Model

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The specific uses made of a model like LifePaths and interpretation of the results must be the responsibility of the authors. In this case, the principal author alone takes full responsibility for any policy conclusions and the range of assumptions used in this analysis. This paper does not represent the views of Statistics Canada.

The LifePaths model is in the public domain, and anyone who would like to do their own simulation analyses, either to explore the results presented here in greater depth, or to generate results based on alternative assumptions, should contact Statistics Canada.

Introduction

There is growing concern regarding the extent to which Canada's retirement income system will be providing adequate incomes over coming years. This paper provides projections, based on simulations using Statistics Canada's LifePaths microsimulation model.¹ The analysis also examines several stylized options for reform, based on reforms that have recently been formally proposed by provincial governments and interest groups.

¹ see http://www.statcan.gc.ca/microsimulation/lifepaths/lifepaths-eng.htm.

The fundamental question is whether Canada's retirement income system is likely to yield adequate incomes for seniors in future. A number of recent studies have produced estimates of both historical patterns (LaRochelle-Côté, Myles and Picot, 2008; Ostrovsky and Schellenberg, 2009) and possible future patterns (Mintz, 2009; Horner, 2009) of post-retirement consumption possibilities in relation to those prior to retirement – generally referred to as "replacement rates" (RRs).

It is important to distinguish RRs that focus only on total or gross incomes before and after retirement, and those focusing on "consumption possibilities" or "net incomes" which also take account of variations over the life course of taxes, saving and dis-saving, and similar factors. While the norm for gross RRs is 70%, and there is some discussion that it ought actually to be a bit lower at 60% (e.g. Mintz, 2009), there is general agreement that the better concept is continuity of consumption, where the norm naturally is 100% -- people generally would wish to arrange their affairs so there is no sharp drop (or sharp increase) in their consumption possibilities around the time of transition from working to retirement. In this analysis, we have invested considerable effort to estimate this more fundamental but empirically challenging concept – how are individuals' consumption possibilities likely to change over their lifetimes, especially from before to after retirement – in our assessment of the adequacy Canada's retirement income system.

A significant challenge in this type of analysis is posed by the old adage, "beware of the mean". An estimate of the average consumption or net income or net RR may not be too concerning for public policy if it is close to the 100% norm. But the average often hides important differences – for example that a substantial portion of Canada's elderly, now or in the future, can expect to fall considerably below the 100% norm for the net replacement rate. This is the main reason our analysis is based on the Statistics Canada LifePaths microsimulation model – to allow us to "drill down" and examine not only average RRs, but also distributions, for example to determine the proportions of Canadians who can expect significant declines in their living standards upon retirement.

The Mintz (2009) study for the Federal Department of Finance, drawing in turn on the study by Horner (2009), has undertaken such an analysis, and concludes,

"... Canadians are, by and large, doing relatively well in ensuring that they have adequate savings for their retirement. There is, however, evidence that not all working Canadians are saving enough to obtain the same level of consumption in their retirement as in working years. These estimates suggest that one-fifth of Canadians may not have sufficient RPPs and RRSP² assets to replace at least 90% of their pre-retirement consumption, with higher degrees of inadequacy especially for modest-and middle-income Canadians. Further study is needed to determine the degree of saving inadequacy since the estimates are based on a stylized model and exclude other sources of retirement income." (p26).

Our results, using a more sophisticated analysis enabled by the LifePaths model, complement and extend those of Mintz (2009) and Horner (2009). In sum, we find that roughly half of Canadian seniors who had middle level earnings in their pre-retirement years will face declines of at least one-quarter in their living standards (i.e. consumption possibilities) post-retirement. This projection is generally in line with historical experience where, for example, LaRochelle-Côté, Myles and Picot (2008, Table 2), using longitudinally linked income tax data, found that over 60% of Canadians in the middle income quintile faced a decline in their net replacement rate at ages 69 to 71 in 2005 of at least one-fifth of their early 1980s disposable incomes.

These latter results suggest retirement income inadequacy is a larger problem than the one-fifth figure just cited from Mintz (2009). But it is important to note that his conclusion, that one-fifth of Canadians may not achieve 90% <u>net</u> replacement rates, is for all income groups combined. As Horner (2009) states, "Those in the modest and middle earnings groups are the main focus of policies relating to retirement saving. In these groups, 28% (modest earners) and 29% (middle earners) did not save enough to meet the 90% consumption replacement target." Still, the Mintz / Horner result generally projects a smaller incidence of replacement target.

² see the Glossary at the end.

It is worth noting that Mintz / Horner consider more than a 10 percentage point drop in *consumption* to be problematic, while our analysis will focus generally on a more stringent threshold of at least a 25 percentage point drop.

One further nuance in the Mintz (2009) conclusion just quoted merits a brief comment, namely that the problem is primarily "inadequate saving discipline". We take a more agnostic view, and simply observe the amounts individuals will likely receive to fund their post-retirement consumption from all sources, whether from continuing to work, from private savings, workplace pensions or public pensions. Given the variety of pension reform proposals currently under discussion (Baldwin, 2010), and the various analyses motivating these proposals for reform, it is inappropriate to ascribe the problem entirely to inadequate individual saving. What some may see as a lack of willingness to save for their longer term future, others will see as inadequacy in other parts of the retirement income system – such as the unduly poor returns offered in markets for private saving and annuities (Ambatcheer, 2009 QQQ), the regulation of workplace pensions, the structure of tax incentives for retirement saving, and limitations in the collective approaches embodied in the public pension system.

The plan of this paper is as follows. We begin, in the following section with a discussion of the measurement issues entailed by the notion of "adequate retirement income", including a fairly extensive numerical example to illustrate the methodology to be used. This is followed by an assessment of the adequacy of the current retirement income system, including a number of sensitivity analyses. Finally, the paper explores two major stylized but representative options for expanding the public pension system, given the inadequacies projected for the status quo system.

Measuring Adequacy

There is a long history of analysis of pension systems with convergence on two main concepts of adequacy. One is the absolute level of income, typically in relation to a poverty or "low income" line. The other is "replacement adequacy", typically measured as the ratio of post-retirement disposable income or "consumable" economic resources to pre-retirement income correspondingly defined (e.g. Lazar Report 1979, Federal Green Paper 1982, Frith Parliamentary Ctte 1983). This analysis focuses on the latter concept, "replacement rate" (RR) adequacy.

There is also a third important aspect, the risk or uncertainty in benefits expected in the future. Depending on the structure of the retirement income system, the various risks may be borne individually, or distributed to varying degrees among fellow employees, employers and tax payers. This aspect is discussed further below.

While the concept of replacement rate (RR) adequacy is straightforward, there are several key assumptions required to make it operational. These include:

- 1. the demographic unit of analysis, e.g. individual or family;
- 2. the specific items comprising the denominator, pre-retirement consumable economic resources;
- 3. the specific items comprising the numerator, post-retirement consumable economic resources;
- 4. the ages over which pre-retirement economic resources are measured;
- 5. the ages over which post-retirement economic resources are measured;
- 6. how to adjust for variations in family size and composition over the pre- and post-retirement periods considered; and
- 7. the discount rate used.

The first assumption concerns whose income(s), and economic circumstances more generally, are to be considered in the analysis. This analysis uses the individual as the focus, with results generally broken down for men and women, and by income. However, individuals usually live in families, and the economic resources of other family members are of benefit to the individual. The most important other family member is typically the spouse (whether married or common law). Thus, while the focus is on individuals, the

analysis also takes account of the economic circumstances of spouses whenever present – which varies over the life course. The presence of children is also considered (see below re assumption 6).

With regard to the next two assumptions, the following table shows the items specifically included in the analysis.

	pre-retirement	post-retirement				
Add	earnings (wages + self-employment)	Add	OAS, GIS, SPA, C/QPP			
			RPP retirement and survivor pensions			
			RRSP withdrawals, annuity and RRIF income			
	imputed rent on net equity in owner- occupied housing		imputed rent on net equity in owner- occupied housing			
		net withdrawals of equity in owner- occupied housing (including accrued capital gains)				
Subtract	income taxes	Subtract	income taxes			
	payroll taxes					
	contributions to equity in owner occupied housing as payments of principal on mortgage					
	RPP and RRSP contributions					
Not Included	work-related expenses					
	other investment income	other investment income				
	business assets ³	business assets				
	other transfers (EI, SA, veterans)		other transfers (e.g. provincial GIS top-ups)			
	net accumulation of consumer durables		net accumulation of consumer durables			
	transfers on capital account, e.g. inheritances and gifts inter vivos					
	other net saving, including initial down payment on house purchase		other net dis-saving			
	other investment income business assets ³ other transfers (EI, SA, veterans) net accumulation of consumer durables transfers on capital account, e.g. inheritances and gifts inter vivos other net saving, including initial down payment on house purchase		other investment income business assets other transfers (e.g. provincial GIS top- ups) net accumulation of consumer durables other net dis-saving			

Table 1 – Approximating Consumption Possibilities for Measuring Replacement Rates

The net amount in both columns is "consumable economic resources" – more specifically disposable income plus imputed rent for owner-occupied housing plus dis-saving minus saving, to use the formal economic concepts. (For example, technically RPP and RRSP "income" is actually a blend of dis-saving and investment income.) For convenience, however, we will often use "net income" as a shorthand for "living standards" or "consumable economic resources".

³ Given that the focus of the analysis is on the broad middle of the pre-retirement earnings distribution, this omission is not material. For example, based on 2006 individual income tax return data, fewer than 5% of individuals age 35 to 55 with total incomes in the \$35 to \$80k range had self-employment income comprising more than one-quarter of their total income. Similarly, fewer than 2.4% of all individuals in the same age/ total income group received dividend income comprising more than one-tenth of their total income. Ordinarily, individuals with closely held incorporated business assets take a substantial portion of the income as dividends due to their favourable tax treatment compared to employment income. Anyone with substantial business assets would typically have high income from either self-employment or dividends. Results are similar when husband-wife couples' tax return data are examined.

As indicated in this table, there are still important omissions – especially private saving other than in RRSPs, RPPs, and capital transfers such as inheritances and gifts inter vivos. These omissions have been dictated primarily by limitations in the available data.

For the fourth assumption above, three alternatives have been used:

- the "best 5 of the last 10 years" before "retirement", defined as the year after the last year of paid work, but not less than age 60, and not more than age 65;
- all the years between age 40 and "retirement"; and
- all the years between age 25 and "retirement".

The first of these denominators is most similar to the usual structure of final average defined benefit RPPs. It is also most likely to reflect the subjective base that Canadians will use as their point of comparison in the years immediately after retirement.⁴ The last denominator is most similar to the base embodied in the benefit formula of the Canada and Quebec Pension Plans, as legislated. The second denominator is intermediate.

It is worth noting that several recent analyses (Ostrovsky and Schellenberg, 2009; LaRochelle-Cote et al, 2008), due mainly to data limitations, have used income averaged over a three year period for the preretirement denominator, rather than income averaged over the longer periods (from 5 to 40 years) used in this analysis. A chart in the Annex illustrates the differences between short and long period average earnings, which can be substantial.

With regard to the fifth assumption, the numerator of the replacement rate, we have explored two – the year when the individual is age 70, and then when he or she is age 80. One might imagine focusing in the first instance on age 65. But at this age some individuals may still be in the paid labour force, and they may also have a spouse who is not yet age 65. In contrast, the vast majority of those age 70 can expect to be "fully retired", neither working nor living with a spouse or partner are more likely to be single, hence receiving a (smaller) survivor pension, and to the extent that pensions are less than fully indexed, receiving pensions that are falling in relative value (see the following section on discounting).

The sixth assumption involves adjustments for economies of scale in terms of the income needs of households with two or more members. The usual method in economic analysis to account for variations in family size, and the one used here, is an "equivalent adult unit" or "equivalence scale". This is a set of numbers used to scale the income of families of various sizes so that they are equivalent in terms of economic well-being to the income of an unattached individual. For example, if the equivalence scale for a family of size four is 2.0, then their "equivalent adult unit" (EAU) income is half their actual income. The results shown below all use as the EAU scale simply the square root of family size, hence 1.0 for an unattached individual, 1.4 for a couple, and an additional roughly 0.3 for each dependent child. This kind of equivalence scale adjustment for variations in family size over the life cycle, and the specific square root of family size EAU scale used here, is standard in this kind of analysis (see, for example, LaRochelle-Cote et al 2008, Ostrovsky and Schellenberg 2009 QQQ double check, and Horner 2009). The impact of this adjustment is illustrated further below in the numerical example; it is substantial, and little appreciated.

Discounting / Measuring Income and Consumption Over Time

The final assumption in this analysis is the way income, saving, consumption, and other dollar flows occurring in different years are rendered commensurable. The standard approach is to use a constant factor called a discount rate. For example, with a discount rate of 2%, one dollar next year is equivalent to \$0.98 this year. The impact of the choice of discount rate in this analysis is most important for the averaging of pre-retirement consumption and earnings, especially when many years are included. But it is also important when examining RRs many years after retirement, for example in considering the economic position of a surviving spouse 15 or so years after "retirement" when the person has reached age 80.

⁴ Note that this is a conjecture; it would be desirable to see if there is any evidence to support this claim.

At first glance, it might seem most appropriate to use the CPI as the discount rate – since it converts incomes into "constant dollars", i.e. dollars of equivalent purchasing power over time. This choice implies that a constant dollar (net) income over time enables an individual to be equally well off in each of a long series of years. However, maintaining constant purchasing power is not necessarily the same as maintaining a constant level of economic well-being. The main reason is that in general, Canadians live in a society with non-trivial real per capita economic growth, and individuals habitually compare themselves to their contemporaneous peers. If everyone else's income is rising, in constant dollar terms, then individuals whose incomes are fixed in constant dollars will be falling behind. In other words, using the CPI as the discount factor is inconsistent with the observation that individuals' judgments of their economic positions are typically relative.

One of the most famous observations in support of a relative concept of economic position is Adam Smith's discussion, in the <u>Wealth of Nations</u> (1776), of the notion of poverty. "By necessaries I understand not only the commodities which are indispensably necessary for the support of life, but what ever the customs of the country renders it indecent for creditable people, even the lowest order, to be without." ⁵ In contemporary terms, we do not expect people to do their laundry with wringer washers, or to be without telephones. But if constant purchasing power were used as the discount factor, and an income from 1900 were converted to 2010 constant dollars using the CPI, this is what would be implied.⁶ On the other hand, an index based on some measure of average incomes or living standards would be consistent with Adam Smith and with relative notions of economic position. Indeed, Layard et al, (2009) (and many others in the subjective wellbeing (SWB) literature, e.g. most recently Boyce et al. 2010) in their recent research have shown that over time, SWB is most closely correlated with individuals' incomes relative to the incomes of their contemporaneous peers, and not with constant dollar incomes.

Conventional economic theory suggests yet another approach to selecting a discount rate. Conceptually, this is the "subjective rate of time preference" – the rate that leaves individuals indifferent between consumption at time t and some other time $t + \Delta t$. While this rate is often identified with market interest rates, it is in fact unobservable. Moreover, even if we simply accept that the subjective rate is "the observed interest rate", there are major empirical issues – e.g. should we take borrowing or lending rates? which among the many that face individuals (e.g. mortgage versus credit card, bank deposit versus GIC) should we use? and how do we measure or estimate these rates after tax? Notwithstanding this empirical morass for operationalizing the concept of subjective discount rates, they are typically positive in real terms, in other words higher than average long term CPI growth. So practically, choosing some sort of subjective time discount rate will generate roughly similar results as measures of the growth rate of average living standards, in contrast to using the CPI as the discount factor.

Our preferred alternative in these circumstances therefore is to use the growth in the average wage (AW) as the discount factor for pension policy analysis. This is the factor legislated by Parliament in the CPP for the YMPE and the updated career average earnings base used to calculate CPP benefits (and correspondingly in Quebec).

It should be noted that real average wage growth has been essentially zero from 1983 to 2010 (and even earlier), the period covering the analyses of LaRochelle-Cote et al (2008) and Ostrovsky and Schellenberg

⁵ The full passage on the "necessaries" of daily life reads as follows: "By necessaries I understand not only the commodities which are indispensably necessary for the support of life, but what ever the customs of the country renders it indecent for creditable people, even the lowest order, to be without. A linen shirt, for example, is, strictly speaking, not a necessary of life. The Greeks and Romans lived, I suppose, very comfortably, though they had no linen. But in the present times, through the greater part of Europe, a creditable day-laborer would be ashamed to appear in public without a linen shirt, the want of which would be supposed to denote that disgraceful degree of poverty which, it is presumed, nobody can well fall into, without extreme bad conduct. Custom, in the same manner, has rendered leather shoes a necessary of life in England."

⁶ Actually, things are much more complicated than this, especially with technical progress and the continuing and even accelerating introduction of "new goods"; see Wolfson (1999)

(2009), so their empirical results will not be affected by the choice of CPI versus AW as the discount factor. However, going into the future, there is a very substantial difference between using the real wage growth assumption of the Chief Actuary in his most recent CPP Actuarial Report (i.e. 1.3% per year, OSFI, 2007) and a CPI assumption. (There are also important differences prior to the 1980s.) The analysis to follow thus includes an assessment of the sensitivity of the results to the choice of CPI rather than AW as the discount factor.

Gross Versus Net Replacement Rates

Conventional wisdom on replacement adequacy in retirement income systems is that if <u>total</u> income after retirement is about 70% of <u>total</u> income (more precisely, earnings) pre-retirement, then an individual will have adequate post-retirement income in terms of the criterion of replacement adequacy. This 70% figure is a measure of the <u>gross</u> replacement rate. In fact, Mintz (2009, p8) has recently argued that a gross replacement rate on the order of 60% should be sufficient. In either case, however, these gross replacement rates are being used as proxies for the achievement of continuity of consumption over the pre- and post-retirement periods, which in turn corresponds to the <u>net</u> replacement rate defined in Table 1 above. Accordingly, this analysis of the replacement adequacy of Canada's retirement income system uses <u>net</u> replacement rates, with a corresponding norm or target of 100% replacement.

Given the wide range of economic circumstances of Canadians and the resulting heterogeneity of the replacement rates they achieve, a <u>microanalytic</u> approach -- one that draws directly on individual-level data for a representative sample of the Canadian population -- is preferred. This is in contrast to analyses which rely on the circumstances of an "average" Canadian, or on a handful of stylized life stories, as in Mintz et al (2009) and in Horner (2009). These latter analyses are at risk of drawing inappropriate conclusions by virtue of omitting the great variety of individual circumstances actually observed in the population.

This heterogeneity is illustrated in the following graphs showing contour plots of gross versus net replacement rates simulated with LifePaths for the 1960 – 1965 birth cohort (i.e. those attaining age 65 in 2025 – 2030), with gross replacement rates along the vertical axis, and net rates along the horizontal.





Figure 1 – Joint Distributions of Gross and Net Replacement Rates (%) by Sex (1960 – 65 cohort)

(Apr 21_Wolf_Base(AIW) m.xlsx sheet MCW Gross vs Net RR)

(BTW, I'm colour blind + MS Excel has these silly plots ...)

The main "mass" of this joint distribution is along a diagonal, with net replacement rates (horizontal axis) tending generally to be 5 to 20 percentage points higher (i.e. to the right of the diagonal) than gross replacement rates, and concentrated in the 35 to 90% range. As is evident from the rectangles superimposed on the scatter plots, gross replacement rates in the presumed target 60 to 70% range in reality can be expected to correspond to net replacement rates in the 55 to 100% range. Gross replacement rates, evidently, are poor proxies for the replacement adequacy of actual retirement incomes. This analysis therefore focuses on net replacement rates.

Illustration

In order to clarify our approach, we have constructed a numerical example for a hypothetical middle income individual and his / her family. Figure 2a begins by showing the main dollar flows, under the simplifying assumption that the individual is a lifetime renter, while Figure 2b shows the size of the family in which the individual is living at each age.



Figure 2a – Hypothetical Individual's Income Flows (\$000s per year) by Age

This individual starts at age 18 with annual earnings of \$25k, rising quite a bit at first, but then more gradually to \$68k per year at age 65, then dropping to zero after attaining age 65. An assumed flow of RRSP saving is also shown. Everything else is derived from 2010 personal income tax structure and public pension benefit levels. The proverbial bottom line is "consumable income" = earnings + public pensions – taxes – RRSP savings + RRSP withdrawals via an assumed joint and 60% survivor annuity, based on 12.5 as the annuity factor. For now, the individual is assumed to be a lifetime renter, so there are no mortgage payments or equity built up in an owner-occupied home.

All amounts in this graph are CPI deflated, hence in 2010 constant dollars. Given a posited 2% per annum inflation rate, over the decade from age 75 to 85 the real value of the survivor pension falls by about 10% every five years. For simplicity, we assume in this illustration that real average wage growth is zero, so the choice of discount factor is irrelevant.

Figure 2b – Hypothetical Individual's Family Size by Age



As shown in Figure 2b, at age 25, the individual forms a union with another person of the same age. When he or she attains age 30, the couple has twins. Then at age 50, one child leaves home; the other child leaves home when the individual who is the focus of the analysis reaches age 55. The individual dies at age 75, while his or her surviving spouse lives until age 85.

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Figure 2c – Hypothetical Individual's "Net Income" by Age, with Equivalence Scale Adjustment



Figure 2c illustrates a little appreciated point, namely the importance of the equivalent adult unit (EAU) scale adjustment. As noted earlier, this EAU scale is somewhat arbitrarily but often in analyses of this kind set at the square root of family size. Consumable income, when "equivalized" by applying the EAU scale adjustment, is substantially lower, both pre- and post- attaining age 65. For example, it is cut in half during the period when family size is 4 (and the EAU scale is therefore 2.0), and is lower until the age 75-80 range when there is only the surviving spouse, and hence the EAU scale is exactly 1.0.

So far, we've assumed that the individual is a lifetime renter. The picture gets a bit more complex if homeownership is taken into account. Figure 2d shows the dollar profiles under an illustrative scenario where a \$200k home is purchased at age 30 with a 25 year mortgage and \$20k down payment. The individual's net equity rises to 100% of the market value of the home by age 55 when the mortgage is fully paid off. As a further illustrative assumption, the scenario in Figure 2d posits that half the equity in the home is liquidated at age 65 and used to purchase the same kind of joint and 60% survivor nominal (i.e. unindexed) annuity as with the RRSP. (The value of the home is assumed to remain constant in real dollar terms.) In this hypothetical scenario, we ignore whether the house is sold and something smaller is purchased, with the remaining cash used to purchase the annuity, or a reverse annuity mortgage is taken out, or something else – since the point here is simply to be illustrative.

Figure 2d – Hypothetical Individual's Accumulation of Home Equity by Age



Given this profile of net equity and mortgage payments, Figure 2e shows the resulting age profiles of saving in the form of paying down the mortgage, net imputed rental income (based on an assumed 3.5% real rate of return), and the annuity income when half the house equity is liquidated at age 65. Note that the annuity declines in value first because it is not indexed (assuming 2% inflation per year) and then at age 75 because the principal annuitant dies and 60% continues to the surviving spouse.



Figure 2e – Hypothetical Individual's Net Flows Associated with Home Equity by Age

Finally, Figure 2f contrasts the "consumable income" and EAUd "consumable income" profiles of the lifetime renter and the individual who buys a home. By purchasing and building up equity in an owner-occupied home, the individual compared to the lifetime renter sacrifices some consumption up to age 55, but has higher consumption thereafter. Similarly to the lifetime renter, the EAU adjustment has a substantial effect for the home owner as well.

Figure 2f – Hypothetical Individual's "Net Income" by Age, Home Owner versus Lifetime Renter

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With this illustrative foundation, we can now turn to another important part of the definition of replacement rate adequacy, the choice of the specific years whose net income should form the numerator and the denominator of the RR ratio. The usual way of thinking about the RR (albeit here in terms of consumption possibilities rather than gross or after-tax income) considers the period just after age 65 divided by consumption possibilities just before age 65, indicated by the pale yellow ovals in Figure 2f.

However, our focus for the <u>post</u>-retirement numerator is at age 70 (pale blue oval) – because by then both spouses are likely over age 65, and neither is likely to be working for pay (though in the simulation results below, this is not a requirement).

<u>Pre</u>-retirement, we could focus on the best 5 of the last 10 years prior to age 65 (pale blue circle) – this is closest to the earnings base in typical large final average pay defined benefit (DB) workplace RPPs. In this hypothetical example, this choice of years (i.e. age 70 in the numerator, best 5 of the last 10 years in the denominator) results in net equivalized RRs of 67.8% for the renter and 65.6% for the owner – a substantial decline. (The owner's RR is somewhat lower than the renter's because their pre-retirement denominator is larger, in turn due to higher imputed rental income (the mortgage is paid off during this period of time) which more than outweighs the imputed rent on half the home equity plus the annuity received at age 70.) Interestingly, in this case, the gross RR is 49.9%, considerably lower than all the net RRs.

Alternatively, we could use as the denominator of the RR all the years between age 25 and "retirement" (i.e. the year after the last year of paid work, but not less than age 60, and not more than age 65; no oval shown) – very similar to that used in the Canada and Quebec Pension Plans. Because this age range includes more years with lower pre-retirement consumption possibilities (at younger ages), this average is lower, so the denominator is smaller, so the RR ratio (with the same numerator) is larger. Specifically in this case, the RR is 76.4 for renter without the EAU adjustment, 91.9 for the renter with the EAU adjustment, 86.9 for the owner without the EAU adjustment, and 102.9 for the owner with the EAU adjustment. These RRs are much more sensitive to the EAU adjustment than those with the best 5 of the last 10 as the denominator, since many more years with a larger family size are included. And using a denominator spanning more years typically includes more years with lower (relative to AW, not just in constant dollar terms) income which also makes the RR higher, so that the adequacy of the retirement income system appears better.

An intermediate definition of the RR uses a denominator based on the "prime" earnings years, from age 45 to "retirement" (no oval shown). This is the denominator that will be the focus of the simulation results to be presented. In this case, the specific net RRs are respectively 71.0 for the renter without EAU adjustment, 83.3 for renter EAUd, 79.7 for owner no EAU, and 91.8 for owner EAUd The EAU adjustment still has a considerable impact on the RR – about 12 percentage points, and the overall RR results are between those with the CPP-like denominator and those with the final average DB RPP-like denominator.

Finally, there is a second option for the numerator -- using age 80 (pale orange oval). In this hypothetical example, the primary annuitant has already died. As a result, the surviving spouse has half as much OAS,

smaller GIS, and only survivor benefits from C/QPP and the un-indexed annuity purchased with half the home equity if he or she had been a home owner. In this case, the net RRs are much lower: 33.4 (71.0) for renter, no EAU, 55.5 (83.3) for renter EAUd, 41.5 (79.7) for owner no EAU, and 67.6 (91.8) for owner EAUd (figures in parentheses are for the same scenario except at age 70). Thus, after a further 10 years, ceteris paribus, net RRs are reduced by 24 to 38 percentage points in this hypothetical example when we focus on the circumstances of the surviving spouse.

In sum, this hypothetical example has illustrated the impacts of considering home ownership versus renting on measured RRs, the choice of age intervals to form the numerator and denominator of the RR ratio, and the impacts of the EAU scale adjustment. Capturing variations in family size by using the EAU adjustment appears more important than taking account of home ownership. And using more years than is typical in the final or best average kinds of RPPs is also more important. Both of these adjustments make the RR adequacy of retirement incomes look better. On the other hand, if we were to focus on the replacement rates at age 80 rather than at age 70, the retirement income system, at least in this made up example, would look considerably worse. As a result, the simulation analysis below considers the sensitivity of our results to all of these factors.

Distribution of Lifetime Earnings

Because of the structure of the public pension system and patterns of individual saving, it is important when assessing the replacement adequacy of Canada's retirement income system to differentiate individuals by their lifetime earnings. Specifically, OAS, being a demogrant (except for the income testing or "clawback" at higher incomes), is proportionally more important in terms of effects on replacement rates for those with lower earnings. GIS and SPA are even more highly targeted toward lower income seniors, hence generate even higher replacement rates at the low end of the income spectrum. On the other hand, private savings tend to be skewed toward those with higher earnings.

There are many ways to measure lifetime earnings for these purposes. We have chosen to use "prime" age family earnings, more precisely labour market income of the individual and his or her spouse, if present, between exact age 40 and "retirement" – defined as the earlier of withdrawal from paid work and attaining age 65, but not before age 60 – for the individual, updated or discounted to 2010 using the average wage index. These earnings are also adjusted using a standard "equivalent adult unit" scale to account for economies of scale in family income needs, as discussed earlier.



Figure 3 – Distributions of "Prime Age" Average Earnings by Birth Cohort and Sex (horizontal axis in \$000s, vertical axis % of population)

⁽Apr21_Wolf_Base(AIW) I.xlsx sheet MCW_1b_average_cohort_RRs_e)

Figure 3 shows the estimated distributions of this "prime" earnings concept for males and females, for the 1960-65 birth cohort which is toward the trailing edge of the baby boom. Because these are individuals' "family" earnings, the differences between males and females are not that great. Still, females' lifetime earnings are lower than those of their male counterparts, reflecting the lower earnings of women compared to men during the periods of their lifetimes when they are single.

About 27% of females and 19% of males have estimated lifetime earnings less than \$35,000, while 19% of females and 26% of males have earnings greater than \$80,000. This leaves about 50% of each sex with earnings in the \$35 to \$80 thousand range. Individuals in this middle 50% range for "prime" earnings will be the focus of the analysis to follow.

Uncertainty

One crucial feature of the retirement income system is the <u>level</u> of income it is most likely to produce during retirement for Canadians in their diverse circumstances, where the focus of this analysis is the replacement rate. Another crucial feature of retirement incomes is their uncertainty or riskiness. There are many kinds of risks, and a considerable portion of current concerns about pension adequacy derive from recent experiences of market meltdowns, and workplace (i.e. private) plan sponsor bankruptcies. Employees have, in many cases, been devastated as the workplace pensions on which they had been counting disappeared.

Indeed, from a broader point of view, pension arrangements are social institutions that either by design or inadvertently

- enable or force individuals to defer consumption to their retirement years;
- redistribute wealth between individuals within the same generation (e.g. by sex or income level);
- redistribute income between generations; and
- share risks between and among individuals, employers, and taxpayers / governments.

The latter risk sharing feature is clearly fundamental, and is recognized explicitly insofar as public pensions are often referred to as "social insurance". However, the patterns of risk sharing are certainly different and often not as clear for workplace pensions and RRSPs. For RRSPs, and money purchase arrangements more generally, the risks appear generally clear – the investment performance of the underlying assets, where the risk is entirely borne by the individual. However, even in this seemingly straightforward case, the risk sharing is actually a bit more complicated. The reason is that the government, via the tax / transfer system, is effectively a silent partner. Higher investment returns entail higher income taxes, and lower returns the opposite. At lower and middle level post-retirement incomes, effective taxation is also implicit in the structure of the GIS and SPA, and in the OAS clawback. Thus, volatility or risk in nominal investment returns is attenuated by the effective marginal tax rates faced by individuals.

There is a further level of risk associated with unknown future rates of inflation. In the early 1980s "Great Pension Debate", this form of uncertainty was central, and various forms of mandatory partial indexing of workplace pensions were vigorously discussed, especially for defined benefit (DB) RPPs. But in the end, there were no changes in this area of pension policy. In fact, inflation rates fell, real returns rose, and many DB plans, in part also as a result of "aggressive" actuarial assumption, began running surpluses. More recently, yields have fallen dramatically, and many DB RPPs are in an "experience deficiency" position. While actuaries typically focus on long run average real rates of return on financial assets, and ignore volatility and uncertainty in these rates of return, historical experience makes it clear that there can be decades long periods when real rates of return are well above or below longer term trends (Hamilton, 2009).

In the case of RPPs, especially defined benefit plans, there are further risks, not least being job mobility leading to lost benefits, or to vested-deferred benefits which are usually un-indexed. There are the risks associated with volatility of market returns on the underlying pension fund assets leading sometimes via experience deficiencies to reduced ad hoc improvements that have traditionally compensated at least in part for unanticipated inflation; and there is the risk of employer bankruptcy when the plan is not fully funded.

At the individual level in the LifePaths simulations underlying the results to be presented, all of these uncertainties except bankruptcy of the employer have been included. These uncertainties show up in the *dispersion* of projected replacement rates. However, there are other broader uncertainties related to the way the population and economy overall are likely to unfold in future – life expectancy, fertility rates, changes in longevity, rates of inflation, real average wage growth, and market yields. The impacts of these latter kinds of uncertainties, specifically in economic growth and in mortality rates, have been explored in Wolfson and Rowe (2007), to which the reader is referred.

Average Replacement Rates

Figure 3 shows our main result based on continuation of the status quo. These results include the <u>accumulation</u> of equity in owner occupied housing based on data drawn from a variety of sources including the population census, recent wealth surveys, and a special version of the Ontario property tax data base linked to income tax returns. However, there is no consensus on the extent to which equity accumulated in owner-occupied housing should be counted on in assessing the adequacy of the public pension portion of Canada's retirement income system. As a result, we have made an arbitrary decision that for those individuals projected to attain age 65 owning a home, half of this equity will be drawn upon to provide an annuity, as in the numerical example above.





(Apr22_Base_withHouse_HE drawdown_50% g.xlsx sheet MCW new base case

This graph shows an average decline in net consumable income between 15 and 35 percentage points for men and women in the middle 50% of the pre-retirement earnings range, i.e. between \$35 and 80 thousand. Women's RRs are higher than those for men by about 5 - 7 percentage points in this pre-retirement earnings range. Most importantly, this graph shows that on average, middle income Canadian men and women in this birth cohort can expect, on average, declines in net RRs of considerably more that the 10 percentage points taken by Horner (2009) and Mintz (2009) as a policy-relevant threshold. The curves also show that replacement rates vary significantly by prime earnings, with replacement rates over 100% for prime earnings below the \$15 - 25 thousand range, and below 50% in the top earnings range – though in this portion of the pre-retirement earnings spectrum, the omitted kinds of saving noted in Table 1 above are likely more important.

It is worth emphasizing again that the replacement rates shown above are "net" replacement rates, taking account of items as described in Table 1 and illustrated in Figures 2a to 2f above. The common rule of thumb in the design of defined benefit RPPs, for example, is that the target should be 70% "gross" replacement. But as shown in Figure 1, while gross and net replacement rates are highly correlated, a net rate of 100% does not typically correspond to a gross rate of 70 (or 60)%. The LifePaths simulation results

in Figure 3 above, and those following, are both more precise and more appropriate for an analysis of the adequacy of Canada's retirement income system.

The basic results shown in Figure 3 are quite sensitive to a number of factors which are explored in the following series of graphs. The first we shall consider is the treatment of owner-occupied housing.

For a majority of Canadians, their house is their major asset, and represents an accumulation of wealth that can be considered part of their planning for retirement. Home ownership provides two kinds of benefits of relevance to this analysis. First, owning a home means that it is unnecessary to pay rent. Of course, one still has to pay the mortgage, property taxes, house insurance, etc. But on average, these expenditures are considerably less than the cost of renting the same dwelling. Economists and National Accountants refer to this benefit as "imputed rent". In effect, a home owner is treated as both a landlord, who owns a house and rents it out, and a tenant, who pays himself this same amount of rent. From a consumption perspective, the one used in this analysis of net replacement rates, imputed rent should be included in consumption, as is shown in Table 1 above.

At the same time that an owner-occupied home is yielding its owner a flow of imputed rental income, it also has an asset value. It is therefore a form of saving. As the mortgage is paid down, the owner's net equity in the home = the market value less the amount of outstanding mortgages, increases, until the mortgage is paid off, when net equity equals the market value. A majority of Canadians enter retirement owning a home, most often without any outstanding mortgage. This asset value is available to draw upon to finance post-retirement consumption.

However, there is an important public policy question – to what extent should the evaluation of the adequacy of Canada's retirement income system be predicated on the expectation that seniors will liquidate the value of their home? We do not make a judgment on this issue. Rather we consider the impacts on the average RRs just shown above for four different treatments of owner-occupancy:

- owner-occupancy is ignored;
- only the net imputed rent benefit of owner occupancy is included, though payments of mortgage
 principal are deducted as saving in computing pre-retirement consumption possibilities in other
 words the asset value of the home after retirement is completely ignored, and the full benefits of
 imputed rent continue during retirement;
- as in the previous case, but upon attaining age 65, half the value of the house is liquidated and used to purchase the same kind of annuity as with any RRSP accumulations, with the annuity income added to post retirement net income, and imputed rent corresponding to halved net equity continuing post retirement; and
- as in the previous case, but upon attaining age 65, the full value of the house is liquidated and used to purchase the same kind of annuity as with any RRSP accumulations, with the annuity income added to post retirement net income, and no further imputed rent continuing post retirement.

Figure 4a – Average Replacement Rates (RR, %), 1960 – 65 Birth, Cohort by Lifetime Earnings (\$000s), at Age 70, Both Sexes, by Treatment of Owner-Occupied Housing



(Apr21_Wolf_Base(AIW) I.xlsx sheet MCW Compare House)

Average RRs in the middle 50% income ranges vary by up to 20 percentage points across these scenarios for the treatment of owner-occupied housing. For the balance of this analysis, the third scenario, where half of any equity at age 65 is annuitized, will be taken as the default assumption.

Average RRs are also very sensitive to the specific ranges of years used in calculating the replacement rate ratios, and to the choice of discount rate. Figures 4b and 4c show similar graphs of average replacement rates for males and females, this time ignoring owner-occupied housing, and again focusing on the 1960 – 65 birth cohort. The specific age ranges used in calculating the replacement rate simulated are: "best 5" of the last 10 years, the "prime" years age 40 to "retirement", and the "updated career" (age 25 – "retirement") for the denominator, and specific age 70 or 80 for the numerator.







Figure 4c – Average Replacement Rates (RR, %), <u>Females</u>, 1960 – 65 Birth Cohort at <u>Age 80</u> by Lifetime Earnings (\$000s), RR Concept, and CPI versus Average Wage Indexing) (no owner-occupied housing)

Additionally, Figures 4b and 4c highlight the impact of the choice of discount factor. The results in Figure 3 above for average replacement rates are based on pre-retirement earnings denominators that have been updated or discounted (to 2010) using an index of average wages (AW). While we have argued that it is inappropriate to use the CPI it has been the focus in other analyses.

The results over the projection period are quite sensitive to the choice of AW or CPI discounting, given the 1.3% real average wage growth assumption used here, in turn based on the most recent actuarial report for the CPP (OSFI, 2007).⁷ Furthermore, there is an interaction between the choice of discount rate and the choice of ages for the numerator and denominator of the RR ratio, which is why alternative combinations of both are shown in Figures 4b and 4c. Figure 4b focuses on males and age 70 for the post-retirement age in the numerator of the RR ratio, while Figure 4c focuses on females and age 80.

Choosing the CPI as the discount factor increases average RRs, especially for the longest period of years used in the denominator of the RR ratio, "Updated Career", i.e. from age 25 to "retirement". The reason is that consumable incomes at younger ages are not updated by as large a factor in computing the preretirement denominator of the RR ratio, so this denominator is smaller, and hence the RR ratio is higher. If only the best 5 of the past 10 years is used, then there is considerably less difference between choosing the CPI or AW as the discount factor – about 10 percentage points compared to about 25 points

The effects of using CPI rather than AW discounting are magnified for the net RRs of women at age 80, as shown in Figure 4c. Indeed, women at age 80 have higher RRs than men at age 70 using the CPI as the discount factor (for each of the three pre-retirement denominators). One part of the intuition is that, despite the general absence of indexing of retirement incomes derived from private savings via RPP pensions in pay and annuities from matured RRSPs, these sources of income are relatively small compared to incomes from public pensions. Second, public pension benefits are all fully CPI indexed. Moreover, the benefits from public pensions for singles versus couples are slightly more generous than the 1.4 equivalence scale

⁽Apr21_Wolf_Base(AIW) m.xlsx sheet MCW Compare CPI)

⁷ Recall that for the past three decades, the difference between CPI and AW has been essentially zero, so this choice of discount factor has not been material in the LaRochell-Cote et al. (2008) and Ostrovsky and Schellenberg (2009) analyses.

adjustment for family size differences at the one and two person levels. Also, in addition to these factors regarding the numerator of the RR ratio for women at age 80, their denominators are also smaller, leading to higher RR ratios.

The main conclusion is that for women at age 80 in the 1960 – 65 birth cohort coming from middle preretirement earnings families, the difference in RRs for CPI versus AW discounting can be up to about 35 percentage points, a very substantial difference. For men, the impact of the choice of discount factor is similar qualitatively, but somewhat smaller in magnitude. Also, for both males and females, the various choices of numerators and denominators for the replacement rate ratio result in a range of about 20 percentage points under AW discounting, and up to more than 30 points under CPI discounting.

As a result, the more usual practices of computing replacement rates, even if net, using CPI rather than AW discounting, and focusing not even on age 70 but even earlier at age 65, significantly improves the apparent adequacy of Canada's retirement income system.

Proportions with "Low" Replacement Rates

Average replacement rates, by their nature, do not show the dispersion in replacement rates individuals in a given lifetime earnings group and birth cohort can expect to achieve. Some will have replacement rates higher than the average; others will have lower replacement rates. Such dispersion also reflects not only the heterogeneity of individuals' life cycle circumstances, but also the accumulated impacts of a range of risks, including job changes with consequent loss of RPP coverage and volatile investment returns in money purchase arrangements. We therefore turn now to explore some key indicators of the dispersion in net RRs expected among individuals.

To start, Figure 5 shows the percentages of those in the 1960 - 65 birth cohort who can expect to have <u>net</u> replacement rates at age 70, on the one hand, of less than 75%, and on the other over 100%. The results are also shown for both AW and CPI discounting.

While 75% is an arbitrary cut-point, RRs less than 75% are indicative of a non-trivial falloff of at least onequarter in living standards some time after usual retirement. And as noted above, this 75% figure is considerably more stringent than the 90% cut-point used by Horner (2009) in his study for the Mintz report (2009). On the other hand, a RR of at least 100% indicates RR adequacy.





(vertical axis percent with RR <75% or >100%, horizontal axis pre-retirement earnings \$000s)

(May6_W_Base(CPI) withHouse_50%HE b.xlsx sheet Wolfson_1c_RR thresholds)

As expected, virtually no one in the bottom pre-retirement earnings group faces a RR under 75% (solid lines), while the vast majority have RRs of at least 100% (dashed lines). But these figures change dramatically as one moves up the earnings spectrum. By the middle 50% earnings range (i.e. \$35 to 80 thousand), over half of the population in this birth cohort can expect a fall of at least one-quarter in their consumable income – using the AW discount factor. The situation does not appear as serious if the CPI is used as the discount factor, at about half these proportions. But as argued above, the AW discount factor is likely more representative of how individuals will perceive their post-retirement economic situations.

Figure 5 also shows that the proportions achieving at least full replacement fall with higher pre-retirement earnings. In the \$35 to 80 thousand middle range, only 5 to 20% can expect to achieve full continuity of consumption possibilities with AW discounting.

So far, we have focused on projections for the 1960-65 birth cohort. Figure 6 shows the projected proportions facing at least a one-quarter fall in consumable income by birth cohort.



Figure 6a – Percent with <75% "Prime" RR by Birth Cohort (both sexes, Age 70)

(vertical axis percent with RR <75%, horizontal axis pre-retirement earnings \$000s)

(Apr22_Base_withHouse_HE drawdown_50% g.xlsx sheet MCW new base case

These LifePaths simulation results show that particularly in the middle \$35 to 80 thousand pre-retirement earnings range, the proportions with net replacement rates below 75% are expected to increase substantially – by about 30 percentage points, as we move from the leading edge of the baby boom (1945-50 birth cohort) to the trailing edge cohort (1965-70).

Several factors can account for this projected deterioration in net replacement rates. For the C/QPP, young people are attending school (mostly post-secondary education) for longer periods of time, hence entering the paid labour force at later ages. A steepening of the age-earnings profiles, with lower earnings at younger ages has also been observed in recent decades. Both of these trends combine to lower expected C/QPP benefits. Further, there was an historical adjustment to the YMPE when it was first indexed that resulted in a degree of "over-shooting" which is reducing the maximum size of C/QPP benefits.

The Old Age Security (OAS) benefit and the Guaranteed income supplement (GIS) and its associated Spouses Allowance (SPA) are fully CPI indexed, but in terms of average wages, they will be declining. Also, the point in the personal income tax system where the OAS begins to be clawed back, the so-called turning point, is also indexed to the CPI, so that with real per capita economic growth, it will decline in relative terms and thereby affect an increasing proportion of seniors with middle pre-retirement earnings.

Finally, the simulations extrapolate from recent patterns of RPP coverage. While participation in workplace pension plans has been relatively stable at higher ages, e.g. around age 50, it has been falling at younger

ages. Thus, while roughly the same number of individuals are projected to be members of RPPs at some point in their lifetimes, the average numbers of years they are members is projected to fall. This too will reduce individuals' expected net RRs.

As shown in Figure 4a above, projected average replacement rates are sensitive to the assumption for the treatment of owner-occupied housing. Figure 6a assumes that for each cohort, both imputed rent and half the accumulated equity in owner-occupied housing is considered in computing the net RRs. Figure 6b, focusing on the 1960-65 birth cohort, shows the impacts of the same four scenarios with regard to owner-occupied housing on the proportions of the population with net RRs falling by at least one-quarter.

Figure 6b – Percent with <75% "Prime" RR by by Treatment of Owner-Occupied Housing (both sexes, Age 70, 1960-65 birth cohort)



(vertical axis percent with RR <75%, horizontal axis pre-retirement earnings \$000s)

Starting from the scenario where home equity accumulation is completely ignored, and then taking only imputed rent into account (i.e. comparing the top two curves), the proportions of middle income individuals expected to face at least a one-quarter decline in their net RR increases by over ten percentage points. The effects of drawing down the accumulated asset values of owner occupied housing result in changes of similar magnitude: the proportion of those with pre-retirement earnings in the \$50 to \$80 thousand range who can expect a decline of at least one quarter in their net replacement rate falls from around 80% to around 70% if only the imputed rent aspect of owner-occupancy is taken into account, and then to about 60% if both imputed rent and half the equity in the house is liquidated, and finally to a bit over 50% if the full value of the house is liquidated and converted into an annuity at age 65.

Economic Uncertainty

As noted earlier, a crucial characteristic of retirement income arrangements is the uncertainty individuals face with regard to the benefits that are ultimately provided. One source of uncertainty is the market yields that will be earned on invested funds. As noted in Hamilton (2009), not only is there a wide range of variation in historical market yields, but also in the lengths of the periods over which substantially lower or higher yields can persist. We have used the LifePaths model to explore this source of uncertainty in somewhat more depth.

This portion of the analysis is based on constructing a series of alternative futures ("economic scenarios") for the economy-wide average market yields on bonds and equities. The approach is quite simple. It is designed to reflect actual historical experience in the year-to-year volatility in market yields, and at the same time to reflect the longer term persistence of the sort highlighted by Hamilton (2009). The yields experienced by all the birth cohorts up to and including calendar 2009 are those observed. For projecting future yields,

we start with the actual time series of real annual market yields by broad asset class between 1948 and 2009. Every seven years, for the period starting in 2010, we randomly draw a year between 1948 and 2002. The economy-wide real average market yield for that seven year period, 2010 to 2016 inclusive, is then set equal to the real average market yield actually observed in the randomly selected historical period. Then starting in 2017, another seven year period is drawn from the historical experience, and so on.

The procedure just outlined generates one economic future. The next step is to generate a number of these economic futures. Figure 7 shows results for the net RRs produced by RRSPs for 8 alternate futures. Note that RRSPs are fully money purchase, and thus the main vehicle where investment return volatility has been explicitly incorporated. For each of these 8 alternate economic futures, a full simulation using LifePaths has been run (with at least 1 million individuals). We focus on RRSPs because this is the source of post-retirement income that is most sensitive to economic uncertainty.



Figure 7 – Average "Prime" RR for RRSPs by Economic Scenario (8 streams), Both Sexes (vertical axis RR %, horizontal axis birth cohort)

The results show a "widening cone of uncertainty" for successive birth cohorts. For the 1945 – 50 birth cohort, the time remaining to experience economic vicissitudes is much shorter than for the 1965 – 70 birth cohort. Correspondingly, the eight alternative economic scenarios result in net RRs for the first birth cohort examined varying by about 1.5 percent. But after 20 years, for the 1965 – 1970 birth cohort, the range is about 4.5 percentage points of net RR. Importantly, this range is about one third the average level of the net RR provided by these private money purchase retirement saving vehicles.

There is no question, therefore, that a shift in the composition of Canada's retirement income system away from public DB pensions to private money purchase arrangements, or from private DB to private DC RPPs, would shift substantial risk to retirees. While increased money purchase pension plans to avoid the looming impacts of aging populations on public pension expenditures was a fairly popular suggestion amongst many economists and private sector analysts, certainly in the 1990s (e.g. QQQ World Bank ref), this idea has all but disappeared from public discourse – first following the burst of the stock market "tech bubble" in 2000, and more recently since the financial collapse in 2008.

Reform Scenarios

Since the 1990s, the pendulum has swung from concerns about affordability of pension systems to increasing concerns about the adequacy of Canada's retirement income system. In particular, there has been concern about workplace pensions as low market yields gradually placed many plans in a deficit position which was sharply exacerbated by the financial crisis in 2008. The bankruptcy of Nortel and the very public plight of its pensioners, along with more gradual pressures to shift workplace plans from defined

benefit to defined contribution, has also raised general awareness of problems with the private part of Canada's retirement income system. In contrast, reforms to the C/QPP in 199X QQQ, especially to increase the payroll tax contribution, have led to a widespread feeling that the public portions of Canada's retirement income system are financially sound, notwithstanding relatively frequent prognostications of "demo doom" given the expected aging of Canada's population as the baby boom cohorts begin to move into retirement.

It was in this context that several provinces issued reports on the retirement income system (OECP, 2008; JEP, 2008; PRP, 2009). They were all concerned about the levels of income that future retirees could expect, and in one way or another either hinted at or proposed expansions of earnings-related pensions. The financial crisis of 2008 also had major effects on virtually all other private retirement savings vehicles, so that not only DB workplace pension plans were seen under threat, but also the alternatives touted by many in the financial industry, namely DC or money purchase plans, including RRSPs.

Indeed, one leading analyst in Canada with in depth private sector experience (Ambachtscheer, 2009) has been advocating a mandatory expansion of Canada's retirement income system, recognizing current and anticipated inadequacies, but by means of a private savings vehicles. Still, to mitigate the risk shifting from employers to workers just noted, his proposal included other important features to reduce management expense ratios and to spread investment risk.

In the face of this mounting pressure for reform of some sort, the Federal Department of Finance commissioned the Mintz (2009) study. The media headlines (e.g. "No Pension Crisis", Financial Post, Dec 19, 2009) tended to give a sanguine interpretation to the report's "first conclusion from the research is that Canadians are, by and large, doing relatively well in ensuring that they have adequate savings for their retirement." However, in the subsequent half year, the Federal Minister of Finance has shifted from agnosticism as to whether or not there is a problem of sufficient magnitude to warrant reforms, to an implicit endorsement of expanded public mandatory pensions, "we should consider a modest, phased in, and fully funded enhancement to the defined benefits under the Canada Pension Plan" (Flaherty, 2010).⁸ This reform would be accompanied by other reforms to broaden the ability of workers to participate in private retirement savings arrangements. But accepting the need to consider expansion of the CPP effectively recognizes that facilitating and incenting increased private saving for retirement is unlikely to be sufficient.

In this section, we therefore focus on reforms that expand the public pension system. Specifically, we consider three reform options. The first, as proposed for example by the Canadian Labour Congress (CLC, 2009) doubles the nominal 25% replacement rate in the C/QPP to 50%, leaving essentially all other provisions unchanged. Correspondingly, C/QPP contributions are increased by 5.2%, the estimated full future service cost of these benefits.⁹

The second reform scenario is a different expansion of the C/QPP, which we refer to as the "wedge" option. It increases the C/QPP replacement rate to 40% (not 50%), but only starting on earnings above half the YMPE (Year's Maximum Pensionable Earnings). However, this 40% nominal replacement rate is extended up to twice the current YMPE. C/QPP contributions are correspondingly increased, based on pro-rating the same 5.2% future service cost of an extra 25 percentage points of nominal replacement noted for the first C/QPP expansion option.

The "wedge" option was designed to address the fact that under the current system as shown above, net RRs decline with pre-retirement earnings, and are already over 100% at the lower end of the pre-retirement earnings range. The "wedge" option also reflects, in a stylized manner, a number of extant proposals that

⁸ To put this statement in a broader context, it is equivalent to Ronald Reagan or George W. Bush saying that Social Security benefits and contributions should be increased by tens if not hundreds of billions of dollars.

⁹ 5.2% is the projected cost of the current retirement and post-retirement survivor pensions in the C/QPP. Pre-retirement survivor, disability, and initial unfunded liabilities of the current C/QPP are not included here. The 5.2% figure is in turn derived from the 2006 CPP Actuarial Report (OSFI, 2007) QQQ precise ref to come...

give prominence to increases in the YMPE. The structure of these two modes of C/QPP expansion is shown in Figure 8, with the CLC "double" option in blue and the "wedge" option benefit structure in red, and both with dashed lines.





UCAE = updated career-average earnings per C/QPP

We have added a third option for comparison. The OAS, the basic and almost universal demogrant for those over age 65, is CPI indexed, and therefore will fall over coming years relative to average wages. Thus, the foundation of Canada's retirement income system is projected to decline in terms of its role in providing net replacement. To counteract this trend, the third option indexes the OAS (and GIS/SPA and income tax etc.) to average wages rather than to the CPI.

The impacts on average net RRs for these three reform scenarios are compared in Figure 9a, for the 1960-65 birth cohort. Correspondingly, Figure 9b shows the impacts of the reforms on the proportions expected to face at least a 25 percentage point decline in net RRs.





Figure 9b – Percent with "Prime" RR < 75 by Reform Scenario for 1960 - 65 Birth Cohort, Both Sexes (vertical axis %, horizontal axis pre-retirement earnings \$000s)



(both Apr22_Base_withHouse_HE drawdown_50% h.xlsx sheet MCW compare reforms by earnings)

Perhaps the most striking feature of these results is just how small the impacts are of these quite substantial reforms of Canada's public pension system. Especially in the middle pre-retirement earnings ranges, Figure 9a shows that the improvements in average net RRs range from 4 to 8 percentage points. The reason the changes are so small is obvious, though, given the gradual phase-in of the reforms. The 1960-65 birth cohort will be age 70 (the age at which the numerator in these RRs is measured) in 2030-2035. This simulation assumes (optimistically) that the reforms are implemented immediately in 2010. So for this cohort, only about one-third to one-half of the benefit expansion is available.

Still, even with this partial phase-in, Figure 9b shows more substantial changes in the proportions likely to face at least a one-quarter drop in their consumable income after retirement – ranging from a 5 to 14 percentage point improvement in the middle earnings ranges.

The targeting of the three reform scenarios is also different. Increasing the indexing of the OAS/GIS etc. by the 1.3 % per annum difference between the CPI and AW growth benefits those in the lower third of the preretirement earnings spectrum relatively the most. But even for the middle and upper portion of the earnings spectrum, the reductions in the proportions facing at least a one-quarter drop in their net RR is very close to those of either of the two C/QPP expansion options. On the other hand, as is visible in Figure 9a, the AW indexing of OAS/GIS etc. increases those average replacement rates the most that are already over 100%, those in the lower earnings ranges.

Comparing the "wedge" and "doubling" options, again not surprisingly, the wedge option provides a greater increase in average RRs at middle and higher pre-retirement earnings, while the doubling option has relatively greater impact for middle range earnings. Still, it is interesting that the "wedge" and "doubling" options have quite similar impacts for middle and higher pre-retirement earnings. This similarity is certainly plausible when examining Figure 8, showing the benefit structures, more closely, since the benefits are not that different for the two options for UCAEs between the YMPE and twice the YMPE.

If the improvements in net RRs from the two C/QPP expansion options are as shown, and these reforms are likely beyond the scope of the "modest reform" tentatively supported by the Federal Finance Minister, then the benefits of reform for those not only in the 1960-65 birth cohort, but those who are closer to retirement will be considerably smaller than those shown in Figures 9a and 9b. In other words, if the status quo projections produced in this analysis suggest that there really is a problem of adequacy in Canada's retirement income system, which seems increasingly accepted, then the reforms under discussion are unlikely to ameliorate the situation in coming decades to any substantial degree.

This may, in turn, raise a major question regarding the presumption that any expansion of mandatory pensions must be gradually phased in. Virtually all of the public discussion and the major documents produced by the provinces accept this presumption without question. However, the introduction of the

C/QPP in 1966 included a very rapid phase-in, plus the "windfall" introduction of the GIS/SPA program for those seniors in the most straitened financial circumstances.

Implicitly, the thinking at that time was that any pension "promises" by the then working age generation to itself in later years when it was retired should be accompanied by a set of transfers to the contemporaneous population of seniors. This was a reflection of a kind of inter-generational golden rule, that the working age generation should not do unto itself any more than it was prepared to do for its parents' generation.¹⁰

Current pension policy discourse has shied away from any talk at all about intergenerational transfers. And analysis of the intergenerational implications of pension changes is complex. Still, several points are worth noting.

First, it is possible to mitigate any intergenerational transfers and at the same time have a more rapid phasein of benefits. Increasing the contribution rate beyond the 5.2% amount used in this analysis would generate a surplus that could be used to phase in C/QPP benefit increases more rapidly. Still, finding an appropriate balance between faster phase-in and even higher contribution rates poses a difficult political judgment. The major efforts required to bring in pension reform, were the segment of the public which is at all interested in retirement income adequacy (say those currently over age 50) to understand that the full benefits would not be visible in their lifetimes, might not appear worthwhile. But making the pension reform more beneficial for these politically relevant age groups by more rapid phase-in, while remaining fully pre-funded, would require a larger increase in the contribution rate.

Second, it should be appreciated that the C/QPP expansion options, even though they are nominally fully pre-funded, already involve intergenerational redistribution. Larger C/QPP benefits automatically reduce GIS/SPA costs. Thus, future government expenditures, and hence tax revenue needs, will be reduced, while payroll taxes now and in the immediate future will be increased. Moreover, there is a widespread expectation that publicly financed health care costs are unsustainable. Arguably, fully pre-funded expansion of the C/QPP increases the likelihood in future that health care costs will be shifted from public to private sources of payment. This too would entail a shift from future general tax revenues as the source of financing to current and future payroll taxes, in this case to fund future health care costs.

Third and more generally, there is a widespread concern that inter-generational transfers are unfair because they unduly burden future generations. This is not necessarily correct. Unfortunately, much of the earlier thinking on this important issue seems to have been forgotten – for example the chapter in the report of the Special Parliamentary Committee on Pension Reform (Frith Committee, 1983) on intergenerational fairness QQQ, and the work of leading public finance economists such as Musgrave (1981). This work was recently reviewed and extended by Wolfson and Rowe (2007), which the reader is encouraged to review.

Two key ideas are worth emphasizing from this literature.

One is that intergenerational fairness depends on far more than whether or not a given program like the C/QPP is fully pre-funded. Future generations will judge whether the current generation has bequeathed them enough or too little to deal with the pension transfers they are having to fund based on a much wider range of considerations. These will include the state of the economy in general – for example was economic growth robust, or is public infrastructure in dilapidated condition, and the state of the environment – for example are pollution levels low or are there major cleanup cost burdens they have inherited.

Further, the C/QPP do not operate in isolation. Changes in payroll taxes have effects on the labour market, on the composition of private sector investment (e.g. capital intensity), and on the directions seen as most profitable for innovation, as well as macro-economic feedbacks. There is no reason to expect that future generations will be unable to do such sophisticated economic calculations.

¹⁰ QQQ a more careful examination of the documents in the run up to the 1966 reforms shows that something like this thinking was in fact explicit – Richard Simeon – need to check

The other key idea concerns indexing. Up to now, public policy with regard to indexing has not been very creative. Both Musgrave (1981) and the Special Parliamentary Committee (Frith, 1983) made recommendations for more sophisticated pension indexing formulae explicitly designed to meet concerns about intergenerational fairness. For example, the Frith committee recommended that an index be developed such that in times of higher unemployment, slower economic growth, and / or higher old age dependency ratios, public pension benefits would grow more slowly, and possibly even decline. Sweden, as a rather rare example, in its last reform effectively indexed their public pension benefits to longevity. Wolfson and Rowe (2007) explore and assess a range of indexing rules precisely from this perspective of intergenerational fairness.

In sum, these ideas about intergenerational fairness may provide routes for contemplating pension reform options that have so far been off limits, but need not imperil intergenerational fairness more broadly and appropriately conceived, and that will allow improvements in net replacement rates to phase in more quickly.

Beyond Money – What About Health and Leisure Time?

In discussions of the replacement rate adequacy of Canada's retirement income system. questions have been raised about the 100% norm used in this analysis. One comment is that the elderly are often ill and frail, so need less money. Another is that the retired have more time on their hands, so are able to substitute their own time for money, and hence again need less. In this section, we briefly address these concerns.

While there is a widespread view that being old means being sick, the data are not supportive. Figure 10, from Wolfson and Rowe (2004), shows recent (2001) and projected (2021) disability status by age and sex.



Figure 10 – Distribution of Disability / Institutionalized Status by Age and Sex for 2001 and 2021

Disability status was defined in functional terms, based on the characteristics most likely to be associated with the need for assistance in performing everyday activities such as housework, grocery shopping, meal preparation, and personal care. Ability to perform these activities was assumed to depend primarily on functional limitations in the areas of mobility, dexterity, cognitive capacity, and pain. The largest and lightest coloured area in the pyramids is for individuals with no substantive limitations of these sorts. The very darkest coloured area on the outside edges of the pyramids represents those in institutions; while the intermediate colours indicate individuals living outside institutions with mild, moderate, or severe disability.

The two population pyramids (more accurately "pears") clearly show the baby boom cohort moving up the age axis over the 20 year span covered. The blue triangles superimposed at the tops of the population pyramids show the substantial projected increase in the 65+ population. Correspondingly, the red superimposed triangles indicate the size of the non-disabled senior population. The key point in this context is that most of the population age 65+ will be functionally healthy. Thus, the vast majority of Canada's seniors can expect to have just as much capacity to use whatever incomes they have as the non-elderly.

The other comment noted above, about leisure time, seems to suggest that seniors have lots of time on their hands which can be put to use in lieu of income. However, this is a very narrow framing of the question. Table 2 shows data from the 2005 General Social Survey on time use patterns where individuals were asked not only how they spent their time, but also how much satisfaction they derived from various major activities.

				Age Groups					
	<u>all*</u>	males 1	females	<u>15-24</u>	<u>25-44</u>	<u>45-64</u>	<u>65+</u>		
Cleaning	2.4	2.2	2.6	2.1	2.4	2.5	2.8		
Groceries	2.7	2.5	2.8	2.6	2.6	2.6	2.9		
Maintenance	2.9	3.3	2.5	2.6	2.9	3.0	3.1		
Other Shopping	3.0	2.5	3.4	3.5	2.9	2.7	2.9		
Communting	3.0	3.0	3.0	2.8	3.0	3.2	3.8		
Clubs	3.1	3.0	3.1	3.4	3.1	2.9	3.0		
Volunteering	3.3	3.0	3.5	3.1	3.2	3.4	3.5		
Cooking	3.3	3.1	3.4	3.1	3.3	3.3	3.3		
TV	3.3	3.3	3.2	3.4	3.2	3.1	3.6		
Social Events	3.5	3.3	3.7	3.8	3.5	3.3	3.2		
Movies / Plays	3.7	3.7	3.7	4.3	3.9	3.4	2.9		
Paid Work	3.8	3.8	3.8	3.7	3.7	3.9	4.2		
Dining Out	4.0	3.8	4.1	4.0	4.1	3.9	3.7		
Supper at Home	4.0	4.1	4.0	3.8	4.1	4.1	4.1		

* basis for sorting

five-point scale with 1 being "dislike a great deal" and 5 being "enjoy a great deal"

The fourteen activities have been ranked according to the overall levels of dislike or enjoyment associated with each. The blue(?) ovals indicate situations where the specific levels within sex or age groups are quite different from the overall average. Importantly in the context of pension policy discussions, paid work is the third highest ranked activity overall, and is the highest for those age 65+. There are several possible explanations for such a high ranking. An obvious one for seniors is that they want more income. But more broadly, there are also major social benefits to being engaged in paid work. One is that the workplace provides an important source of social interaction and contact with a network of peers; it enables one to avoid social isolation. Another is that individuals intrinsically want to feel that they are contributing members of society. Being able to contribute is a major source of satisfaction.

All of these factors support policy directions that would make it easier for seniors to maintain a substantial connection to the paid labour force. This in turn would mean delayed or at least gradually phased retirement would be preferred by many. There have been some policy moves in this direction, for example allowing C/QPP benefits to commence anywhere between age 60 and 70 on an actuarially adjusted basis. But as the current round of pension reform discussion evolves, these time use data suggest that more "out of the box" thinking is warranted with respect, at the least, to the very concept of retirement, not least as a sharply defined point in time. As a result, there are strong social as well as financial reasons to question current structures and assumptions about stereotypical patterns of life course behavior. Such questioning could open up a more innovative range of policy options for improving Canada's retirement income system.

Concluding Discussion

This analysis began by examining whether or not Canada's retirement income system is likely to provide adequate incomes in coming decades. As a prelude to the discussion of the simulation results, the methodology for measuring "adequacy" was carefully discussed. The core concept we have used is continuity of consumption possibilities, or equivalently an ability to maintain living standards after retirement in line with those enjoyed prior. The corresponding statistical measure is the net consumption replacement rate (RR), the ratio of consumption possibilities after retirement to those before. The assumed norm is 100%. The methodological discussion highlighted a number of factors to which the RR is quite sensitive, including the discount factor, and the method for taking account of changes in family size over the life course.

Notwithstanding these sensitivities, the projections showed that a substantial proportion of middle income Canadians is likely to face significant declines in their living standards after retirement. In short, about half of

those with mid level earnings in working years can expect at least a one-quarter drop in their living standards by age 70 – taking account not only of the public pension system, but also private retirement savings in RRSPs and workplace pensions, and accumulated equity in owner-occupied housing. Women especially can expect a further drop when they reach age 80. Notably, the 25% figure we have used is much more stringent that the ten percentage point threshold used by Mintz (2009) and Horner (2009) in their studies for the Federal Department of Finance.

Our simulation projections therefore corroborate much of the public policy analysis and discussion, that there is reason for concern about the adequacy of the retirement income system in future. This public discussion has led most recently to the conclusion of the Conservative Finance Minister that some "modest" enlargement of the public pension system may well be needed. To this end, we have simulated and explored the likely impacts of three reform options. All of these options are at the outside edge of what the Minister of Finance likely considers "modest", if not well beyond. However, none of them has a very large impact on projected replacement rates, for example for the trailing edge of the baby boom cohort, those born in 1960-65 who are currently age 45-50. The impacts for older baby boom cohorts who still have yet to retire will be even smaller. The basic reason is that the reform options expanding the main earnings-related public pension, the C/QPP, are phased-in gradually.

These results in turn raise the option, which up to now has been "off the table", of more rapid phase-in of benefits in one way or another. Such an accelerated phase-in need not conflict with full pre-funding. But it would entail a higher contribution rate associated with the funding of the expanded portions of the public pension system. More fundamentally though, the fixation with full pre-funding, while eminently reasonable on the face of it, begs an underlying question regarding intergenerational fairness. On this score, the public discussion to date is seriously inadequate, and appears unaware of important discussions of this issue during the previous era of heightened interest in pension reform, the "Great Pension Debate" of the early 1980s. We have pointed to some directions for renewed analysis of this issue of intergenerational fairness.

Similarly, we briefly examined two related topics in the context of the current pension policy discussions – the likely future health status of the elderly, and their preferred uses of their expanded leisure time. In both cases, the results are contrary to conventional thinking. By and large, seniors can expect to spend most of their age 65+ years without significant disability. And many seniors would like to spend more of their time in paid work. The image of a huge and growing population of frail seniors unable to engage in many activities is simply wrong.

These facts suggest that the current pension reform discussions are unduly constrained. There is a major opportunity for more "out of the box" thinking, for the development of more fundamental options that address the shifting patterns of activity over the life course, options that respond to and enable the kinds of reciprocal evolution of individual behaviours and social norms for behavior analysed by Mathilde White Riley in her presidential address to the American Sociological Association over two decades ago:

"Nowadays a major current source of structural strain is the long-term failure of our institutions to accommodate the steady rise in the proportion of people who are old. Large strata of older people have been added at the top of the traditional age pyramid, but no comparable activities have been prescribed for them either in the work force or the family; and no adjustments have been made for repercussions in all the other strata. This "structural lag" means (apart from individual dislocations) that human resources in the oldest-and also the youngest-strata are underutilized, and excess burdens of care are imposed upon strata in the middle years." (Riley, 1987, p9-10)

Finally, it is important to appreciate the methodological advance implicit in this analysis, as well as our earlier work cited with regard to intergenerational equity and the future prevalence of disability. This is the LifePaths microsimulation model of Statistics Canada. In the mode of the mathematician's "proof by construction", we have demonstrated the feasibility and power of a very high level of policy analytic sophistication. These kinds of methods are normal practice in fields as diverse as cosmology and global climate modeling. It is unfortunate that in the context of multi-billion dollar policy decisions in the pension area, these methods are normal so the norm.

Glossary

OAS – Old Age Security, a federal monthly demogrant for those age 65 and older, CPI indexed, and "clawed back" based on income at a 15% (QQQ) rate on income over QQQ

GIS – Guaranteed Income Supplement, an income-tested monthly payment to those age 65 and older, and their spouses, reduced at a rate of 50% of net income in the previous year

SPA – Spouse's Allowance, an income-tested monthly payment that effectively extends GIS in situations where one spouse is age 65 or older, and the other is age 60 to 64.

C/QPP – Canada and Quebec Pension Plans, mandatory earnings-related contributory public pensions replacing 25% of "updated career average earnings" (UCAE) to a maximum of the "year's maximum pensionable earnings" (YMPE); earnings in calculating UCAE are updated uinsing an index of average wages (AW), while pensions in pay are updated using the CPI

RPP – Registered Pension Plan, a workplace private pension arrangement meeting the requirements for registration under the Income Tax Act, which allows employer and employee (if it is a contributory plan) contributions to be tax deductible, and investment returns within the plan to be non-taxable, while the entire amounts of annuity payouts (i.e. both investment returns and capital) are taxable

RRSP – Registered Retirement Saving Plan, an individual saving arrangement meeting the requirements for registration under the Income Tax Act with parallel tax treatment as for RPPs

DC - Defined Contribution or money purchase arrangement, all RRSPs are DC as are some RPPs

DB – Defined Benefit,

EI – Employment Insurance, a weekly public benefit when unemployed based on weeks and hours of prior employment and wage levels (formerly UI = unemployment insurance)

SA - Social Assistance, monthly welfare payments

YMPE - Year's Maximum Pensionable Earnings under the C/QPP, equal to the average wage

CPI – Consumer Price Index

AW – Average Wage

EAU – Equivalent Adult Unit(s), used to adjust an individeal's household income according to household size, taken in this analysis to be the square root of household size.

RR – Replacement Rate

Annex – Correlation Between Short and Long Term Earnings



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