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PENSION PAPERS

The Piggy Bank Index: Matching Canadians' Saving Rates to Their Retirement Dreams

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- Making smart savings choices is critical to ensuring Canadians have access to sufficient and secure post-retirement incomes. Except for the working poor, Canadians must save a very high fraction of pre-retirement earnings every year – either through employer plans or private saving – to provide for reasonably adequate and assured retirement incomes.
- We estimate that most Canadians, should they wish to retire at age 65 and replace 70 percent of their working incomes, will need to save from 10 to 21 percent of their pre-tax earnings every year, if they save for 35 years.
- Although private retirement savings allow choice about retirement age and income, *Income Tax Act* limits on tax-recognized savings would prevent many earners from accumulating sufficient RRSP savings over 33 years (by age 63) to securely replace 70 percent or more of their working incomes.

As Canada's babyboom generation approaches retirement age, public concern about the adequacy of retirement income is mounting. The sharp fall in stock markets and interest rates in 2008/09, coupled with the bankruptcy of a few major employers, has heightened Canadians' anxiety over the adequacy and certainty of their expected retirement incomes, from employer pensions, Registered Retirement Savings Plans (RRSPs) and other private savings. This anxiety has given rise to public debate about the tax and fiduciary rules governing corporate pension plans, about the possibility of expanding contributory public pension plans such as the CPP/QPP, about how much tax-deferred saving the *Income Tax Act* should allow, and for how long.

To date there has been little focus on the fraction of annual earnings that must be saved – either through employer plans, private saving, or expanded contributions to a public plan – to provide adequate and reasonably assured retirement incomes. The required level of personal saving is unknown to most individuals, leaving them to their own devices for a large part of retirement planning. This *e-brief* asks the following question: what are the annual rates of retirement savings – beyond mandatory CPP/QPP premiums – that individuals of different incomes must save to enjoy a comfortable retirement? The answers highlight the diverse and, in many cases, large fractions of annual earnings that must be saved.

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Factors Affecting Retirement Income and Required Savings

Retirement income beyond what governments provide may come from an employer pension, private annuities, or the drawdown of private savings. In all cases, income depends on accumulated savings at the time of the retirement and an individual's age at retirement. Further, accumulated savings at the time of retirement depend on savings during working life, and the investment returns on those savings. Thus, the fraction of earned income a person must save during working years, to provide a desired level of retirement income, depends on five main factors:

a) return on investments;
b) income level;
c) age of retirement/number of contribution years;
d) target post-retirement income as fraction of pre-retirement earnings; and,
e) annuity factors.

This *e-brief* provides indicative estimates of the fraction of pre-tax earnings that must be saved each year to provide lifetime inflation-adjusted income (pre-tax) after retirement equivalent to a target fraction of final earnings based on plausible assumptions about each of these factors (Tables 1 and 2). We also demonstrate how these estimates respond to changes in these assumptions for the median wage earner (Table 3).

The Assumptions

(A) RETURN ON INVESTMENT: Nominal returns on a prudent investment portfolio vary from year to year and decade to decade. Nevertheless, over very long periods, total real returns (i.e., adjusted for inflation) on a prudent portfolio are much less variable and have averaged in the order of 4 percent per year.[1] To be prudent and to compensate for other potential sources of bias in our assumptions, we have used a 3 percent real return assumption in our calculations.[2] We also assume inflation will average 2 percent annually.

(B) RELATIVE INCOME LEVELS: We assume that public plans – Old Age Security (OAS), the Guaranteed Income Supplement (GIS) and the CPP/QPP – will continue in their present structure and will continue to provide an important part of (even all of) the income needed to meet target earnings replacement needs of lower income workers. In all cases, we assume that a person's place in the income distribution for all people of a given age remains the same every year of working life from age 30.[3]

(C) AGE OF RETIREMENT / NUMBER OF CONTRIBUTION YEARS: The longer the post-retirement period and the fewer earning years over which savings accumulate, the higher the fraction of earnings that must be saved to provide a target retirement income. We solve for:

1. Savings that begin at age 30 and retirement that occurs at age 65 (35 years of saving).
2. Savings that begin at age 30 and retirement that occurs at age 67 (37 years of saving).
3. Savings that begin at age 30 and retirement that occurs at age 63 (33 years of saving).

1 See Appendix A.

2 In this paper we have assumed that the objective is to replace a share of final earnings. Thus, accumulation during working years must be adequate to compensate for the increase in the average level of real wages over the 33-, 35- or 37-year earnings period. Average wage levels over very long periods of time, like returns on capital, are related to productivity growth, but over shorter periods are related to labour-market conditions. In this *e-brief*, we assume real wage levels increase by 1 percent per year – which may be low given potential responses to Canada's changing demographics.

3 We use age 30, which is later than the average workforce entry age, to reflect the fact that earnings and savings will be volatile during early working years, and that working lives are often marked by interruptions in earnings because of unemployment, child birth, or leaves of absence, for example.

As many people desire to save less in their earlier working years and more in their later years – Appendix B illustrates this point – we also provide calculations where savings rates increase by age cohort.

(D) TARGET RETIREMENT INCOME:[4] The higher the targeted fraction of pre-retirement earnings to be replaced during retirement, the higher the fraction of earnings a person must save every year. We provide calculations for different target replacement rates. We start at 70 percent, usually considered the "gold standard" rate, along with a 60 percent replacement level (Table 1). We also provide calculations for a moderate 50 percent replacement rate in Appendix C.

(E) ANNUITY FACTORS: For our calculations we have assumed that retirement income takes the form of a regular, individual life annuity valued at the time of retirement based on current life tables and annuity factors.[5] We think these assumptions (summarized in Box 1) are reasonable and in aggregate unbiased.[6]

Box 1: Assumptions for Individual Saving Rates

Replacement rate	70%, 60%
Nominal rate of return	5%
Nominal wage growth	3%
Inflation	2%
Earnings period	
Retire at 63	33 years
Retire at 65	35 years
Retire at 67	37 years
Annuity Factor* (individual life indexed annuity, no guarantee, 3.5% underlying interest rate, indexed to inflation at 2%)	
Age 63	17.27
Age 65	16.08
Age 67	14.94
Savings rates by age	
Ages	
30-41	0.5 × full
42-53	full
54-retirement age	1.5 × full

*The calculation of the present value of a cash flow or other income stream that produces $1 in income over periods of time.

4 Retirement income provided from savings over and above equity accumulated in owner-occupied housing.

5 We are grateful to James Pierlot and Faisal Siddiqi at Towers Watson for providing these factors to us. Although we used individual annuity factors for the purposes of our calculations, readers should keep in mind that under DB pension legislation, benefits are automatically paid in the form of a minimum 60 percent Joint and Survivor pension for those who have a spouse on the date they retire (unless waived by the spouse). Also, because of the adverse selection problem, individuals purchasing an annuity from their individual or group RSP savings may face higher annuity costs and thus require higher accumulated saving at time of retirement.

6 The key sources of bias in individual assumptions are as follows:

a. In cross section, individuals' relative earnings increase with age up to about age 50. Hence "final" average earnings (in relative terms) are higher than "lifetime" average earnings (in relative terms). As we have assumed a flat age earnings profile (i.e., a worker's earnings are in the same income deciles over all earning years) we may have biased downward the fraction of annual savings required.

b. While large corporate or government plans take advantage of scale to minimize the costs of asset management and effects of adverse selection in the provision of pensions, individuals face (much) higher costs on both counts. Thus, for individuals without employer-provided defined-benefit or hybrid plans, we may have biased downward the fraction of annual savings required.

c. While the average rate of return on a mixed prudent portfolio has generated real returns (before taxes and fees) a little in excess of 4 percent per annum. over very long periods, this return has been quite variable over the decades. For this reason, we chose to do our calculations on the basis of a more prudent 3 percent. Thus, we may have biased upward the fraction of annual savings required. This upward bias should roughly offset the downward biases noted above.

Calculated Required Savings

We estimated required saving rates for workers at different levels of relative income (Tables 1 and 2; Table 3 reports a sensitivity analysis). We also performed an indicative calculation of the "savings from gross payroll" required, including CPP/QPP contributions (Table 4). The broad implications of these calculations are:

1. With the exception of the working poor, a high fraction of gross earnings – e.g. from 10 to 21 percent for retirement at 65 – must be saved every year to provide for a 70 percent replacement of earnings after retirement. This fraction is likely higher than many Canadians believe and higher than is set aside in most employer-based group RSPs or defined-contribution plans. It is also higher than the effective contribution over time to many employer- sponsored defined-benefits plans, and for high-income earners exceeds the annual limits placed on RRSP contributions (Table 1, columns 1, 3 and 5). In particular, *Income Tax Act* limits would prevent many earners from accumulating enough RRSP savings over 33 years (by age 63) to replace 70 percent or more of their working income.
2. Extending retirement from 65 to age 67 and increasing the number of saving years from 35 to 37 does reduce the fraction of earnings that must be saved, but the required saving rate still remains high (Table 1, columns 5 and 6). People wishing to retire earlier at 63 face even higher costs (Table 1, columns 1 and 2).
3. Delaying saving until later in life implies extraordinarily large fractions of income – more than 20 percent for a significant number of above-average earners – must be saved during the last decade of working life (Table 2).
4. Reducing the target replacement ratio from 70 percent to 60 percent – and further to 50 percent – appreciably reduces the fraction of earnings to be saved (Table 1, columns 2, 4 and 6; Appendix C). However, above-average earners must still save remarkably large fractions.
5. Taking into account the approximate amounts of current CPP/QPP premiums charged for provision of regular retirement benefits, the fraction of gross cash payroll that must be saved to provide a target replacement income of 70 percent of pre-retirement earnings approaches 20 percent for all average and higher wage earners (Table 4).

Concluding Comments

To summarize, Canadians who desire to replace a high fraction of pre-retirement earnings with an inflation-adjusted income stream from retirement until death must save a high fraction of their earnings each year. Our calculated indicative saving rates rise sharply with income level and (far) exceed what most individuals actually save or what employers contribute to defined-contribution plans.[7] In many cases, they also exceed what employers consistently contribute to defined-benefit or hybrid pension plans. And importantly, they sometimes far exceed what the *Income Tax Act* allows. The fact that our indicative calculations suggest that Canadians (either individually or through employer plans) are currently saving far less than they need to save to provide for pensions approaching 70 percent – or even 60 percent – of pre-retirement earnings raises important policy questions.

First, are Canadians willing to give up enough current consumption during their working lives to enjoy the level of consumption after retirement that is provided by a 60 percent or 70 percent pension? Their actions suggest they are not. This may be simply because they thought they were saving enough to meet this goal. Or it may be that conventional assumptions about the desired trade-off between consumption during working years and post-retirement consumption are wrong for many, or most, Canadians.

7 Average total RPP and RRSP savings rates (net of withdrawals) are estimated at 4 percent and 3 percent of earnings respectively for individuals under 60 years old in 2007. See Appendix B for detailed estimates by age group.

Table 1: Constant Private Saving Rates as a Percentage of Annual Pre-tax Earnings to Provide for Target Retirement Income

	Early Retirement (at age 63)		Retirement at age 65		Late Retirement (at age 67)	
	70% Replacement Rate	60% Replacement Rate	70% Replacement Rate	60% Replacement Rate	70% Replacement Rate	60% Replacement Rate
Annual Earnings	*(percent)*		*(percent)*		*(percent)*	
1st Decile – $12,451	0	0	0	0	0	0
2nd Decile – $21,056	0	0	0	0	0	0
3rd Decile – $28,530	11	3	7	0	5	0
4th Decile – $35,782	15	10	10	7	8	5
5th Decile – $42,803	16	12	11	8	9	6
6th Decile – $51,381	17	13	13	10	10	7
7th Decile – $61,270	19*	15	14	11	12	9
8th Decile – $73,958	20*	16	16	13	13	10
9th Decile – $95,627	22*	18	17	14	15	12
High Income – $150,000	25*	21*	21*	17	17	14

Source: Authors' calculations as described in text. Income deciles are estimated from Statistics Canada's Social Policy Simulation Database (SPSD) for earners (labour income greater than $500) aged from 30 to 55 years old.
*The annual savings rate exceeds either the annual 18 percent threshold or the maximum annual amount placed on RRSP contributions.

Table 2: Variable Private Saving Rates as a Percentage of Annual Pre-tax Earnings to Provide for Target Retirement Income

	Retirement at age 65					
	70% Replacement Rate			60% Replacement Rate		
Annual Earnings	*(percent)*			*(percent)*		
ages	30-41	42-53	54-64	30-41	42-53	54-64
1st Decile – $12,451	0	0	0	0	0	0
2nd Decile – $21,056	0	0	0	0	0	0
3rd Decile – $28,530	4	8	11	0	0	1
4th Decile – $35,782	6	11	17	4	8	11
5th Decile – $42,803	6	12	19	4	9	13
6th Decile – $51,381	7	14	21	5	10	16
7th Decile – $61,270	8	16	24	6	12	18
8th Decile – $73,958	9	17	26	7	14	21
9th Decile – $95,627	10	19	29*	8	16	23
High Income – $150,000	11	23*	34*	9	19*	28*

Source: Authors' calculations as described in text. Income deciles are estimated from Statistics Canada's Social Policy Simulation Database (SPSD) for earners (labour income greater than $500) aged from 30 to 55 years old.
*The annual savings rate exceeds either the annual 18 percent threshold or the maximum annual amount placed on RRSP contributions, inclusive of carry forward provisions.

Table 3: Partial Sensitivity Analysis – Private Saving Rates as a Percentage of Net Median Earnings, 70% replacement rate

		Constant Savings Rate			Retirement Savings by Age Group		
		Retirement at 63	Retirement at 65	Retirement at 67	Retirement at 65		
					ages (percent)		
		(percent)	*(percent)*	*(percent)*	30-41	42-53	54-64
Median earnings results for 70% replacement rate		16	11	9	6	12	19
Replacement rate	high (80%)	19	15	12	8	16	24
	low (50%)	7	5	3	2	5	7
Nominal rate of return	high (7%)	11	8	6	5	9	14
	low (3%)	21*	16	13	8	16	24
Nominal wage growth	high (5%)	22*	16	6	8	16	24
	low (1%)	11	8	13	5	9	14
Annuity Factor *Underlying Interest Rate*							
1 percentage point higher		14	10	8	6	11	17
2 percentage points higher		13	9	7	5	10	15

Source: Authors' calculations as described in text.
The annual savings rate exceeds either the annual 18 percent threshold or the maximum annual amount placed on RRSP contributions, inclusive of carry forward provisions.

Table 4: Private and Public (CPP/QPP) Saving Rates as a Percentage of Annual Pre-Tax Earnings (retirement at age 65, 70% replacement of earnings)

	Private Saving Rate	Approx. CPP/QPP Saving	Total Saving from Earnings
Annual Earnings	*(percent)*	*(percent)*	*(percent)*
1st Decile – $12,451	0	5	5
2nd Decile – $21,056	0	6	6
3rd Decile – $28,530	7	6	13
4th Decile – $35,782	10	6	16
5th Decile – $42,803	11	6	17
6th Decile – 51,381	13	6	19
7th Decile – $61,270	14	5	19
8th Decile – $73,958	16	4	20
9th Decile – $95,627	17	3	20
High Income – $150,000	21	2	23

Source: Authors' calculations as described in text. Assumes approximately 70% of current total CPP/QPP contribution rate of 9.9 percent is attributable to regular pension costs (i.e. excluding costs of ancillary long term disability and survivors' benefits), as estimated in the 23rd Actuarial Report on the Canada Pension Plan, p. 28.

Second, are Canadians willing to work more years and retire later in order to reduce the fraction of earnings they must save during their working years? It may be that many would prefer to work longer and save less while working in order to enjoy a high target income in retirement. Others may, of course, choose to retire earlier and enjoy lower income and consumption in retirement.

Our suspicion is that there is no consensus about the appropriate trade-offs on these two issues. Different Canadians will legitimately make different choices. But to make smart choices, Canadians – employers, employees and the selfemployed – need both adequate information and, most importantly, appropriate vehicles to provide efficient risk-adjusted management of their savings both during working years and in retirement.

This gives rise to the third key question: do current public policies provide the right incentives for the development of appropriate vehicles for managing retirement savings? Much of the current public debate focuses on this question but tends to assume that we know the answers to the first two questions. The purpose of this paper has been simply to indicate the level of saving necessary to provide high and secure post-retirement incomes, so that the debate on how to "improve" our Canadian pension system is well grounded. Changes in public policy can certainly improve incentives for, and the efficient management of, retirement savings. But in the end, if Canadians want high incomes and consumption in their retirement years, they will have to save more of their incomes and forgo more consumption during their earning years.

Appendix A — Table B1: Average* Real** Rates of Return

	60% equity + 40% long bonds	60% equity + 20% long bonds + 20% t-bills	Common Stock Index	Canada Long Bonds	3-Month T-Bills	Wage and Salary Index
			Ending in 2008 *(percent)*			
Last 10 years	3.8	3.1	3.1	4.7	1.4	0.3
Last 20 years	6.2	5.2	5.1	7.8	3.1	0.3
Last 30 years	6.1	5.5	5.7	6.6	3.7	0.2
Last 40 years	4.3	3.9	4.1	4.6	2.8	0.7
Last 50 years	4.4	4.2	4.9	3.7	2.6	1.0

*Geometric averages **Net of CPI

Rate of return assumptions: Common stocks returns computed from the December to December ratio of the S&P/TSX Total Return Index. Canada long bonds returns assume the purchase of a bond with 18 years to maturity in December, sold after one year.

Data source: Canadian Institute of Actuaries, Report on Canadian Economic Statistics 1924-2008.

Appendix B — Table B1: Registered Retirement Savings Plan (RRSP), Registered Pension Plan (RPP) and Deferred Profit Sharing Plan (DPSP) Savings Rates Estimated as a Fraction of Earnings, 2007

	Age Groups				
	Under 30	30 to 44	45 to 59	Under 60	60 and over
			Share of Earnings *(percent)*		
Individual RPP Contributions	1	2	2	2	1
Individual RRSP Contributions	2	4	5	4	8*
Estimated Value of Employer RPP/DPSP Contributions	1	2	3	2	2
RRSP Withdrawals (Dissaving)	0	-1	-1	-1	*
TOTAL	**4**	**7**	**9**	**7**	*

* RRSP withdrawals can reasonably be considered pension income for individuals aged 60 and over. Also, average earnings of individuals over 60 years old are much lower than that of younger age groups because many are retired and drawing on pension and other sources of income; thus, for the older age group, considerable uncertainty remains around RRSP and total savings rates.

Source: Authors' calculations based on Canada Revenue Agency's taxation statistics. Calculations follow methodology found in Horner (2009).

Appendix C

Table C1: Savings Rates (percent) as a Percentage of Annual Pre-tax Earnings, both Constant and Variable, for a 50% Target Replacement Rate

	50% Replacement Rate			50% Replacement Rate		
	Retirement at 63	Retirement at 65	Retirement at 67	Retirement at 65		
Annual Earnings	*(percent)*	*(percent)*	*(percent)*	*ages (percent)* 30-41	42-53	54-64
1st Decile – $12,451	0	0	0	0	0	0
2nd Decile – $21,056	0	0	0	0	0	0
3rd Decile – $28,530	0	0	0	0	0	0
4th Decile – $35,782	3	0	0	0	0	1
5th Decile – $42,803	7	5	3	2	5	7
6th Decile – $51,381	9	6	4	3	7	10
7th Decile – $61,270	11	8	6	4	9	13
8th Decile – $73,958	12	9	7	5	10	15
9th Decile – $95,627	14	11	9	6	12	18
High Income – $150,000	16	13	11	7	14	22

Source: Authors' calculations as described in text. Income deciles are estimated from Statistics Canada's Social Policy Simulation Database (SPSD) for earners (labour income greater than $500) aged from 30 to 55 years old.

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