Canadian Retirement Incomes: How Much Do Financial Market Returns Matter?

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How much might poor financial market returns affect the financial well-being of Canadian seniors? We compare three scenarios: if Canadian financial markets (a) never experienced the financial crisis of 2008 (i.e., continued on their pre-2008 path); (b) experienced the crisis and return to historical trends; or (c) enter a new low normal of depressed stock market returns and continued low interest rates. Using a population microsimulation model, we model the first order impacts—that is, before behavioural responses such as delayed retirement or increased savings—on the retirement income flows of Baby Boom retirees. While annual income from private savings of the median Canadian baby-boom senior drops by over half in the event of continuing low financial market returns, median financial welfare drops by only just over a fifth. Rising social transfers and stable income sources (such as Canada/Quebec Pension Plan and implicit income from home ownership) partially shield Canadian seniors from financial market risk. Canadian research has long recognized that the Canadian social pension system protects poorer Canadian seniors from destitution. Our results indicate that it also helps shield the Canadian elderly population as a whole from financial market risk.

Keywords: retirement security, microsimulation, new low normal, financial crisis, financial security, Canadian retirement income system, Old Age Security program

Dans quelle mesure les rendements peu élevés des marchés financiers influencent-ils la situation financière des Canadiens âgés ? Dans cet article, nous comparons trois scénarios, en supposant que les marchés financiers : a) n'avaient pas subi la crise de 2008 (i.e. s'ils avaient continué sur leur lancée d'avant 2008) ; b) avaient subi la crise de 2008, puis étaient revenus à leurs tendances historiques ; c) n'avaient pas subi la crise de 2008, puis avaient entamé en 2012 une phase de faible croissance (devenue normale) associée à des taux d'intérêts bas. Grâce à un modèle de microsimulation de la population, nous évaluons les impacts immédiats – c'est-à-dire sans tenir compte de possibles réactions comme le report de la retraite ou l'augmentation de l'épargne – sur les flux de revenus des baby-boomers à la retraite. Nous observons que, si les rendements des marchés financiers continuaient d'être faibles, la part du revenu annuel tiré de l'épargne personnelle de la médiane des baby-boomers retraités baisserait environ de la moitié, mais que la richesse médiane ne baisserait par contre que de un cinquième. La hausse des transferts sociaux et des sources de revenus stables (comme le Régime de pension du Canada et le Régime des rentes du Québec, et le revenu implicite issu d'un logement occupé en propriété) met donc partiellement les retraités à l'abri des risques des marchés. Les chercheurs canadiens reconnaissent depuis longtemps que le système de revenu de retraite protège du dénuement les personnes âgées les plus pauvres ; nos résultats montrent que ce système protège aussi l'ensemble des citoyens âgés contre les risques des marchés financiers.

Mots clés : sécurité du revenu de retraite, microsimulation, faible croissance normale, crise financière, sécurité financière, système de revenu de retraite du Canada, programme de la Sécurité de la vieillesse

Introduction

The financial crisis of 2008 severely reduced stock market prices and initiated a prolonged low interest rate environment. Between December 2007 and December 2008, the Toronto Stock Exchange (TSX) dropped by 35 percent and the nominal yield on 1–3-year short-term Canadian securities dropped by 72 percent (from 3.9 percent to 1.1 percent).[1] Although the TSX has shown some recovery, interest rates remain low.[2] The financial crisis of 2008 and subsequent events therefore demonstrated the potential importance for retirement income of:

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1. Stock market downside risk: The risk that equity prices drop, thus reducing the value of retirement savings' equity portfolio.
2. Interest rate downside risk: The risk that the rates of return on fixed securities drop, thus reducing retirement income by both decreasing the investment return on newly purchased fixed securities and driving down the payout of newly purchased annuities (which are generally priced based on prevailing long-term bond yields).[3]

For retirees, depressed asset values and lower interest rates can interact multiplicatively. For example, an individual who invested in equities (TSX) and then at the end of 2007 converted entirely to short-term Canadian securities upon retirement would have received a return of 3.9 percent on the original portfolio value. Had that individual followed the same strategy but waited a year to retire (at the end of 2008 after the market collapse and decline in interest rates), he/she would have received a return of 1.1 percent on a portfolio value that had dropped by 35 percent. In this example,[4] depressed asset values and a decline in interest rates together would create an 82 percent reduction in annual returns (on an original portfolio value of $1,000,000, for example, the annual return would drop from $39,000 to $7,150). Similarly, had the individual chosen to annuitize, the drop in interest rates would have produced a much lower lifetime payout. For example, at the end of 2007, $100,000 could have purchased an annual life annuity with a ten-year guarantee for a 65-year-old female with a payout of just under $7,000, but at the end of 2012 an identical purchase would have a payout of $5,800 owing to the continuing low interest rate environment.[5]

How much impact do such risks have on the comprehensive financial well-being of Canadian seniors? Who is affected most and how much does the Canadian retirement income system, particularly the income-testing component of the Old Age Security and Guaranteed Income Supplement programs, help shield retired Canadians against financial market risk?

There are many possible future financial market scenarios that could be evaluated. This paper restricts itself, however, to comparing retirement incomes for Canadian seniors across three alternative scenarios: (a) no financial crisis (Scenario "2007 Baseline"); (b) historical rates up to 2012 (including financial crisis) followed by a return to pre-2007 returns (Scenario "Temporary Shock"); and (c) historical rates up to 2012 followed by a new reality of long-term low financial market returns (Scenario "New Low Normal").

We investigate the "first-round" consequences for baby boomers born 1951–1966 (who turn 65 between 2016 and 2031)—that is, we assume no changes between scenarios in individual savings behaviour, employment/retirement behaviours, and benefits from employer-provided defined benefit plans and the Canada/Quebec Pension Plan (C/QPP). Although it is highly likely that savings and employment/retirement behaviour would eventually react,[6] and employer-provided defined benefit pension plans and the C/QPP might well be changed in the event of long-term poor financial markets, we focus on the first-round impacts because we want to examine the size of the financial shock to individuals and the dynamics of Canadian retirement income sources in the face of financial market risk before any reactive behavioural changes. We focus exclusively on objective financial impacts in financial flows during retirement.[7]

Low returns on equities in 2008[8] have prompted a literature examining the impact of the financial crisis on the retirement security of seniors that has predominantly asked "how the sharp decline in the stock market would affect wealth and retirement" (Gustman, Steinmeier, and Tabatabai 2011, 3).[9] Much less attention has been paid to the extremely low yields now available on fixed securities, including the consequentially lower return on annuities. Beginning in 2009, the annualized average nominal yields on Canadian government bonds have dropped to levels that have not been seen since the 1950s and, after accounting for inflation, to levels that have not been seen since before 1980.[10] A contribution of this paper is that its financial market scenarios model these two components of the financial market downside risk—continuing low interest rates (including the higher costs of annuitization) and depressed equity returns.

To understand the overall impact on financial well-being of Canadian seniors, we measure the retirement income available for personal consumption, including earnings, government public pension benefits (Canada/Quebec Pension Plan benefits, Old Age Security, and Guaranteed Income Supplement), employer pension plan benefits, registered and non-registered financial wealth income flows (annuitized wealth and discretionary withdrawals), housing wealth flows, taxes and savings, all of which are adjusted for household size. We do not explicitly model bequest behaviour, but we do model the income flows from which consumption occurs and bequests are made.

To adequately capture the many components that make up the income available for personal consumption of Canadian seniors within each financial market scenario, as well as account for the realistic diversity that exists within and across the lives of Canadians, we use Statistics Canada's LifePaths model.[11] LifePaths is a dynamic microsimulation model of the Canadian population that simulates individual life-courses of a representative sample of individual Canadians case by case (birth, education, employment, income, taxes, marriage, child-bearing, retirement, etc.), recreating the diversity of the entire

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Canadian population over time. LifePaths summarizes, incorporates, and integrates an enormous range of Canadian data to generate its rich life-course modelling. LifePaths' primary objective is to simulate statistically representative data samples of the history of the Canadian population, and it enables future projections—hence LifePaths is the best available source of longitudinal simulations based on real data of individual Canadians and their families that is sufficiently comprehensive for this analysis.

The first section reviews the literature. The second section describes the three pillars of the Canadian retirement income system—(a) government public pension programs (Old Age Security [OAS], income-tested Guaranteed Income Supplement [GIS], and the Canadian/Quebec Pension Plans [C/QPP]); (b) employer pension plans; and (c) individual savings—and discusses how they interact with financial markets, particularly in a poor financial market environment. The third section outlines our methodology, methodological issues, financial market future scenarios, and outcome measures. The fourth section analyzes and the fifth section concludes.

Literature Review

The Canadian social pension system, consisting of the Old Age Security (OAS) and the income-tested Guaranteed Income Supplement (GIS),[12] is primarily responsible for the "major success story of Canadian social policy in the twentieth century … the reduction of poverty among Canadian senior citizens" (Osberg 2001, 170). Because OAS and GIS were designed with a strong anti-poverty emphasis, poverty among seniors in Canada has fallen significantly over the past 35 years by both historical and international standards, as well as relative to other age groups in Canada (Milligan 2008; Osberg 2001; Schirle 2013; Veall 2008). The importance of the Canadian social pension program to low-income Canadians is thus well acknowledged. However, other than as a component of retirement income, the benefit of the social pension system to the rest of Canadian seniors—specifically, its value in shielding Canadian seniors against financial market risk—has been much less emphasized (one exception being Davies and Yu 2013).

The impact of the financial crisis of 2008 on retirement financial security has garnered substantial attention, particularly in US literature. Bricker et al. (2011) and Deaton (2012) examined qualitative surveys to analyze the effects of the financial crisis on retirement expectations and general well-being of Americans. Coile and Levine (2009, 2010, 2011) and Goda, Shoven, and Slavov (2011) investigated actual and/or expected adjustments in retirement behaviour by Americans. Changes in wealth of Americans were the focus of Bricker et al. (2011), Gustman et al. (2010, 2011), Sass, et al. (2010), and Wolff (2011). As well, Gustman et al. (2010, 2011) analyzed the consequences of multiple adverse effects (e.g., being laid off and needing to sell an undervalued home so as to relocate for new employment).

Similar to this paper are studies that use microsimulation methods to model the impact of the financial crisis on future retirement financial security. Butrica et al. (2010) used large-scale microsimulation population modelling to project the impact of the financial crisis on the retirement prospects of Americans under alternative stock market recovery scenarios. The "National Retirement Risk Index" by the Center for Retirement Research at Boston College (Munnell, Webb, and Golub-Sass 2009) and the "EBRI Retirement Security Projection Model" by the Employee Benefit Research Institute (VanDerhei 2011) projected the proportion of American households who have become at risk of insufficient retirement income as a result of the financial crisis. VanDerhei (2011) and Brady (2009) both used microsimulation modelling to ask how much additional savings those Americans at risk need to make up the shortfall created by the crisis. They concluded that the long-term effect of financial crisis will be most felt by near-retirees (since they have greater savings than their younger counterparts and will not have time to recover from their losses) and the more affluent (since they have more financial assets at stake in general) but working longer and saving more can mitigate the impacts of the financial crisis.

Canadian research on the impact of the financial crisis on retirement financial security is much more limited, perhaps partly due to data availability. In the United States publicly available data include (a) the University of Michigan Health and Retirement Study (HRS) (a longitudinal panel study of more than 26,000 Americans over the age of 50 every two years) and (b) the US Federal Reserve Bureau's Survey of Consumer Finances (a triennial survey of the balance sheet, pension, income, and other demographic characteristics of US families: in 2007–2009, it collected longitudinal panel data and therefore provided an excellent data source in measuring the effects of the financial crisis), as well as (c) the Panel Study of Income Dynamics (PSID). Canada does not have an HRS or a PSID counterpart, and the Statistics Canada Survey of Financial Security (SFS) (a cross-sectional survey that reports on the assets and debts of Canadian families) was collected in only three years (1984, 1999, and 2005).[13] Moreover, the 2005 survey sampled only 9,000 dwellings compared with 23,000 dwellings in the 1999 sample.[14] Without the sort of longitudinal retirement wealth data available in the United States, Canadian researchers cannot directly compare the wealth holdings of Canadians before and after the financial crisis.[15] Although much more research has been done in the United States, these findings do not extend easily to Canada owing to the significant differences in the retirement income systems (see the next section)

and the different ramifications of the financial market crisis (most notably, Canadian house prices did not collapse).

Only through data integration and simulation modelling can a comprehensive picture of retirement wealth security in Canada be attempted—as this study does.

Three Pillars of the Canadian Retirement Income System

The Canadian retirement income system has often been discussed in terms of "three pillars"; this section discusses how they interact with financial markets in a poor return environment. We highlight some distinct features of the Canadian system that differ from the United States to illustrate why results from the US literature cannot necessarily be generalized to Canada.

First Pillar: OAS/GIS and C/QPP

The Canadian public pension system consists of the social pension program (OAS/GIS) and the contributory Canadian/Quebec Pension Plans (C/QPP).[16] Compared to the United States, it has a stronger antipoverty emphasis, while the US public retirement income system is better able to replace the standard of living of middle-class Americans after retirement.[17] To illustrate, at 50 percent, 100 percent, and 150 percent of the average wage that the individual is assumed to earn throughout his/her career, Table 1 shows OECD (2013) calculations of the net replacement rates for an individual with constant full-time earnings in each country.[18]

With less public retirement security, middle- and upper-income Canadians are more dependent on personal savings to maintain their standard of living after retirement—and hence are potentially more vulnerable to low investment returns than Americans.

OAS/GIS benefits partially protect Canadians from downside financial market risk since public payouts are income-tested, and the income component includes capital income flows from registered sources (which decline in a prolonged poor financial market environment scenario). To illustrate, using the example from the introduction, a single senior with a 3.9 percent return (as in 2007) on $1,000,000 of registered savings with no other sources of income would have had market income of $39,000 per year and would have received an additional OAS maximum benefit of $502.31 per month, as of October 2007, but would not have been eligible for GIS in 2007. However, after the market collapse and the decline in interest rates, if the same person received a reduced interest rate of 1.1 percent on a diminished portfolio of $650,000, this would produce private market income of $7,150, ensuring eligibility for a further $406.19 per month[19] in GIS benefits on top of the maximum OAS benefit.

Table 1: OECD Net Pension Entitlements Replacement Rates of Worker in Canada and the US at 50%, 100%, and 150% of Average Wage

	0.50 of AW	1.00 of AW	1.50 of AW
Canada	88.7%	57.3%	39.7%
US	63.8%	50.0%	46.6%

Source: OECD (2013).

The C/QPP is partially prefunded and therefore affected directly by a long-term poor financial market environment. Public finances will also be affected by (1) decreased income tax revenues (due to reduced investment income), (2) increased payments under OAS/GIS, and (3) lower interest charges on government debt. Nevertheless, because any future changes to OAS/GIS or C/QPP program parameters will require explicit political decisions, we do not model any long-term impacts of financial markets on these programs.

Second Pillar: Employer Pension Plans

Although the percentage of employees covered by a pension plan in 2010 was similar in Canada and the United States, historical trends in both coverage rates and the types of pension plans being provided are dissimilar. Between 1990 and 2010, the percentage of Canadian employees (private and public sector) covered by an employer-sponsored pension plan dropped from 45.3 percent to 38.8 percent (Statistics Canada 2011), while the percentage of US employees covered changed from 39.0 percent to 39.8 percent (Copeland 2012, Figure 19). Table 2 summarizes private sector pension coverage, because that is where change has been greatest. It shows a strong decline in pension plan participation rates in the Canadian private sector (dropping from 31.1 percent to 24.4 percent between 1987 and 2010) while coverage rates in the United States remain steady. The United States has seen more rapid decline in defined benefit (DB) plan coverage and rise in defined contribution (DC) plans—as Table 2 shows, 40 percent of US private sector pension plan shares switched from DB to DC between 1976 and 2010 (from 71.7 percent to 31.9 percent). Canada experienced less decline in the share of DB pension plans (from 91.1 percent to 72.2 percent) over the same period.[20]

Unlike DC pension plans where the financial market risk is the responsibility of the plan participant, DB pension plan sponsors are legally obligated to pay out vested, accumulated plan benefits regardless of financial market performance. In 2010, just over one-sixth (17.6% = 72.2%*24.4%; see Table 2) of Canadian private sector workers were in such plans. In our scenarios, we incorporate the long-run trend decline in pension plan

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Table 2: Private Sector Employer-Sponsored DB and DC Pension Plan Participation Rates

	Canada	US
Employer-sponsored pension plan coverage		
2010	24.4%	39.5%
1987	31.1%	39.8%
Defined benefit share		
2010	72.2%	31.9%
1987	88.4%	51.1%
1976	91.1%	71.7%
Defined contribution share		
2010	27.8%	68.1%
1987	11.6%	48.9%
1976	8.9%	28.3%

Notes: The US and Canadian statistics both double-count workers who participate in more than one plan. The Canadian statistics represent the share of pure DB and DC plans and classify plans that are a mix of the two designs as DB (which account for 3.2 percent of pension plans in 2010). 1987 DB/DC share Canadian statistics use the average between 1986 and 1988.
Sources: US Participation Rates: Copeland (2012; Figure 19) (note that first year given is 1987); Canada Participation Rates: Statistics Canada (2011); US Pension Plan Design Shares: US Department of Labor Employee Benefits Security Administration (2014, Table E5); Canada Pension Plan Design Shares: CANSIM Table 280–0016.

coverage and shift in design among private sector pension plans from defined benefit to defined contribution,[21] but we do not model the possibility that changed financial market returns may accelerate this decline or shift (that is, that poorer financial markets would lead to more employers freezing, terminating, or redesigning existing employer pension plans). Nor do we model the additional necessary contributions that employees enrolled in a DB plan may need to make to maintain their benefits in a poor financial market environment. Our model of the second pillar, therefore, reflects only how depressed financial market returns affect the accumulated payout of DC pension plan benefits and private savings. Among the one-sixth of private sector workers who continue to have DB pension plans, however, rising employee/employer contributions and the possibility of plan freezes/terminations/redesigns, which we do not model in this paper, are likely to be a major concern.

Third Pillar: Individual Savings

Poor financial market returns directly impact the personal savings of Canadians in financial assets such as tax-sheltered retirement savings government programs (notably Registered Retirement Savings Plans [RRSPs]), tax-free savings accounts, and personal non-registered financial assets. A low interest rate environment also influences the price of annuities, affecting those who annuitize their savings (e.g., their RRSPs).

The size of the impact of low financial market returns depends partly on how many Canadians hold financial assets in retirement and how much they hold. The 2005 Canadian Survey of Financial Security (2005 SFS) reported that 60 percent of Canadians had RRSP accounts[22] but the median RRSP account level was $25,000 (Pyper 2008), which is rather low compared to the present value of other retirement income sources (OAS/GIS, C/QPP, employer DB pension plans, and housing wealth). Table 3 summarizes the registered and non-registered financial assets and debts of Canadian seniors using the 1999 Survey of Financial Security (1999 SFS) and the 2005 Survey of Financial Security (2005 SFS) (Appendix B expands this table, showing also rows for each category of non-registered assets). While most Canadian seniors had some financial savings, only approximately a third of the senior population held more than $100,000.

In addition to personal financial assets, housing wealth is crucial for Canadian seniors—indeed it is the largest asset after private pension plans (Baldwin et al. 2011). Over 60 percent of Canadian seniors own their home mortgage-free, which is higher than any other age group (Chawla and Wannell 2004; Turcotte, Liu, and Schellenberg 2007). In 2005, nearly 70 percent of Canadian seniors owned a home, with a median value for these homeowners of $131,000.[23]

In this study, we think of owner-occupied housing as generating a steady stream of in-kind income (i.e., the consumption value of implicit housing services received)—hence we abstract from volatility in real estate market prices. We assume instead that housing wealth remains unchanged across financial market scenarios.[24] We include the value of homeownership in our total income measure through its imputed net return on housing equity[25] (as determined by the value of the senior's home). Theoretically, mortgage debt could change between scenarios; however, Canadian seniors are unlikely to hold a mortgage and Bricker et al. (2011) found that debt of Americans, including mortgage debt, was only slightly changed by the financial crisis. We further assume that all debt levels are unaffected by changes in the financial market scenarios.[26]

Methodology

LifePaths and Key Projection Assumptions

Statistics Canada's LifePaths is the largest microsimulation model of its kind in Canada. By integrating and extending the large range of existing data sets within Statistics Canada, it provides a comprehensive picture of the life-courses of Canadians, while modelling the realistic complexity and diversity within life-courses and across individuals.

Table 3: Financial Assets and Debts of Canadian Seniors

	Percent Households with Wealth Level within Each Range					Mean	Median	Mean	Median
	$0	$0–$5,000	$5,000–$50,000	$50,000–$100,000	$100,000+	Across Households Holding Wealth/Debt		Across Individuals Holding Wealth/Debt (adult equivalent)	
1999									
Ages 65–74									
(A) RRSP/LIRA/RRIF	41%	4%	24%	10%	21%	$111,000	$55,000	$85,000	$43,000
(B) All non-registered	6%	29%	37%	9%	18%	91,000	15,000	69,000	12,000
Total (A+B)	5%	20%	28%	13%	34%	158,000	48,000	120,000	37,000
(C) Financial debt (excluding mortgage)	68%	16%	14%	1%	1%	(11,000)	(5,000)	(8,000)	(4,000)
Net total (A+B+C)	3%	15%	27%	12%	33%	169,000	56,000	128,000	45,000
Ages 75+									
(A) RRSP/LIRA/RRIF	72%	2%	13%	6%	8%	85,000	44,000	68,000	35,000
(B) All non-registered	6%	22%	38%	11%	23%	106,000	25,000	88,000	22,000
Total (A+B)	5%	20%	35%	12%	28%	131,000	35,000	108,000	30,000
(C) Financial debt (excluding mortgage)	86%	9%	5%	0%	0%	(7,000)	(2,000)	(5,000)	(2,000)
Net total (A+B+C)	4%	17%	34%	12%	28%	135,000	38,000	112,000	33,000
2005									
Ages 65–74									
(A) RRSP/LIRA/RRIF	40%	5%	26%	10%	19%	118,000	50,000	90,000	40,000
(B) All non-registered	6%	25%	37%	12%	20%	124,000	22,000	97,000	19,000
Total (A+B)	5%	18%	24%	19%	34%	196,000	62,000	152,000	50,000
(C) Financial debt (excluding mortgage)	60%	12%	23%	4%	0%	(17,000)	(10,000)	(14,000)	(8,000)
Net total (A+B+C)	3%	12%	24%	17%	32%	211,000	66,000	164,000	51,000
Ages 75+									
(A) RRSP/LIRA/RRIF	61%	3%	18%	9%	10%	91,000	44,000	74,000	37,000
(B) All non-registered	7%	22%	33%	17%	22%	103,000	29,000	84,000	24,000
Total (A+B)	6%	17%	30%	16%	30%	140,000	49,000	115,000	39,000
(C) Financial debt (excluding mortgage)	81%	9%	8%	1%	0%	(13,000)	(5,000)	(10,000)	(4,000)
Net total (A+B+C)	5%	16%	28%	16%	30%	144,000	54,000	118,000	41,000

Notes: The SFS reports assets and debts at the economic family levels. Adult-equivalent wealth is calculated by dividing household wealth by the square root of the number of household members. Age groupings are by age of the major income recipient. Non-registered financial assets consist of non-registered savings in the form of deposits, mutual funds, bonds, stocks, business equity, and other financial assets.

[a] 2005 constant dollars: Cansim Table 326–0021

Source: Authors' calculations using the 1999 and 2005 Survey of Financial Security Public Use Microdata.

(LifePaths) builds an entire population by simulating the actions and interactions of individual units case by case. Figure 1 represents the evolution of a simulated life in LifePaths. This is a simplified flow chart for illustration purposes, and is not intended to convey the true complexity of LifePaths. We list only some of the components of LifePaths—marital status, fertility, education, employment, and migration. For each simulated life, LifePaths tracks the individual's relevant characteristics, such as those listed in the first box. These characteristics enter as explanatory variables to determine the times until the occurrence of each possible event (arrow A). The event with the shortest wait time "wins" and, once it occurs, the individual's characteristics are updated (arrow B). These characteristics then enter again as explanatory variables to determine the next event (arrow A). This continues until death, thus creating a complete life course with all of the necessary details for millions of simulated Canadians. (MacDonald et al. 2011, 76).

LifePaths' simulation of the past uses behavioural equations estimated from historical data to build a representative modelled population that is consistent with all available microdata on Canadians and sums to aggregate statistics. LifePaths' simulation of the future requires assumptions, and, other than the future financial market projection scenarios (described in the next section), we rely on the default future projection scenarios built into LifePaths (version 5.1.6.0.):

- An aggregate downward trend in employer pension plan coverage and a continuing shift from defined benefit to defined contribution plans among private plans (see "Second Pillar" section);
- an aggregate real wage growth rate of 0.3 percent[27] and inflation rate of 2.3 percent[28];
- a continuation into the future of historical RRSP saving behaviour observed over the past decade;

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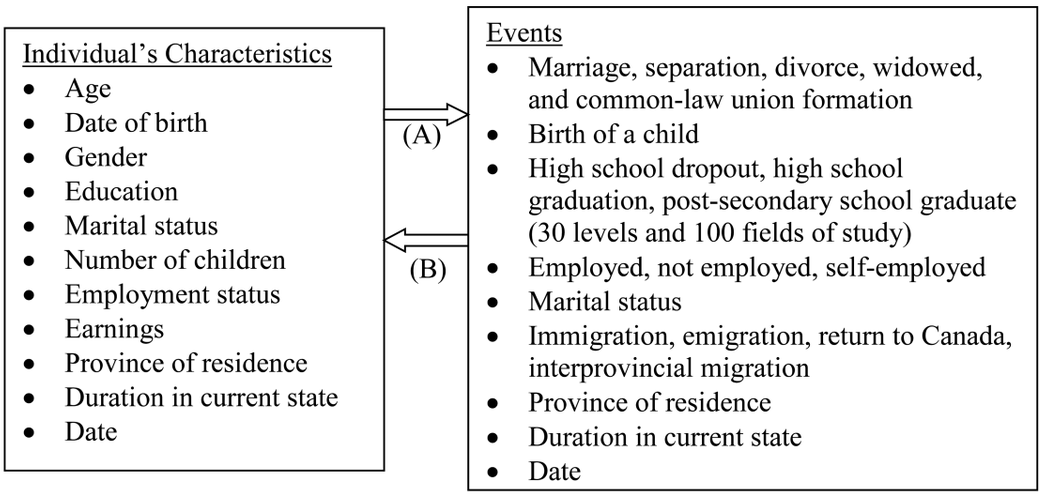

Figure 1: Illustration of LifePaths' Simulation of a Canadian Life-Course
Source: MacDonald et al. (2011, Figure 1).

- the continuation of public pension program provisions, and payroll and income tax systems, as currently legislated;
- a modest trend away from marriage (among all age cohorts, including seniors);
- a flattening out of increasing female labour participation rates and increasing post-secondary education attainment; and
- a modest trend of increasing life expectancy and fewer children across future cohorts according to the medium demographic assumptions for fertility, mortality, and migration from Statistics Canada's official population projections (Statistics Canada 2005).

As already noted, we abstract from behavioural responses, such as additional savings and delayed retirement, which might offset or exacerbate the impact of poor financial returns. A basic overview of LifePaths can be found at Statistics Canada Modelling Division (Spielauer 2013).

The baseline assumption in LifePaths is that DC pension plan wealth and some RRSP wealth[29] are annuitized at retirement. For the purpose of this project, this paper developed and integrated into LifePaths an annuity price calculator that realistically incorporated the relevant features of the annuity, personal characteristics of the purchaser, prevailing mortality assumptions, and financial market inputs akin to actual Canadian annuity providers.[30] This annuity calculator was validated using annual midyear annuity quotes from 1985 until the present across a range of Canadian insurers (between 8 and 17 Canadian insurers each year). We assume single-premium nominally fixed annuities (for couples, we assume joint annuities that reduce to two-thirds of the payout on the death of the first spouse).

Financial Market Scenarios

We design our financial market scenarios for years 2008 onward using a simple, baseline approach where (a) we assume an investment strategy of 60 percent Canadian equities and 40 percent risk-free assets for all Canadians[31] and (b) rates of return are deterministically fixed.[32] Our data sources are (using all available data since 1951):

- Risk-free asset: Government of Canada three-month Treasury Bills
  - Cansim V122541
- Equity asset: Canadian common stock
  - Cansim V122618, V122619, V122620, V122628 (Toronto Stock Exchange statistics)
- Annuities: Fixed Immediate Life Annuity (single life and joint and last survivor)
  - Cannex Financial Exchanges Limited and the Individual Finance and Insurance Decisions Centre "Payout Annuity Index" (historical annuity prices)
  - The Society of Actuaries (historical and current mortality tables and mortality improvement tables)

Using this simplified financial market framework, we compare the projected retirement income of Canadians across three financial market scenarios that diverge in 2008:

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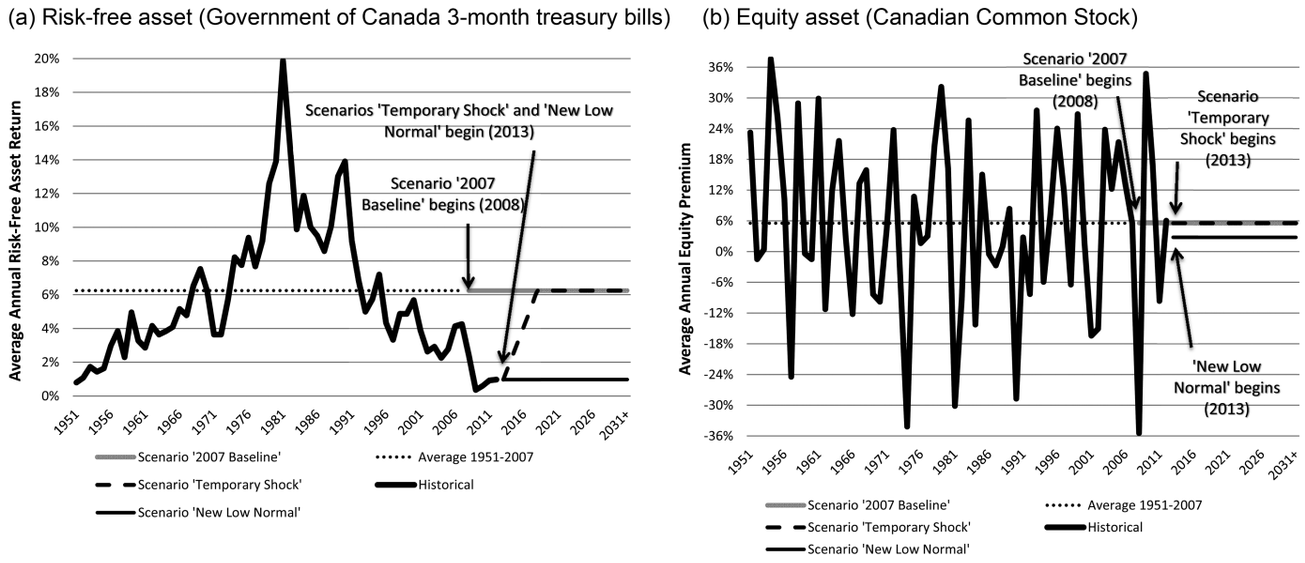

Figure 2: Rate of Return Scenarios
Notes: "2007 Baseline" (no financial crisis); "Temporary Shock" (historical rates up to 2012 and return to historical averages thereafter); and "New Low Normal" (historical rates up to 2012 and low returns thereafter).

1. "2007 Baseline": In this scenario, the financial crisis never occurred and equities and fixed securities (which are the risk-free asset and the yield underlying annuity pricing) follow their pre-2008 long-term mean;
2. "Temporary Shock": This scenario follows historical rates up to 2012 (thus including the financial crisis). Thereafter, beginning in 2013, equities return to their historical average equity premium and fixed securities recover in the following five years (linearly between 2013 and 2018); and
3. "New Low Normal": This scenario also follows historical rates up to 2012, but thereafter it assumes that Canada has entered a new financial market reality of long-term low market rates of return—an equity premium at half of the average historical value[33] and a continuation of 2012 low yields for fixed securities.[34]

Figure 2 illustrates the relationship between the (a) risk-free asset and (b) equity investment returns in the three scenarios. Until 2007, all three scenarios model the average rate of return using the actual realized average historical rate in that year (using LifePaths' default asset allocation and financial market model, which was last estimated in 2008 and includes more assets and variability of investment returns between individuals than our future projection modelling[35]). Beginning in 2008:

- Scenario "2007 Baseline" simulates an alternative history of no financial crisis by modelling rates of return using the pre-2008 average of 6.2 percent for the risk-free asset and 5.5 percent for the equity premium (for a total of 11.8 percent return on the equity asset). The average annual return on the assumed portfolio is therefore 9.6 percent ($40\% \times 6.2\% + 60\% \times 11.8\%$) in nominal terms and 7.3 percent in real terms.
- Scenarios "Temporary Shock" and "New Low Normal" continue to follow the historical returns up until and including 2012.
  - Scenario "Temporary Shock" thereafter fixes the equity premium at its historical level of 5.5 percent and linearly returns the risk-free asset rate of return to pre-2008 averages by 2018 (from 1 percent in 2013 to 6.2 percent in 2018 and beyond, at which point matching scenario "2007 Baseline").
  - Scenario "New Low Normal," on the other hand, continues in 2013 and beyond at the 2012 level risk-free asset return (1 percent) and assumes half the historical equity premium. The average annual nominal return on the assumed portfolio in the "New Low Normal" scenario is therefore 2.6 percent ($40\% \times 1.0\% + 60\% \times 3.7\%$) (0.3 percent real return).

The assumed rate of return underlying the pricing of annuities follows the same pattern as the risk-free asset in Figure 2a for the three scenarios, except the values differ—the historical rates underlying annuity pricing are generally higher than the T-bill rates (the average

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pre-2008 historical rate being 8 percent, and the 2012 rate being 3.2 percent).

Segmenting the Population

Across the three financial market scenarios described in the previous section, our analysis compares each individual senior's primary retirement income sources, as well as the "annual income available for individual consumption" described in Figure 3.

We examine early boomers (born 1951–1958) and late boomers (born 1959–1966). Using the 2009 after-tax Low Income Measure (LIM; one half of median equivalent income),[36] we also segment this population by working-life "representative" after-tax income:

- <LIM: Poor (15 percent of the cohort)
- 100–200 percent LIM: Lower-Middle (42 percent of the cohort)
- 200–400 percent: Upper-Middle (38 percent of the cohort)
- >400 percent LIM: Affluent (5 percent of the cohort)

We calculate a "representative" level of working-life after-tax income by removing the lowest and highest five years between ages 35 and 64 and averaging real after-tax income over the remaining middle 20 years.[37] We use working-life income to segment the population, as opposed to income after age 65, so as to compare the same individuals across scenarios.

Analysis

Table 4 summarizes the changes in the mean projected retirement income flows across scenarios. The "2007 Baseline" scenario is clearly unrealistic, since we know the financial crisis did happen, but it illustrates the expected future that might plausibly have been envisaged when households made their financial decisions before 2007. Going forward, the issue is whether financial markets will return to historical trends, so the difference between "Temporary Shock" and "New Low Normal" is of primary interest. "New Low Normal" could also be called "Permanent Shock" and is included as a lower bound to expectations of future investment returns. None of these scenarios are intended as predictions; rather, we use them as polar cases to understand the interaction of retirement income sources in the face of financial market variability.

Table 4 shows that the "New Low Normal" impacts are at least twice as large as "Temporary Shock"—that is, a long-term low financial market returns environment is at least twice as harmful as the financial crisis alone to the average retirement income flows of the 1951–1966 birth cohort. Table 4 also illustrates how, as noted in the "First Pillar" section, decreased capital income flows from registered sources on account of a poor financial market environment can be partially offset by greater net payments of OAS and GIS benefits. In Table 4, OAS and GIS benefit levels rise in response to the reduction in registered savings income.

Table 4 lists future income flows at age 70 by source for the cohort born between 1951 and 1966. The first column in Table 4 shows income flow means (2012 family-based adult-equivalent dollars) under scenario "2007 Baseline". The second column shows the same means under scenario "Temporary Shock", as well as the proportional mean changes when moving from scenario "2007 Baseline" to scenario "Temporary Shock". It is not surprising that flows from registered and non-registered wealth are the most affected, reducing by 30 percent and 25 percent respectively. While registered wealth comprises only financial assets, non-registered wealth declines less since it also includes real estate assets and business equity, both of which are by assumption essentially not affected by the financial market scenarios in our simulations. Employer pension plan benefits decrease moderately by 5 percent, since they are made up of DC pension income flows (which are affected) and DB pension benefits (which we assume remain stable). OAS and GIS benefits both grow somewhat (1 percent and 8 percent). Finally, income taxes reduce by 10 percent due to lower income flows from financial assets.

The fourth column in Table 4 shows the mean values under a long-term low financial market returns environment (scenario "New Low Normal"), and the proportional change in income means compared to the first two scenarios. Flows from registered wealth decrease by 30 percent on account of the financial crisis, but decrease an additional 54 percent if the markets do not recover. The last column shows the aggregate impact of a long-term low returns environment as compared to no financial crisis by giving the proportional change in the income flows from scenario "2007 Baseline" to scenario "New Low Normal." For example, the aggregated effect of the financial crisis followed by a long-term low returns environment is a 68 percent drop in average registered wealth income flow [$68\% = (1 - 30\%)*(1 - 54\%) - 1$], 62 percent in income flows from non-registered wealth, and 12 percent in employer pension benefits (driven by changes in DC pension plan payouts). These impacts on the income available for consumption are somewhat subdued between the two extreme scenarios by:

- the stabilizing impact of unchanging C/QPP benefits, earnings income, employer pension income of DB design, and imputed rent;
- the rise in OAS and GIS benefit levels (3 percent and 15 percent); and
- a corresponding 22 percent drop in income and payroll taxes.

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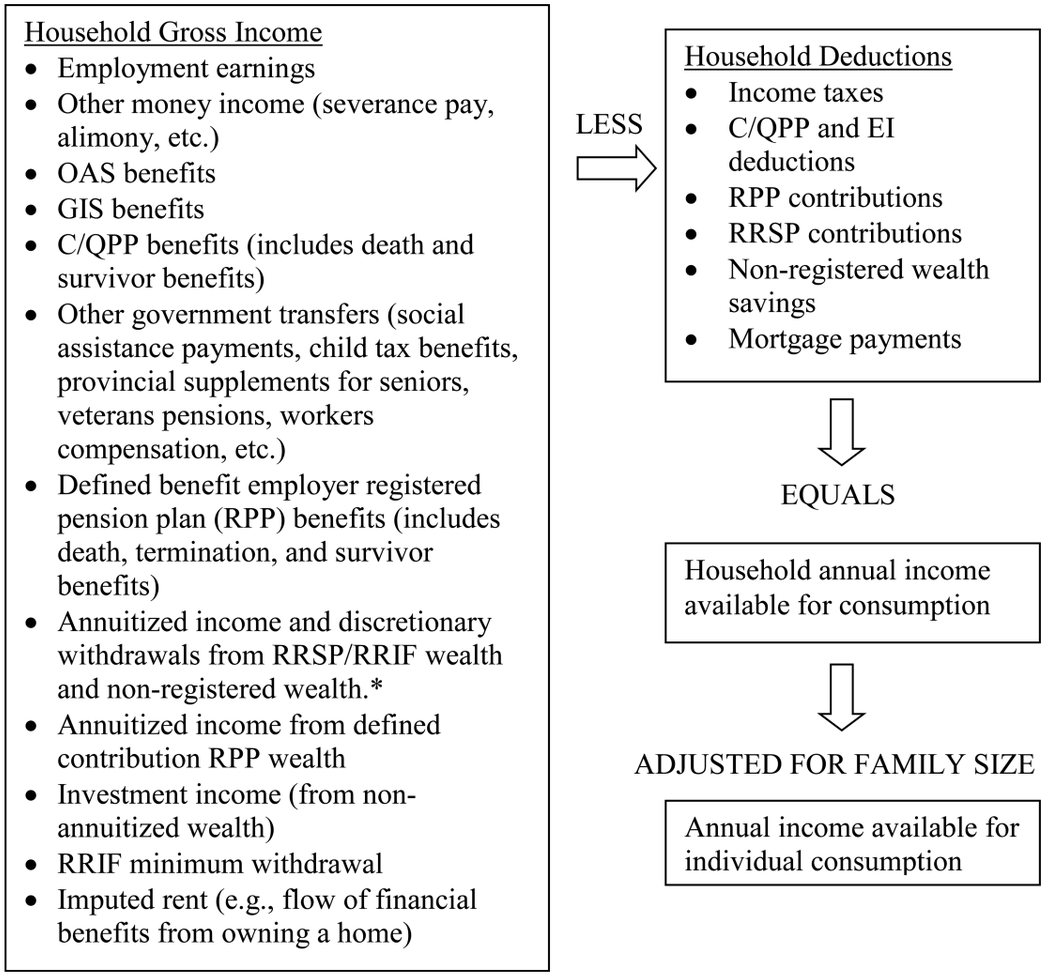

Figure 3: The Process of Measuring Annual Income Available for Individual Consumption
Notes: *The non-registered wealth concept used is marketable wealth (or net worth) other than primary housing—that is, "the current value of all marketable or fungible assets less the current value of debts" (Wolff 2012, 6) other than primary housing and mortgage debt. These include the sum of non-registered financial assets (chequing accounts, GICs, trusts, etc.), real estate assets (other than primary housing), and business equity, less non-mortgage debt (credit card, lines of credit, car loans, etc.).

The stable sources of income, along with the growth in senior social benefits and lower taxes, soften the impact of the financial market scenarios. In the end, the overall income available to seniors for individual consumption has an average drop of 16 percent between the two scenarios "No Crisis" to "New Low Normal," which we think of as modest given the extreme assumptions underlying these scenarios (a drop of 7.3 percent to 0.3 percent in the annual real rate of return on investments, and a drop from 8 percent to 3.2 percent for the nominal yield underlying the annuity pricing; see the section "Financial Market Scenarios").

To get a fuller picture, we examine mean and median longitudinal income flows (based on the average across each senior's lifetime from age 65 until death) for (a) annual income available for individual consumption (see Figure 3); (b) annual senior social benefits (OAS and GIS, including spousal allowance and net of any repayments); and (c) annual income flows from private savings (total of employer pension plan benefits and flows from registered and non-registered wealth).

Table 5 gives the mean and medians of these three income flows for the 1951–1966 birth cohorts. The shift in the values from scenarios "2007 Baseline" to "Temporary Shock" shows the impact of the financial crisis alone, while the shift from "Temporary Shock" to "New Low Normal" shows the additional impact if financial markets

Table 4: Retirement Income Source Means at Age 70 (2012 adult-equivalent family-based dollars)

1951–1966 Birth Cohort	Scenario "2007 Baseline"	Scenario "Temporary Shock"		Scenario "New Low Normal"		
Income Sources	Mean (00s)	Mean	% Change from Scenario "2007 Baseline"	Mean	% Change from Scenario "Temporary Shock"	% Change from Scenario "2007 Baseline"
Earnings	$10,500	$10,500	0%	$10,500	0%	0%
CPP benefits	8,900	8,900	0%	8,900	0%	0%
Imputed rent	3,600	3,600	0%	3,600	0%	0%
OAS benefits	7,000	7,100	1%	7,200	1%	3%
GIS benefits	1,300	1,400	8%	1,500	7%	15%
Other income	2,000	2,000	0%	2,000	0%	0%
Employer pension plan benefits	13,600	12,900	−5%	12,000	−7%	−12%
Flows from registered wealth	7,700	5,400	−30%	2,500	−54%	−68%
Flows from non-registered wealth	6,800	5,100	−25%	2,600	−49%	−62%
Income and payroll taxes	9,000	8,100	−10%	7,000	−14%	−22%
Total (annual income available for individual consumption; see Figure 3)	52,400	48,900	−7%	44,000	−10%	−16%

Source: Authors' calculations.

have entered a new long-term low financial market returns environment.

Like Table 4, Table 5 shows that each income flow is increasingly impacted between scenarios. "Private savings annual payout" shows a 21 percent drop in both the mean and median incomes from all private savings (employer pension plan benefits and flows from registered and non-registered wealth) in scenario "Temporary Shock," and a further 41 percent and 40 percent drop in scenario "New Low Normal," creating an overall reduction of 54 percent and 53 percent. If Canadian seniors had to rely entirely on income flows from private savings, this income decline of over 50 percent would have dramatic effects on their well-being. However, the median value of Canadian social transfers is approximately a sixth of income available for consumption in the "2007 Baseline" scenario, and the mean and median values of these benefits grow by 13 percent and 9 percent in a long-term low financial market returns environment. Higher OAS and GIS benefits, along with stable sources of income, help shield Canadian seniors from the financial market shock, reducing the overall impact on the "income for consumption" to drops of approximately less than a quarter (24 percent for the mean and 22 percent for the median) between the extreme scenarios.

Table 6 breaks the 1951–1966 birth cohort into early and late boomers, so as to illustrate the different impacts of a long-term low financial market returns environment on income available for individual consumption on these two birth cohorts. Comparing "Temporary Shock" and "2007 Baseline" shows that a transitory financial market shock has, in aggregate, nearly an identical impact on the mean and median values between the early and late boomers (10 percent and 8 percent versus 10 percent and 9 percent).[38] The younger cohort have, however, more capacity to reduce this impact by saving more, trying to find better performing investments (possibly globally), delaying retirement, or obtaining partial employment while retired.

If interest rates and equity returns do not recover, however, much bigger shifts in retirement income flows are likely, whatever the point of reference. When we compare the scenarios "New Low Normal" and "Temporary Shock," the incremental impact of a continuation of low returns is greatest among the younger birth cohort (12 percent and 11 percent versus 20 percent and 18 percent). As one might expect (and as we find in supplementary analysis) the first round impact of continued low financial returns is greater the longer savings returns are affected—hence, it continues to grow for younger birth cohorts since they have longer exposure to a poor financial market in scenario "New Low Normal." Younger cohorts are also more exposed to the possibility of future benefit reductions by employer-provided DB pension plans and changes to the C/QPP that might well occur in the event of long-term poor financial markets. On the other hand, younger cohorts also will have greater opportunities to mitigate the impact (as noted earlier).

Table 5: Mean and Median (among all persons) of Three Retirement Income Flows (averaged from age 65 until death) (2012 adult-equivalent family-based dollars)

	Scenario "2007 Baseline"	Scenario "Temporary Shock"		Scenario "New Low Normal"		
1951–1966 Birth Cohort	Value (00s)	Value	% Change from Scenario "2007 Baseline"	Value	% Change from Scenario "Temporary Shock"	% Change from Scenario "2007 Baseline"
Annual income available for consumption						
Mean	$53,600	$48,400	−10%	$ 40,500	−16%	−24%
Median	45,300	41,300	−9%	35,300	−15%	−22%
OAS/GIS annual benefits						
Mean	7,900	8,300	5%	8,900	7%	13%
Median	7,800	8,000	3%	8,500	6%	9%
Private savings annual payout						
Mean	35,900	28,200	−21%	16,500	−41%	−54%
Median	24,300	19,300	−21%	11,500	−40%	−53%

Notes: "Annual income for consumption" is the annual income available for individual consumption (see Figure 3), and "Private savings annual payout" is the total of employer pension plan benefits and flows from registered and non-registered wealth.
Source: Authors' calculations.

Table 6: Mean and Median Annual Income Available for Individual Consumption (averaged from age 65 until death) by Birth Cohort (2012 adult-equivalent family-based dollars).

	Scenario "2007 Baseline"	Scenario "Temporary Shock"		Scenario "New Low Normal"		
	Value (00s)	Value	% Change from Scenario "2007 Baseline"	Value	% Change from Scenario "Temporary Shock"	% Change from Scenario "2007 Baseline"
1951–1958 birth cohort						
Mean	$51,800	$46,700	−10%	$41,000	−12%	−21%
Median	44,000	40,300	−8%	35,800	−11%	−19%
1959–1966 birth cohort						
Mean	55,400	50,000	−10%	40,000	−20%	−28%
Median	46,500	42,500	−9%	35,000	−18%	−25%

Source: Authors' calculations.

As noted earlier in Tables 4 and 5, the "New Low Normal" impacts are at least twice as large as "Temporary Shock" alone. Calculating impacts in terms of percentage changes in aggregate total income flows implicitly weights impacts by dollar holdings, and, as we will see next, large declines are concentrated among more affluent Canadians.

Figure 4 traces the full distribution of annual income available for individual consumption under the three scenarios. The distribution of average annual income available for individual consumption declines between scenarios, particularly for the upper income groups. Medians are marked with a star.

To more closely examine the income distributional impact of alternative financial scenarios, we turn to Tables 7a–b. As described in the section "Segmenting the Population," we label as "poor" the 15 percent of the 1951–1966 birth cohort who have an adjusted average working-life after-tax income less than the Low Income Measure (LIM). We call "lower-middle" the 42 percent of that cohort who fall between 100 percent and 200 percent of the LIM. Together they make up about half the cohort (57 percent), and the "upper-middle class" (200–400 percent of the LIM) are another two-fifths of the population (38 percent of the 1951–1966 cohort), leaving the "affluent" (incomes greater than 400 percent of the LIM) at about 5 percent of the cohort.

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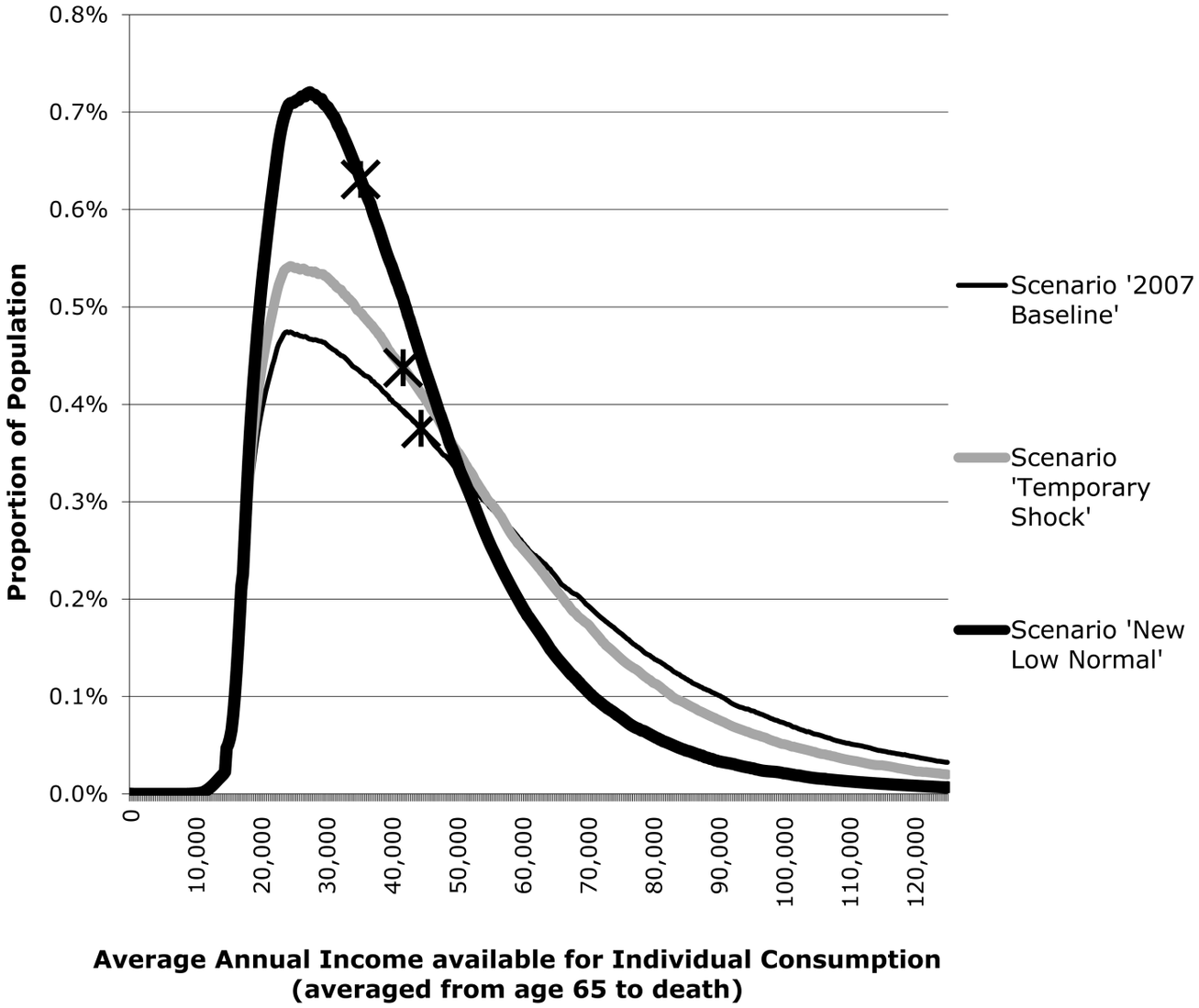

Figure 4: The Distribution of Annual Income Available for Individual Consumption (averaged from age 65 until death) (2012 adult-equivalent family-based dollars)
Notes: Smoothed using ten-year moving average, median marked with a star. "Annual income for consumption" is the annual income available for individual consumption (see Figure 3).

Table 7a shows that the "Temporary Shock" and "New Low Normal" scenarios have bigger impacts for more affluent cohorts, as might be expected, given that it is affluent households who disproportionately hold financial wealth. For example, "New Low Normal" reduces the mean annual income of the affluent available for consumption by 29 percent and the median by 34 percent, which is a much larger impact than for the poor (10 percent decline in mean and 6 percent in median).

Table 7b further illustrates the much greater exposure of more affluent cohorts to the financial market, both in absolute terms and as a proportion of their retirement income resources. Under scenario "2007 Baseline," Table 7b lists the pre-tax "OAS + GIS" and "Private Savings Annual Income" as a percentage of income available for consumption if the financial crisis had not occurred for the four income groups (aggregated across the 1951–1967 birth cohort). It also shows how these income flow proportions change across each scenario. The more affluent have not only much greater savings in terms of absolute value, but also relative to their annual income available for consumption. Comparing the "poor" with the "affluent" cohorts, the median private savings annual income for the affluent in the "2007 Baseline"

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Table 7a: Mean and Median Annual Income Available for Individual Consumption (averaged from age 65 until death) by Income Group (2012 adult-equivalent family-based dollars)

	Scenario "2007 Baseline"	Scenario "Temporary Shock"		Scenario "New Low Normal"		
1951–1966 Birth Cohort	Value (00s)	Value	% Change from Scenario "2007 Baseline"	Value	% Change from Scenario "Temporary Shock"	% Change from Scenario "2007 Baseline"
Poor (<LIM, 15% of pop.)						
Annual income available for consumption						
Group mean	$25,700	$24,500	−5%	$23,100	−6%	−10%
Group median/8th percentile	22,500	22,000	−2%	21,300	−3%	−6%
Lower-middle (100–200% LIM, 42% of pop.)						
Annual income available for consumption						
Group mean	$41,400	$37,900	−9%	$33,200	−12%	−20%
Group median/36th percentile	37,500	35,000	−7%	31,000	−11%	−17%
Upper-middle class (200–400% LIM, 38% of pop.)						
Annual income available for consumption						
Group mean	$70,100	$62,500	−11%	$50,300	−19%	−28%
Group median/76th percentile	64,800	58,000	−10%	46,800	−19%	−28%
Affluent (>400% LIM, 5% of pop.)						
Annual income available for consumption						
Group mean	$118,400	$107,100	−10%	$83,700	−22%	−29%
Group median/97.5th percentile	115,500	102,300	−11%	76,300	−25%	−34%

Source: Authors' calculations.

scenario is 89 percent of their median annual income available for consumption, compared to only 7 percent for the poor.

Table 7b finds that all income groups are somewhat shielded by growing benefits from OAS and GIS in poor financial market conditions. Between the two extreme scenarios, for example, the median private savings annual income for the upper-middle class drops from 71 percent to 47 percent of median income available for consumption, while the median value of social transfers, beginning at 10 percent of income available for consumption, grows to 16 percent in the "New Low Normal" due to greater benefits levels and less income for consumption in each progressive scenario. Similar increases occur for the other income groups.

The growth in the value of these social pension benefit payouts, both in value and as a proportion of income, help to lessen the impact of the financial market (along with the mitigating impact of corresponding reductions in income and payroll taxes, and the stability of C/QPP and imputed rent). The poor typically do not have enough financial assets for variations in the rate of return to have a large impact, and part of any loss in capital income will be offset by the GIS; hence, returning to Table 7a, there is a median loss in income for consumption of only 6 percent in the "New Low Normal" scenario. On the other end of the spectrum, the affluent receive only some of their income from OAS benefits and none are eligible for GIS benefits. In a long-term low financial market returns environment, they continue to be ineligible for GIS benefits but less of their OAS benefits are clawed back, which helps a bit in recovering their lost capital income. In short, the Canadian social transfer system reduces the impact of poor financial returns across income groups, and particularly so for the low-income population.

If we rank the baby boomer population by their adjusted working-life after-tax income (as described in the section "Segmenting the Population") and divide them into 20 vintiles, Figure 5 shows the percentage loss in income available for consumption (as defined in Figure 3) relative to 2007 expectations for each scenario. For example, "Scenario 'Temporary Shock' vs '2007 Baseline'" shows the drop in the average annual income available for consumption between "2007 Baseline" and "Temporary Shock," as a percentage of the average "2007 Baseline" value, for those members of the population within each vintile. As Figure 5 illustrates, the more affluent are more exposed to financial market risk. For example, compared to expectations in 2007, before the financial crisis, the poorest 5 percent of the cohort will experience an 8 percent drop in their income available for consumption in the case of a continuing low financial

Table 7b: Pre-Tax Value of "OAS + GIS" and "Private Savings Annual Payout", as Percentage of Income Available for Consumption, by Income Group

	Scenario "2007 Baseline"	Scenario "Temporary Shock"		Scenario "New Low Normal"		
1951–1966 Birth Cohort	% Annual Income Available for Consumption	% Annual Income Available for Consumption	Change in % from Scenario "2007 Baseline"	% Annual Income Available for Consumption	Change in % from Scenario "Temporary Shock"	Change in % from Scenario "2007 Baseline"
Poor (<LIM, 15% of pop.)						
OAS/GIS annual benefits						
Group mean	46%	49%	3%	53%	5%	8%
Group median/8th percentile	54%	57%	2%	60%	3%	6%
Private savings annual payout						
Group mean	26%	20%	−6%	12%	−8%	−14%
Group median/8th percentile	7%	5%	−2%	4%	−1%	−3%
Lower-middle (100–200% LIM, 42% of pop.)						
OAS/GIS annual benefits						
Group mean	20%	23%	3%	27%	5%	7%
Group median/36th percentile	22%	24%	2%	29%	5%	7%
Private savings annual payout						
Group mean	53%	44%	−9%	30%	−14%	−23%
Group median/36th percentile	43%	37%	−6%	26%	−11%	−18%
Upper-middle class (200–400% LIM, 38% of pop.)						
OAS/GIS annual benefits						
Group mean	9%	11%	2%	15%	4%	6%
Group median/76th percentile	10%	12%	2%	16%	4%	6%
Private savings annual payout						
Group mean	77%	68%	−9%	50%	−19%	−28%
Group median/76th percentile	71%	64%	−7%	47%	−17%	−24%
Affluent (>400% LIM, 5% of pop.)						
OAS/GIS annual benefits						
Group mean	3%	4%	1%	7%	3%	4%
Group median/97.5th percentile	3%	4%	1%	8%	4%	5%
Private savings annual payout						
Group mean	90%	83%	−7%	63%	−20%	−27%
Group median/97.5th percentile	89%	82%	−7%	60%	−22%	−29%

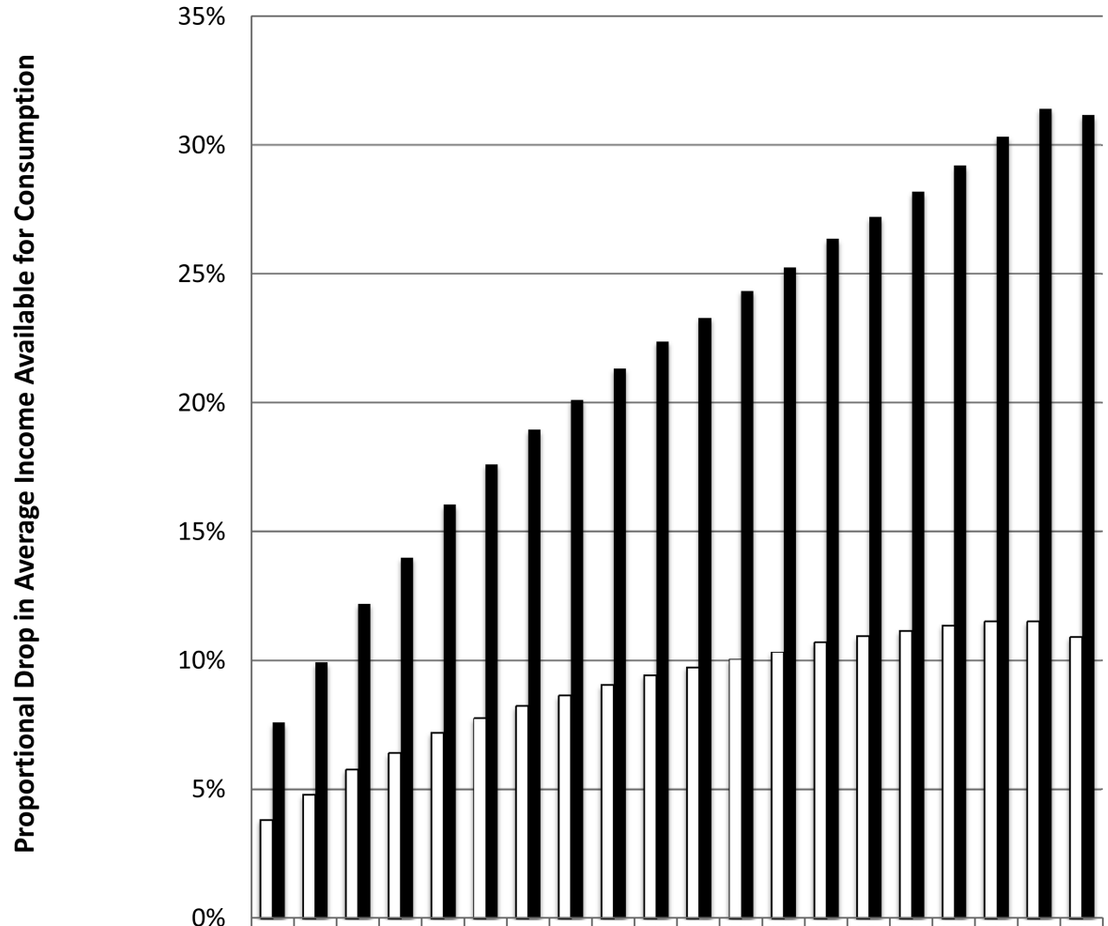
Notes: "OAS + GIS" and "Private savings annual payout" (total of employer pension plan benefits and flows from registered and non-registered wealth) before tax are expressed as a percentage of the scenario's "Income available for consumption" (see Figure 3). "LIM" is updated annually by the all-items consumer price index.
Source: Authors' calculations.

market, while the most affluent 5 percent can expect a 31 percent drop.

This paper has not examined the division of the incomes of elderly Canadians between own consumption and bequest. Affluent seniors who were planning to leave inheritances can decide to react to reduced income flows by maintaining their consumption, but reducing their planned bequests, in which case the ultimate impact of declining financial market returns may be smaller inheritances of the younger generations of affluent families. Such behavioural responses are, however, likely to be most often observed among higher-income Canadians.

Conclusion

This paper has investigated the implications of the financial crisis, and a possible new reality of long-term low interest rates and depressed stock market returns, for Canadian baby boomers' financial prospects as seniors. Using a population microsimulation model, it compared three scenarios: if Canadian financial markets (a) never experienced the financial crisis of 2008 (i.e., continued



	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th
□ Scenario 'Temporary Shock' vs '2007 Baseline'	4%	5%	6%	6%	7%	8%	8%	9%	9%	9%	10%	10%	10%	11%	11%	11%	11%	12%	12%	11%
■ Scenario 'New Low Normal' vs '2007 Baseline'	8%	10%	12%	14%	16%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	31%	31%

Figure 5: Percentage Losses Relative to 2007 Baseline Scenario
Notes: Percentage decline by vintiles in average income available for consumption, age 65 to death, vintiles ranked according to real working-life after-tax income.

on their pre-2008 path) ("2007 Baseline"); (b) experienced the crisis and return to historical trends ("Temporary Shock"); or (c) entered a new long-term environment of depressed stock market growth and continued low interest rates ("New Low Normal"). The paper focused on how well the current Canadian retirement system shelters seniors from financial market risk before any reactive behavioural changes. It did not examine, therefore, likely mitigating behavioural responses (e.g., delayed retirement or increased savings by individuals) or possibly aggravating changes (e.g., forced unemployment, policy changes to the C/QPP and OAS/GIS systems, or future benefits reductions by employer defined pension plans).

If financial markets recover, the effects of the financial crisis on financial prospects will be similar for both older and younger baby boomers. If financial markets have entered a new reality of low interest rates and depressed equity returns, however, the financial impacts are at least twice as large as the financial crisis alone, with even more severe repercussions awaiting younger baby boomers and generations thereafter. Early baby boomers born 1951–1966 (who will begin to hit 65 after 2016) have already done most of whatever retirement savings they are going to do. Delayed retirement, or partial employment after normal retirement age, is the main adaptive strategy for maintaining incomes available for them—and in fact the employment rate of older cohorts of Canadians

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has been rising rapidly in recent years.[39] The more affluent can also mitigate the impact by proactively reducing their intended bequests. Younger cohorts have greater opportunity to mitigate the impact of declining returns by saving more, and/or searching for higher-yielding assets (possibly global investments and real estate), in addition to delaying retirement, partial employment after retirement, and reducing intended bequests. On the other hand, younger cohorts are more exposed to any increased future erosion of employer-provided DB pension plans and any future amendments to OAS/GIS and the C/QPP in the event of a continuing poor financial market.

In aggregate, the financial security of the low-income senior population is much less affected by the future path of the financial market than the more affluent: the poorest 5 percent of the population experience an 8 percent drop in financial welfare (in terms of income available for consumption) based on their pre-2007 expectations and in the event of a continuing low financial market, while the richest 5 percent see a 31 percent drop. Upper-income Canadians are the most exposed to continuing low interest rates owing to their relatively greater holding of financial assets, and are thus those most likely to respond with increased labour supply (presumably of higher productivity, higher wage labour), increased savings, and/or decreased bequests.

Our "New Low Normal" scenario represents a very large change from the pre-2008 financial world in which Canadians now alive have made most of their financial decisions, but the simulated impacts on the financial security of most seniors are moderated by

- retirement income sources that are not directly affected by financial market volatility (specifically, employment earnings, C/QPP benefits, defined benefit employer pension plan benefits, and in-kind income from home ownership); and
- the Canadian social transfer system (OAS/GIS), which produces rising benefits in the event of reduced income from registered wealth.

For example, while annual income from private savings (in terms of employer pension plan benefits and personal investments) of the median Canadian baby-boom senior drops by over half on account of the financial crisis and in the event of a continuing low financial market, their financial welfare (in terms of income available for consumption) drops by only just over a fifth.

Rising social transfers and stable income sources (including the C/QPP) combine to partially shield Canadian seniors from financial market risk. Our results thus demonstrate the important role of the Canadian social pension system in not only protecting poorer Canadian seniors with no other source of income from destitution, but also partly shielding middle-class, and even affluent, Canadian seniors from financial market risk.

The flip side of these results is, however, that they illuminate the potential exposure of older Canadians to political risk, in the form of demands for "reform" of the Canadian public pension system (OAS/GIS and C/QPP), including the possibility of reduced or delayed benefits or a transition to individual account-type social security plans.

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We would like to thank Kevin Moore for reviewing and providing feedback on the LifePaths code underlying this project, Martin Reeves—the assistant vice president of payout annuities at Sun Life Financial—for his assistance in providing industry insight as to the annuity price calculator modelling component of this project, Cannex Financial Exchanges Limited for their assistance in collecting data in the calibration of the annuity price modelling (http://www.cannex.com), and finally "The Individual Finance and Insurance Decisions Centre" at York University for building the publicly available "Payout Annuity Index." This project was funded by the Committee on Knowledge Extension Research of the Society of Actuaries and the Actuarial Foundation of Canada Research Committee—the authors are thankful to these organizations. MacDonald gratefully acknowledges the financial support of the Social Sciences and Humanities Research Council of Canada.

Notes

1 Source: CANSIM V122541, V122618.

2 The TSX rose 30 percent in 2009 but interest rates remain low (for example, 1.1 percent on short-term Canadian government bonds at the end of 2013): CANSIM V122620; V122558. The Bank of Canada announced on 17 April 2012 that it would target an overnight rate of 1 percent, a policy still maintained at the time of writing (January 2014).

3 Interest rate risk also affects portfolio values when rising interest rates reduce the market value of currently held fixed securities.

4 We do not mean this example to be interpreted as representative, just illustrative of the potential for interactions between equity values and interest rates.

5 Rounded estimates calculated from the "Payout Annuity Index" by the Individual Finance and Insurance Decisions Centre at York University (www.ifid.ca/payout.htm).

6 In the event of poor financial markets, choosing to save more or delay retirement can mitigate the impact of poor financial market returns. On the other hand, unemployment and forced early retirement during a recession can exacerbate the negative impact of low financial returns by curtailing personal retirement savings and reducing pension income (for example, Davies and Yu [2013] found that, in the case of DB plans, pension income could reduce up to 50 percent if unemployment comes at the end of career). Coile and Levine (2009, 2010) and Osberg (1993) found that older workers who have been laid off are more likely to retire early when labour markets are slack.

7 Subjective outcomes, such as the anxiety generated by the volatility of the financial market (see Bricker et al. 2011; Deaton 2012), are therefore not considered.
8 In 2008, the Canadian common stock index TSX earned a total return of −33 percent and the US common stock index S&P of −37 percent.
9 Other studies include Butrica, Smith, and Toder (2010), Sass, Monk, and Haverstick (2010), Bricker et al. (2011), Gustman et al. (2010, 2011), Wolff (2011), and Davies and Yu (2013).
10 Appendix A graphs the historical yield-to-maturities on Canadian fixed securities year by year.
11 This analysis is based on Statistics Canada's LifePaths Model (version 5.1.6.0). The assumptions and calculations underlying the simulation results were prepared by the authors, and the responsibility for the use and interpretation of these data is entirely that of the authors. An overview of LifePaths can be found at www.statcan.gc.ca/microsimulation/lifepaths/lifepaths-eng.htm.
12 OAS and GIS are social benefits for Canadian seniors meeting a residence requirement (regardless of employment and earnings history). As of October–December 2013, the maximum OAS benefit for a single was $550.99 per month, which reduces at a rate of 15 percent for Canadians earning more than $69,562, until it is eliminated entirely for retirement income exceeding $114,815. GIS as of October 2013 had a maximum benefit of $747.11 per month for a single, reduced by $0.50 for every dollar of income (excluding OAS benefits and depletion of non-registered savings). See www.servicecanada.gc.ca/eng/services/pensions/oas/payments/index.shtml.
13 There is also a 2012 SFS, but the data have not yet been released at the time of writing (January 2014).
14 Baldwin et al. (2011, 9) relied on the earlier data, stating, "The 1999 version is used (rather than the 2005 version) because its larger sample size makes it possible to conduct reliable analyses at the level of detail required here."
15 In a recent paper, Davies and Yu (2013) examined the impact of the financial crisis on private retirement savings of Canadians by projecting forward the assets and wealth holding reported in the 2005 SFS to 2008–2009, and examining the impact of the historical changes in asset prices during the financial market crisis on those projected values. They found that the GIS program provides some cushion for Canadians against poor financial markets.
16 C/QPP is an earnings-related defined benefit pension aimed at replacing up to approximately 25 percent of the average industrial wage.
17 While the Canadian public pension system is made up of OAS, GIS, and C/QPP, the United States has Social Security plus Supplemental Security Income (a means-tested top-up payment available for low-income pensioners).
18 For workers who entered the labour market in 2008 and spent their entire working lives under the same set of rules, "the net replacement rate is defined as the individual net pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners" (OECD 2013, 140).
19 Based on GIS rates as of January 2014, see www.servicecanada.gc.ca/eng/services/pensions/oas/payments/index.shtml.
20 For discussions on the shift in employer pension plans in Canada, see Brown and Liu (2001), Broadbent, Palumbo, and Woodman (2006), Gougeon (2009), and Mackenzie (2010).
21 This paper relies on the LifePaths default projection assumptions, which assume a continuation of the trend to less employer pension plan coverage and continuing movement from defined-benefit to defined-contribution plans among the private sector. By 2030, for example, we assume that (a) 35.8 percent of Canadian employees (public and private sector) will participate in a pension plan; (b) 22.6 percent of Canadian private sector employees will participate in a pension plan, among whom 56.0 percent will be in a DB pension plan and 42.9 percent will be in a DC pension plan; and (c) public employees participation rates and plan shares will remain steady.
22 RRSP contributions are deductible from income taxes (up to a limit) and the investment income accumulates tax-free, while withdrawals are taxed as ordinary income. Age and income both have a strong influence on the likelihood of having RRSP investments and its value. In the 2005 SFS, 35 percent of households with after-tax income less than $36,500 held RRSPs with a median value of $10,000, while 89 percent of households with after-tax income higher than $85,000 held RRSPs with a median account level of $80,000 (Pyper 2008). Similarly, older households were more likely to hold RRSP accounts, and the median value was higher.
23 Ten percent had mortgage debt with a median value of $41,000, and 18 percent owned other real estate with a median value of $63,000 (authors' calculations from 2005 SFS).
24 There is, however, a slight feedback in LifePaths modeling between "total income" and the house purchase decision that leads to a slight decrease in the value of purchased homes when we simulate a poor financial market.
25 Venti and Wise (2004) found that the majority of retirees do not draw down their housing wealth to support retirement consumption, and those who do are generally owing to health shocks or the death of a spouse. In Canada, seniors are far less likely to move from their home than any other age group (Clark, 2005) and the take-up of reverse mortgages on housing equity and other such financial instruments is rare (Chiuri and Jappelli 2010).
26 Bricker et al. (2011) observed that the debt levels for Americans were changed very little by the financial crisis between 2007 and 2009. Moreover, financial debt is a relatively smaller concern for Canadian seniors in general according to the 1999 and 2005 SFS, where financial debt has a median level of less than $8,000 for both senior age groups in both survey years.
27 Here we adjust the LifePaths baseline scenario assumption to approximately match average real wage growth from 1980 to 2011 (CIA 2012).
28 Inflation estimate is that used by the chief actuary of Canada (Office of the Chief Actuary of Canada 2010).

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29 LifePaths models the choice of either converting RRSP assets to an annuity or to RRIF assets at a person's chosen conversion age of no later than age 71.

30 The authors thank Sun Life Financial, who provided substantial insight into the annuity pricing assumptions employed by Canadian insurers.

31 Including additional fixed security asset classes adds little to simulation accuracy. The return on a bond portfolio depends on the investor's buy/sell strategy and the term of the existing bonds that make up the portfolio. For example, if an investor chooses a buy-and-hold strategy, then he/she will earn the initial yield-to-maturity underlying the pricing of each bond in the portfolio at the time of purchase regardless of any changes in the financial market. If he/she decides, however, to sell a bond before maturity, the return depends on the remaining duration of the bond and the prevailing yield curve. Data on portfolio composition and turnover at this level of detail is not available across the Canadian population.

32 Adding stochastic variation in investment returns between individual investors across Canada (where historical data is nearly non-existent) while correspondingly modeling the appropriate stochastic variability of investment returns over time, both correctly specified under each financial market scenario, does not integrate into the current framework of LifePaths and is therefore outside the scope of this paper. Building an incorrectly specified model of stochastic variation would add misleading noise in an already complex model.

33 Mehra and Prescott (1985) marked the beginning of a long line of research questioning why the 6 percent historical equity premium has been "so high" and whether it will continue. Jacquier, Kane, and Marcus (2005) argued that the historical equity premium has been exaggerated, and Siegel (2005) projected that the future equity premium will drop from its historical average of 6 percent to 2–3 percent.

34 King and Low (2014) examined the continuing collapse in "world" real interest rates over the past three decades, and particularly since the financial crisis. They noted that the five-year weighted average yield on ten-year bonds has fallen from 4.27 percent in 1985–1989 to 0.5 percent in 2010–2013. Guay and Allaire (2013, 4) argued that "the 20th century's financial history contains events that are deemed unique and non-replicable, and should not be a basis for enthusiasm in future long-term returns"; rather, lower projections are more realistic given today's current monetary policies (where the short-term rate is commonly aimed at less than 1 percent), the aging of the population, and the maturing of pension funds across industrialized countries. They projected "realistic" long-term returns to be 1.8 percent for Canadian long-term government bonds (ten years+) and 5.75 percent for Canadian equities and argued that the high historical returns are invalid predictors of future long-term returns (and, in fact, are negatively correlated), and that projection models that use only current and prospective market information (e.g., the model that they employ) show much more predictive accuracy. Reinhart and Rogoff (2009) are also among those expecting a long-term low financial market returns environment.

35 LifePaths' financial market modeling employs ten asset classes available for investment and features stochastic variation between investors by adding variability around the assets' observed rates of return in each historical year. This approach requires subjective assumptions regarding asset allocation and investor variability, but LifePaths has the advantage of calibrating its detailed results against actual historical portfolio values of sample Canadians.

36 For example, the 2009 LIM value for a single person is $18,680 (Murphy, Zhang, and Dionne 2012).

37 Trimming the average reduces the influence of outlier years—for example, both abnormally low (possibly negative) and unusually high earning years among the self-employed. For over 90 percent of the population, however, the trimmed average is within 90–110 percent of the full average. Our analysis does not include Canadians who die before reaching retirement or immigrants who arrive after age 35, as either would create missing years in the income measure.

38 Although Table 6 shows an absolute increase in retirement income between birth cohorts in both the mean and median values, we note that MacDonald et al. (2011) forecasted a decline in average replacement rates across birth cohorts because working-life income is projected to grow even faster than retirement-life income (mostly owing to greater participation of women in the workforce [Schirle 2009], but also because inflation indexed OAS/GIS benefits lag any real-wage growth and participation in employer pension plans is declining).

39 Between 1984 and 2002, the employment rate of Canadians aged 65 to 69 fluctuated in the 10–12 percent range; by September 2013, it had risen to 25.2 percent. See CANSIM Table 282-0001.

40 The public-use microdata files used in Tables B1 and B2 contain 15,933 dwellings in 1999 and 5,267 in 2005, which included 3,371 senior-headed dwellings in 1999 and 1,130 in 2005. Computations by the authors.

41 These are made up of total Registered Retirement Saving Plans (RRSPs), Locked-in Retirement Accounts (LIRAs), locked-in RRSPs, Registered Retirement Income Funds (RRIFs), Life Income Funds (LIFs), and Locked-in Retirement Income Funds (LRIFs).

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Appendix A: Historical Yield-to-Maturities on Canadian Government Fixed Securities

Figure A1 graphs the historical nominal yield-to-maturities on Canadian fixed securities year by year (calculated using the arithmetic averages of the 12 monthly yields-to-maturity [CIA 2012]). Figure A2 graphs the historical yield-to-maturities after accounting for inflation.

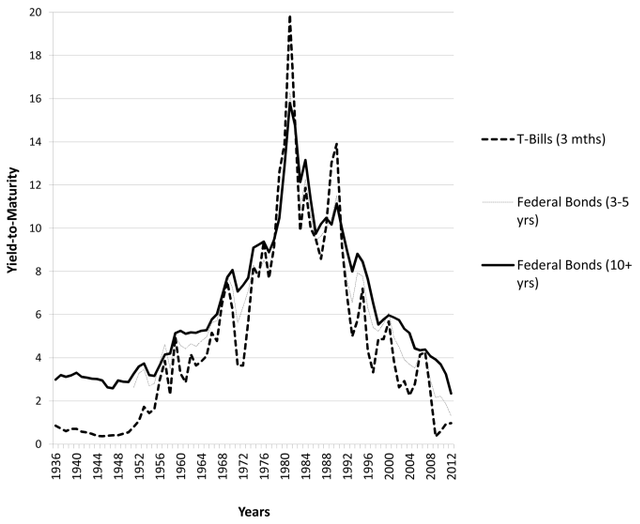

Figure A1: Historical Annualized Nominal Yield-to-Maturities on Canadian Government Fixed Securities
Source: Authors' calculations from data summarized in CIA (2012).

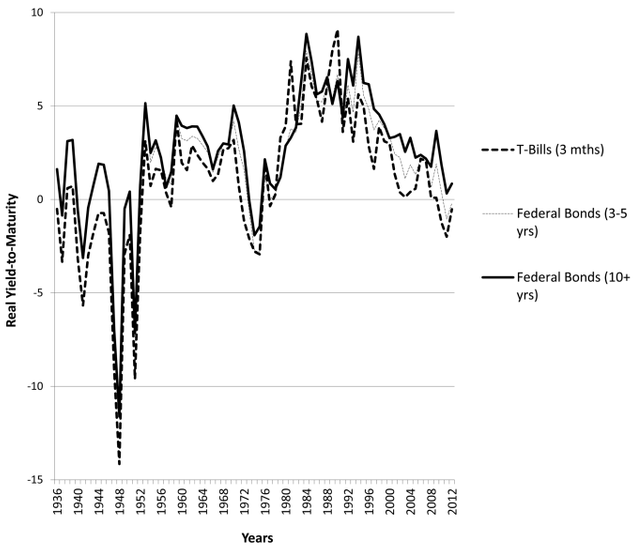

Figure A2: Historical Annualized Real Yield-to-Maturities on Canadian Government Fixed Securities
Source: Authors' calculations from data summarized in CIA (2012).

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Appendix B: Financial Assets of Canadian Seniors

This appendix summarizes the registered and non-registered financial assets and debts of Canadian seniors using the 1999 Survey of Financial Security (1999 SFS) and the 2005 Survey of Financial Security (2005 SFS).[40] The first line of Table B1 shows the registered wealth holdings[41] in 1999 of Canadian economic families whose major income recipient is aged 65–74. The first five columns show the distribution of registered wealth of these households—for example, 41.5 percent of such households had no registered wealth. For the 68.5 percent of households holding registered wealth, the last four columns give the mean and median at the household level and at the adult-equivalent individual level (i.e., dividing the household value by the square root of the number of household members).

Tables B1 and B2 suggest that most Canadian seniors have some financial savings, but only about a third of the senior population have more than $100,000. These values are similar in 1999 and 2005 (after debt, 32.9 percent and 32.1 percent of 65–74-year-olds, and 27.9 percent and 30.4 percent of 75 years plus).

Table B1: Financial Assets and Debts of Canadian Seniors from the 1999 Survey of Financial Security

	Percent Households with Wealth Level within Each Range					Mean	Median	Mean	Median
	$0	$0–$5,000	$5,000–$50,000	$50,000–$100,000	$100,000+	across Households Holding Wealth		across Individuals Holding Wealth (adult equivalent)	
Ages 65–74									
(A) RRSP/LIRA/RRIF	41.5%	3.9%	23.9%	9.6%	21.1%	$111,000	$55,000	$85,000	$43,000
Non-registered									
Deposits	7.3%	36.5%	41.7%	7.5%	7.0%	31,000	8,000	24,000	6,000
Mutual funds	84.8%	1.9%	7.2%	2.5%	3.5%	78,000	35,000	61,000	25,000
Bonds	83.9%	5.3%	8.4%	0.7%	1.7%	33,000	12,000	27,000	9,000
Stocks	89.4%	2.5%	4.2%	1.4%	2.6%	131,000	28,000	101,000	21,000
Other financial asset	92.0%	1.7%	4.7%	0.4%	1.2%	45,000	12,000	35,000	11,000
Business equity	90.7%	2.6%	2.5%	0.7%	3.4%	239,000	30,000	166,000	17,000
(B) All non-registered	5.8%	29.2%	37.5%	9.3%	18.0%	91,000	15,000	69,000	12,000
Total (A+B)	4.6%	20.1%	28.4%	13.1%	33.5%	158,000	48,000	120,000	37,000
(C) Financial debt (excluding mortgage)	68.3%	16.3%	14.3%	0.6%	0.5%	(11,000)	(5,000)	(8,000)	(4,000)
Net total (A+B+C)	2.9%	15.0%	27.3%	12.3%	32.9%	169,000	56,000	128,000	45,000
Ages 75+									
(A) RRSP/LIRA/RRIF	71.7%	2.2%	12.7%	5.6%	7.8%	85,000	44,000	68,000	35,000
Non-registered									
Deposits	6.1%	26.1%	42.8%	11.0%	14.0%	51,000	16,000	43,000	14,000
Mutual funds	88.3%	0.7%	5.3%	2.1%	3.6%	103,000	48,000	87,000	37,000
bonds	80.1%	5.2%	10.2%	2.4%	2.0%	34,000	13,000	29,000	10,000
Stocks	91.6%	1.2%	2.4%	0.7%	4.1%	246,000	92,000	209,000	77,000
Other financial asset	94.2%	1.7%	2.4%	0.6%	1.2%	52,000	22,000	41,000	16,000
Business equity	95.8%	0.9%	0.5%	0.3%	2.4%	234,000	121,000	168,000	109,000
(B) All non-registered	5.7%	22.3%	37.9%	11.3%	22.8%	106,000	25,000	88,000	22,000
Total (A+B)	5.3%	19.6%	34.9%	12.3%	28.0%	131,000	35,000	108,000	30,000
(C) Financial debt (excluding mortgage)	85.8%	9.3%	4.6%	0.3%	0.0%	(7,000)	(2,000)	(5,000)	(2,000)
Net total (A+B+C)	4.1%	16.8%	34.3%	12.3%	27.9%	135,000	38,000	112,000	33,000

Notes: The SFS reports assets and debts at the economic family levels. Adult-equivalent wealth is calculated by dividing household wealth by the square root of the number of household members. Age groupings are by age of the major income recipient.

[a] 2005 constant dollars: Cansim Table 326–0021

Source: Authors' calculations using the 1999 SFS Public Use Microdata.

Table B2: Financial Assets and Debts of Canadian Seniors from the 2005 Survey of Financial Security

	Percent Households with Wealth Level within Each Range					Mean	Median	Mean	Median
	$0	$0–$5,000	$5,000–$50,000	$50,000–$100,000	$100,000+	across Households Holding Wealth		across Individuals Holding Wealth (adult equivalent)	
Ages 65–74									
(A) RRSP/LIRA/RRIF	40.2%	5.1%	25.6%	10.0%	19.1%	$118,000	$50,000	$90,000	$40,000
Non-registered									
Deposits	6.7%	34.9%	39.8%	8.2%	8.8%	49,000	10,000	39,000	8,000
Mutual funds	85.1%	0.6%	6.1%	5.3%	2.9%	91,000	55,000	74,000	41,000
Bonds	88.8%	4.6%	3.7%	0.5%	2.4%	64,000	9,000	50,000	7,000
Stocks	86.3%	2.4%	4.5%	3.2%	3.6%	174,000	50,000	144,000	37,000
Other financial asset	94.3%	1.0%	2.8%	1.0%	0.9%	74,000	25,000	60,000	18,000
Business equity	91.5%	2.1%	2.1%	0.5%	3.7%	261,000	53,000	177,000	37,000
(B) All non-registered	6.1%	25.0%	36.8%	12.0%	20.1%	124,000	22,000	97,000	19,000
Total (A+B)	4.9%	17.9%	24.3%	19.3%	33.6%	196,000	62,000	152,000	50,000
(C) Financial debt (excluding mortgage)	60.5%	11.9%	23.4%	3.7%	0.4%	(17,000)	(10,000)	(14,000)	(8,000)
Net total (A+B+C)	3.5%	12.4%	24.2%	17.0%	32.1%	211,000	66,000	164,000	51,000
Ages 75+									
(A) RRSP/LIRA/RRIF	60.9%	2.5%	17.9%	9.0%	9.7%	91,000	44,000	74,000	37,000
Non-registered									
Deposits	7.8%	25.3%	39.9%	17.0%	9.9%	50,000	18,000	41,000	15,000
Mutual funds	83.6%	0.4%	6.5%	3.7%	5.8%	120,000	65,000	97,000	57,000
Bonds	87.9%	3.7%	5.9%	0.7%	1.8%	40,000	11,000	34,000	7,000
Stocks	91.7%	2.3%	2.3%	1.4%	2.3%	135,000	29,000	117,000	21,000
Other financial asset	93.7%	2.4%	2.6%	0.5%	0.9%	70,000	7,000	56,000	5,000
Business equity	95.6%	1.0%	0.7%	0.4%	2.3%	217,000	105,000	183,000	74,000
(B) All non-registered	6.7%	21.8%	33.0%	16.5%	21.7%	103,000	29,000	84,000	24,000
Total (A+B)	6.4%	17.1%	29.8%	15.9%	30.5%	140,000	49,000	115,000	39,000
(C) Financial debt (excluding mortgage)	81.4%	9.4%	7.8%	1.4%	0.0%	(13,000)	(5,000)	(10,000)	(4,000)
Net total (A+B+C)	5.0%	16.0%	27.7%	15.7%	30.4%	144,000	54,000	118,000	41,000

Notes: See Table B1.

[a] 2005 constant dollars: Cansim Table 326–0021

Source: Authors' calculations using the 2005 SFS Public Use Microdata.