Compulsory Government Pensions vs. Private Savings

The Effect of Previous Expansion to the Canada Pension Plan

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Executive summary

In recent years, there has been a strong push to expand the Canada Pension Plan (CPP). Ontario has already set out a plan to create an additional mandatory provincial program mirroring the CPP, the Ontario Retirement Pension Plan (ORPP), which is slated for implementation on January 1, 2017. Yet the debate about expanding compulsory public pensions has largely overlooked important consequences for private savings, and thus may have overstated the benefits of such a policy move.

Increasing compulsory savings can have the unintended consequence of reducing the amount that households save privately. Households who are content with their balance between current consumption and saving for the future might respond to increased mandatory savings by reducing voluntary savings, maintaining their overall consumption-saving balance. This means that if governments mandate higher CPP or ORPP contributions, Canadians may simply reduce their private savings in vehicles such as RRSPs and TFSAs. While this trade-off has been highlighted by standard economic theory and international studies, its impact has received little attention in the debate about expanding the CPP or enacting new provincial plans.

This study builds on past Fraser Institute work by empirically examining the extent to which historical increases to CPP contributions affected the private savings of Canadian households. The survey data used accounts for the saving patterns and demographics of Canadian households for select years from 1986 to 2008, spanning a substantial increase to the CPP contribution rate. The analysis focuses on particularly important changes made to the CPP between 1996 and 2004, when the total contribution rate rose from 5.6 percent to 9.9 percent of insurable earnings as part of reforms to improve the program's long term outlook.

The results show that past increases in the compulsory CPP contribution rate were followed by decreases in the private savings rate of Canadian households. This drop in private savings is after accounting for changing interest rates and shifts in demographics such as age, income, and home ownership. Specifically, our results associate a 0.895 percentage point drop in the private savings rate of the average Canadian household with each percentage point increase in the total CPP contribution rate, holding other factors

constant (the average private savings rate for all households was 7.1 percent in 1996, the year before the CPP reforms).

Breaking down this result into income and age groups shows that the negative effect on private savings is most pronounced among the young (under 30) and smallest for those approaching retirement (50–64). We also find a larger percentage point drop in the private savings rate of lower-income households and practically none for those with higher income. Further analysis based on the empirical results suggests that households may have, on average, substituted between private and public savings on a dollar-for-dollar basis, whereby a one dollar increase in CPP contributions is offset by approximately a dollar decrease in private savings.

The debate about the efficacy of compulsory expansion of the CPP or new provincial plans such as the ORPP should account for the consequence of reduced private savings. Our results suggest that *overall* retirement savings won't increase to the extent of the increase in compulsory savings, and perhaps won't increase at all. In the end, there will be a reshuffling of retirement savings, with more money going to forced savings and less to voluntary savings. This means the benefits of increasing the CPP or enacting the ORPP must be weighed against the flexibility and choice offered by private savings vehicles such as RRSPs and TFSAs. For instance, voluntary vehicles like RRSPs can be used for buying a home, obtaining skills training, withdrawing in case of a terminal illness, or fully transferring assets to a beneficiary upon death.

The key to providing retirement income through savings is a set of rules that allows for an optimal mix of savings for different people in different stages of life and with different preferences. The benefits to a compulsory expansion of the CPP or of similar provincial policies need to be considered against the costs, which as our analysis suggests will include a reduction in voluntary private savings.

Introduction

In recent years, there has been a strong push to expand the Canada Pension Plan (CPP), with a growing number of provincial governments expressing support for the idea. Ontario has already set out a plan to create an additional mandatory provincial program—the Ontario Retirement Pension Plan (ORPP)—mirroring the CPP, which is slated for implementation on January 1, 2017. Other provinces could follow Ontario's lead. But this move to expand compulsory public pensions may very well be unnecessary. A full accounting of the availability of retirement resources suggests the existing system serves the vast majority well (Cross, 2014; Mintz, 2009).

An important issue that has received little attention in the debate is the potential for increased compulsory savings to lead to reduced voluntary savings. That is, as governments mandate higher retirement savings contributions, Canadians may simply reduce their private savings in vehicles such as Registered Retirement Savings Plans (RRSPs) and Tax Free Savings Accounts (TFSAs). Indeed, economic theory, preliminary evidence for Canada, and international studies all suggest that people will reduce their private savings to offset the higher contributions needed to fund the expanded government plans.

This potential substitution effect, whereby people reduce their (voluntary) private savings as (compulsory) government savings increase, has been almost entirely absent from the current public debate, except for a preliminary analysis completed by Lammam et al. (2013). Examining the increases in compulsory CPP contributions over the period 1993 to 2003, that study pointed to a negative correlation between CPP and RRSP contributions (RRSPs are an important private savings vehicle for retirement). That is, as CPP contributions increased, RRSP activity declined.[1]

This paper builds on Lammam et al.'s preliminary analysis by empirically examining whether past increases to the CPP contribution rate had an

1. Specifically, the analysis considered three measures of RRSP activity: (1) RRSP contributors as a percentage of taxfilers; (2) RRSP contributions as a percentage of income; and (3) RRSP contributions per taxfiler. The effect of CPP increases was examined for individual taxfilers aged 45 or less and aged 45 to 64, with each age group also divided into income groups of $10,000–$50,000 and $50,000–$100,000.

impact on the private savings rate of Canadian households. Specifically, the paper exploits important changes in the CPP rate between 1996 and 2004, and is a natural follow-up to the analysis by Lammam et al., who note that their work is a "preliminary investigation of readily available aggregate data from the Canada Revenue Agency" (2013: 29).

The first section of this paper presents background information on the CPP. The second summarizes the economic framework for analyzing savings, namely the life-cycle model. The third section reviews some of the existing literature on the effect of public pensions on private savings. The fourth sets out the empirical model and summarizes the data used, while the fifth section presents the econometric results.

Structure of the CPP

The CPP and its Quebec counterpart the QPP were created in the 1960s.[2] The CPP covers employed and self-employed workers in Canada through the payment of mandatory contributions. It is designed to replace about 25 percent of the pre-retirement earnings on which a person's contributions are based, up to a maximum amount, referred to as the "year's maximum pensionable earnings." The CPP provides beneficiaries with a defined benefit in retirement, which can be drawn at a reduced rate as early as age 60, although the normal retirement age for CPP is 65.[3] Postponing the receipt of CPP to after the age of 65 results in a higher benefit amount that increases with the length of the postponement until one reaches the age of 70 when the CPP must be taken up.

Contributions are paid on earnings above the annual exemption ($3,500 since 1996) and below the year's maximum pensionable earnings ($53,600 in 2015). The contribution rate—which is a payroll tax—is 9.9 percent; it is split equally between the employee (4.95 percent) and the employer (4.95 percent).[4]

Table 1 displays the CPP contribution rate and minimum and maximum earnings thresholds for contributing from 1986 to 2015. The combined contribution rate increased steadily throughout the period up to 2003 (**figure 1**).

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2. Because of their similar structure during the period under analysis in this study (1986 to 2008), references to the CPP hereafter also cover the QPP, unless otherwise indicated. Contribution rates in the CPP and QPP were identical during the time of expansion we study (year ending in 2003), although they diverged starting in 2012. In addition, it should be noted that CPP and QPP are differentiated by the entities that manage their assets. The Canada Pension Plan Investment Board was created in 1997 to manage CPP assets (assets were previously used to purchase provincial government bonds), while QPP funds have been managed by the Caisse de Dépôt et Placement du Québec since the QPP's creation.

3. CPP retirement benefits depend on how much and for how long beneficiaries contribute and the age at which they retire. If Canadians draw on the CPP early, their benefits are reduced by a set percentage for each month the CPP is taken before age 65.

4. CPP outlays, unlike other public pension programs, such as Old Age Security and the related Guaranteed Income Supplement, are funded through dedicated payroll taxes. Tax contributions in excess of benefit payouts are invested into an investment fund managed by the Canada Pension Plan Investment Board.

Table 1

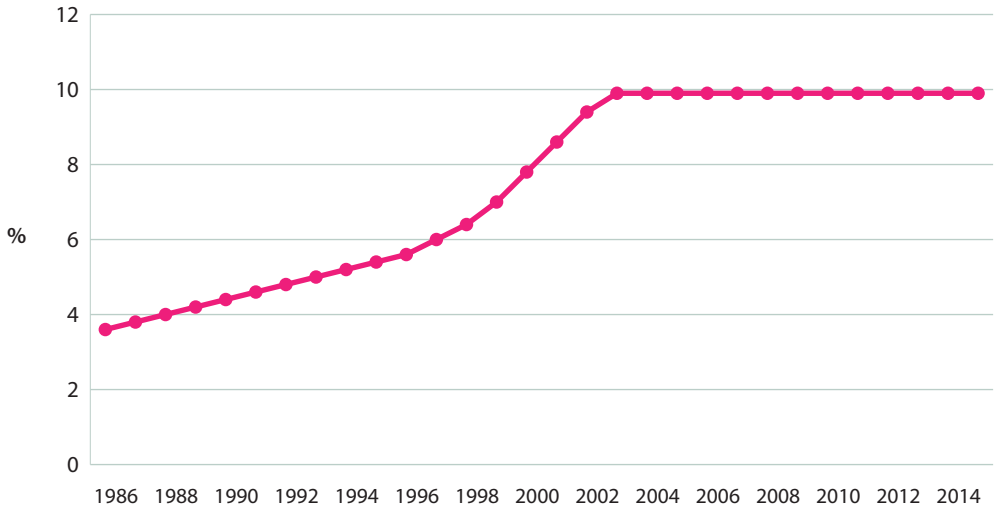
CPP contribution rate and minimum and maximum income thresholds for contributing, 1986–2015

Year	Employee contribution rate (%)	Employer contribution rate (%)	Total contribution rate (%)	Minimum annual pensionable earnings ($)	Maximum annual pensionable earnings ($)
1986	1.8	1.8	3.6	2,500	25,800
1987	1.9	1.9	3.8	2,500	25,900
1988	2	2	4.0	2,600	26,500
1989	2.1	2.1	4.2	2,700	27,700
1990	2.2	2.2	4.4	2,800	28,900
1991	2.3	2.3	4.6	3,000	30,500
1992	2.4	2.4	4.8	3,200	32,200
1993	2.5	2.5	5.0	3,300	33,400
1994	2.6	2.6	5.2	3,400	34,400
1995	2.7	2.7	5.4	3,400	34,900
1996	2.8	2.8	5.6	3,500	35,400
1997	3	3	6.0	3,500	35,800
1998	3.2	3.2	6.4	3,500	36,900
1999	3.5	3.5	7.0	3,500	37,400
2000	3.9	3.9	7.8	3,500	37,600
2001	4.3	4.3	8.6	3,500	38,300
2002	4.7	4.7	9.4	3,500	39,100
2003	4.95	4.95	9.9	3,500	39,900
2004	4.95	4.95	9.9	3,500	40,500
2005	4.95	4.95	9.9	3,500	41,100
2006	4.95	4.95	9.9	3,500	42,100
2007	4.95	4.95	9.9	3,500	43,700
2008	4.95	4.95	9.9	3,500	44,900
2009	4.95	4.95	9.9	3,500	46,300
2010	4.95	4.95	9.9	3,500	47,200
2011	4.95	4.95	9.9	3,500	48,300
2012	4.95	4.95	9.9	3,500	50,100
2013	4.95	4.95	9.9	3,500	51,100
2014	4.95	4.95	9.9	3,500	52,500
2015	4.95	4.95	9.9	3,500	53,600

Note: Until 2011, the CPP and QPP rates were the same; they began diverging in 2012, with the QPP rate increased to 10.05% in 2012, 10.20% in 2013, 10.35% in 2014, and 10.50% in 2015. The minimum and maximum amounts are the same for both regimes. <http://www.rrq.gouv.qc.ca/SiteCollectionDocuments/www.rrq.gouv.qc/Anglais/publications/regime_rentes/retraite/revenus_admissibles_a.pdf>. The total QPP rate is split equally between employees and employers.

Sources: Lammam et al., 2013: table 1; CAAT, 2015; Frenken, 1993: table 1.

Figure 1
Combined CPP contribution rate (%), 1986–2015



Source: See table 1.

In fact, from 1993 to 2003, there was a near doubling within the span of a decade (5.0 percent to 9.9 percent). The increase in the contribution rate during this period coincided with important reforms to the CPP, announced in 1997, that put the program on a more stable and sound financial footing.[5]

Importantly, the 1997 reforms likely had the effect of changing the expectations of working-age Canadians regarding the future CPP benefits they would receive. That is, as the program moved away from a pay-as-you-go model to partial funding, the expectation of actually receiving the government's promised CPP benefits likely increased.[6] The maximum pensionable

5. In the early 1990s, there was growing recognition by all governments and the public that the revenues and accumulated assets of the CPP were insufficient to weather the pressures expected from the retirement of the baby boomers without marked increases in the payroll tax, reducing benefits, and/or accumulating government debt. In 1997, important reforms were announced to alleviate some fiscal pressure and, in large part, put CPP on a more sustainable path. The CPP reforms in 1997 entailed four broad changes: (1) increasing the contribution rate earlier than scheduled so that larger surpluses could be recorded sooner and invested to meet obligations; (2) establishing the CPP Investment Board to actively invest the surplus funds in order to maximize the risk-adjusted rate of return of CPP assets; (3) freezing the value of earnings exempted from the payroll tax at $3,500 so that more individuals would contribute to the plan; and (4) bringing in a series of small benefit changes intended to reduce overall benefit spending.

6. When the CPP and QPP were created in the 1960s, two funding approaches were in conflict. The federal government favoured a pay-as-you-go approach similar to Social Security in the United States, while the Québec government favoured a model leading to

earnings amount increased every year in nominal terms from $25,800 in 1986 to $53,600 in 2015. To reiterate, earnings beyond $53,600 (in 2015) are not subject to the CPP payroll tax.

capital accumulating in the hands of the Caisse de Dépôt et Placement du Québec. The compromise was a plan with an original level of premiums above those needed for a pay-as-you-go approach but less than those required for a fully capitalized pension fund. As time passed, the CPP and QPP evolved towards a pay-as-you-go model that was modified and moved towards a full funding model with the major reforms in the 1990s. See Vaillancourt (2000) for more details.

The economic framework for analyzing savings

The life-cycle model of income is a framework, widely accepted among economists, for analyzing how people save and consume. The life-cycle model is based on the early work of economists Milton Friedman and Franco Modigliani.[7] Their contributions help explain how people consume and save over their lifetimes. An important insight of the general model is that individuals and households are forward looking, and make decisions about consumption and savings today based on their expectations of the future.

A key insight found in Friedman's work is that people make current consumption decisions based on the resources they *expect* to have over their lifetime.[8] More specifically, they aim to even out or "smooth" their lifetime consumption in a way that maintains a relatively stable lifestyle, despite temporary fluctuations in income.[9] The level of consumption they target is based on their preferences and how much income they expect to earn during their lifetime. The model suggests that consumption patterns may change in response to permanent, but not temporary, changes in income, since it is permanent changes that alter one's lifetime wealth.

This means people use an expectation of their lifetime income (earnings and return on savings), or what Friedman referred to as their "permanent income," when making decisions about consumption—and thus savings—today. Temporary increases in income, such as a one-time tax rebate, are seen both conceptually and empirically as having almost no effect on a person's consumption because such changes do not affect individuals' expectations about their income over time. On the other hand, changes that do alter a

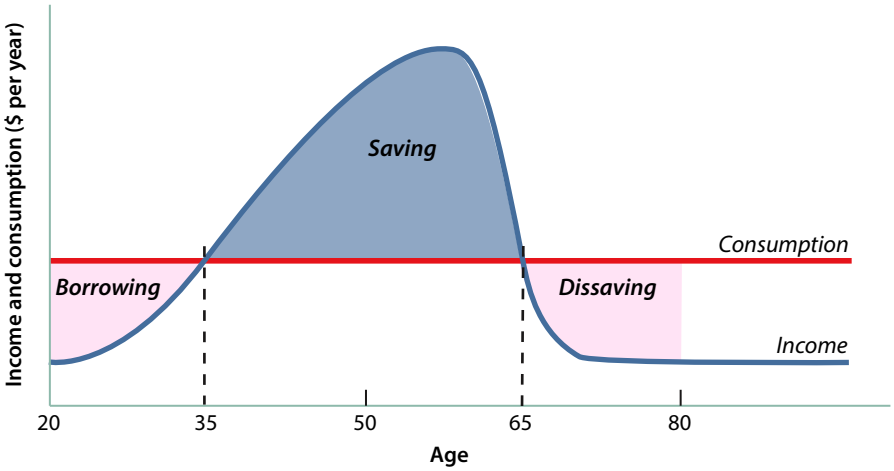
7. See Milton Friedman (1957) and Franco Modigliani (2005).
8. Friedman's theory is known as the "permanent income hypothesis."
9. In practice, people use the following information to calculate a stable living standard: current and future taxes; future sources of income; future family circumstances; inflation; rates of return on savings; and future expenses.

person's expectations, such as an unanticipated promotion leading to higher earnings, do affect consumption behaviour and savings.[10]

Consumption smoothing has implications for how economists analyze savings. Broadly speaking, the amount of money people save is the income left over after allowing for their annual consumption spending. Insofar as younger and older people tend to have relatively low annual income, and insofar as consumption spending tends to be less variable than income, most will generally borrow during their younger years when income is relatively low, save during prime working years when income is high, and draw down savings ("dissave") during retirement when income falls (**figure 2**).[11]

Figure 2

Life-cycle of income and consumption smoothing



Source: Lammam et al., 2013.

Canadians save for different reasons: for retirement, bequests, unforeseen events (losing a job or unexpected expenses), or big-ticket purchases (for example, a car or a down payment on a house). Saving for retirement occurs through many vehicles, including the CPP, RRSPs, Registered Pension Plans (RPPs), TFSAs, unregistered savings, and home equity. The life-cycle model suggests that each of these retirement savings vehicles are, to some degree, substitutable. The fundamental idea is that those who increase their savings in one vehicle without a permanent change in their income will tend to

10. A promotion may be expected or unexpected. If a promotion is fully expected, then the model suggests its effect on earnings is already incorporated into a person's estimate of permanent income and therefore has little effect on consumption or savings.

11. This is a highly simplified presentation. Some very young people might not easily borrow against future earnings and so may consume less than their future consumption. Consumption habits may stabilize later on (say around age 35).

decrease savings in another vehicle, with little impact on the overall level of savings. After all, it is lifetime income and the desired level of consumption that dictates the amount of money left over for savings.

Let us now turn to the real-world implications of the life-cycle model to understand how it predicts Canadian savers would respond to an expanded CPP. First, it is important to note that increasing the CPP contribution rate is fundamentally equivalent to increasing mandatory retirement savings over a range of income. The life-cycle model suggests that, if expanding the CPP has no effect on an individual's permanent income, Canadian savers will respond to higher mandatory retirement savings through the CPP by reducing their private voluntary retirement savings elsewhere. Again, the basic idea is that people treat these and other forms of retirement savings as substitutes so that, if more money goes into one, less goes into another.

There are fundamentally two types of individuals: those who currently save voluntarily outside the compulsory CPP, and those who have little or no retirement savings outside the CPP. For those who save voluntarily, the life-cycle framework predicts that raising the CPP will cause them to reduce savings elsewhere—be it RRSPs, RPPs, TFSAs, regular savings, or housing equity. The analysis in this report is concerned with substitution between CPP and total private savings. For those who have no alternative savings, raising the CPP would force them to save when they would have chosen to consume today rather than save. For this latter group, total savings may increase with an expanded CPP. However, it is not clear that this is desirable from the perspective of these individuals, since other programs of the public pension system—namely Old Age Security and the Guaranteed Income Supplement—may already have been sufficient to provide them with a retirement income adequate for a stable lifestyle in terms of consumption.

The debate about expanding the CPP or creating new provincial plans such as the ORPP has paid little attention to the implications of the life-cycle framework, even though it is a widely accepted framework for analyzing savings behaviour. By not fully accounting for the possible crowding out of other voluntary savings, we run the risk of overestimating the amount of total savings—and thus the benefits—to come from expanded government pensions. As a result, there has not been a complete examination of the likely benefits and drawbacks of an expanded CPP or new provincial pension plan.

Literature review on the effect of public pensions on private savings

The seminal work of Feldstein (1974) sparked numerous studies on the impact of public pensions on private saving. Feldstein derives an empirical strategy from the life-cycle theory in order to examine how the projected benefits of Social Security for individuals in the United States would alter their present consumption behaviour and consequently their savings. The author explains that the use of Social Security wealth (SSW) in present value terms as an explanatory variable captures both the "asset-substitution" and "inducement-to-retirement" effects. According to the theory, the asset-substitution effect would reduce private savings in response to an increase in SSW. This stands in contrast to the inducement-to-retirement effect, which would increase savings as a result of shorter working years. Feldstein's results show a significant negative effect of SSW substitution on savings, i.e. the dominance of the first effect over the second.

Following Feldstein, other researchers have used aggregate time series data from national economic accounts to explore the relationship between Social Security and private savings over time. Page (1998) offers a comprehensive review of this line of research. His main conclusion is that the findings are highly sensitive to the choice of Social Security wealth definition and the period of time under scrutiny. For instance, Lesnoy and Leimer (1982) show that the application of alternative methods for calculating Social Security benefits can result in positive or negative effects of Social Security on savings.[12] The authors insist that how individuals form their expectations of future Social Security benefits, and whether they adapt them to variations in the ratio of benefits to disposable income across time, make it necessary to test for different definitions of SSW. In addition to the SSW variable from Feldstein (1974), who assumed a constant ratio of benefits to disposable income for each period, Lesnoy and Leimer (1982) used four other definitions based on

12. Leimer and Lesnoy (1982) question the findings of Feldstein (1974) and subsequent time series studies that used the same method of calculation for Social Security wealth. See Feldstein (1982, 1996) for a reply.

whether the individuals use a current benefit ratio, adapt this ratio to previous benefit ratios, use actuarial projections to anticipate future changes in the benefit ratio, or are perfectly able to forecast the variation of benefit ratios over time. For all the definitions, the authors do not find any statistically significant coefficients for SSW.

Page (1998) also reviews studies that examine pensions and private wealth across countries. The presence of various sources of heterogeneity among countries is the main shortcoming in this case. For instance, saving habits differ across countries and can influence the choice of public pension program, rather than the other way round (Page, 1998: 27).[13]

The third stream of literature reviewed in Page (1998) uses cross-sectional household survey data to estimate directly the effect of the US Social Security program on private saving (this is in contrast to the time series approach, which generally includes consumption as the independent variable). According to the author, the majority of estimates using the cross-section method find a substitution effect between zero and 50 percent of private saving for each dollar increase in Social Security wealth. The sample size, the measure of Social Security wealth, and the discount rate are among the main sources of variation in those estimates. However, the difference in earnings, age, and marital status represent a methodological challenge in cross-section analysis, since these factors can influence both Social Security wealth and private wealth. Page (1998) also warns against the potential bias stemming from the wrong specification of the relationship between wealth and income—in particular, with respect to the linear treatment of income. For instance, precautionary saving can result in a nonlinear relationship between wealth and income. (For more on precautionary saving in Canada, see Alan, 2006). Furthermore, Gale (1998) finds additional sources of bias arising from the exclusion of employer pension contributions and narrow measures of non-pension wealth.

More recently, Attanasio and Brugiavini (2003) proposed a new method for examining the effect of public pensions on saving. Focusing on a major pension reform in Italy in 1992 (the "Amato reform"), the authors apply a difference-in-difference estimator to measure the impact of future pension benefits from the reform on the savings rate of Italian households classified by age and occupation groups. For this purpose, both cross-section and time series microdata are combined for two periods before and after the reform.

13. See Samwick (2000) for a cross-country examination of the impact of funded and unfunded Social Security systems on national saving. For basic evidence on the relationship between government pension benefits and non-governmental sources of retirement income, see Biggs (2014) which suggests that, "on average, for every additional dollar of income that retirees receive from the government, they generate 93 cents less retirement income on their own."

The choice of *savings rate* instead of consumption or the level of saving is another distinctive feature of this study. In addition, group and year dummies are included in the regressions.

The findings indicate a significant substitution between public pensions and private saving for all age groups, especially for the middle age group. The substitution effect is generally even higher and closer to one if future earnings are part of the control variables. On the other hand, a lower effect is reported for younger and older groups. This variation across age groups provides further evidence that the effect of public and private wealth is not homogeneous and affects the saving behaviour of individuals from different age and occupation groups in different ways. In addition, using the Survey of Household Income and Wealth in Italy between 1989 and 2002, Bottazzi et al. (2006) estimate a substitution effect of 29 percent after computing households' expectation of their retirement age and replacement rate. The substitution effect increases to 38 percent for informed individuals—those with the right forecast of the replacement rate after the pension reform—relative to uninformed individuals, for whom the substitution effect is approximately 24 percent.

Attanasio and Rohwedder (2003) apply a similar methodology to that used in Attanasio and Brugiavini (2003) to pension reforms in the United Kingdom. They examine the impact of two sets of reforms on private saving. First is the indexation of the Basic State Pension (BSP) to prices in 1980, which entitles retirees to a flat rate benefits. The second reform is the implementation in 1978 of a pension plan based on earnings: the State Earnings-Related Pension Scheme (SERPS). The regression results related to the estimation of the effect of pension wealth on saving rates by age groups show that the offset between SERPS and private saving increases with age, reaching a peak of 75 percent for 54–64 year olds. However, no statistically significant effect was found for the BSP, except for a small effect for the youngest group. The authors evoke liquidity constraint to explain this difference in the estimates between SERPS and BSP, since this constraint can reduce the substitution between public and private wealth.[14]

Thus, in accordance with the prediction of the life-cycle theory and past results from research using time-series data (e.g., Feldstein, 1974) and cross-sectional data (e.g., Bernheim, 1987), studies examining the impact of reforms observe a substitution effect between public and private wealth when there are controls for age and employment groups.

Most recently, Chetty et al. (2013) examine the saving behaviour and retirement policies in Denmark. The authors suggest that the individual response to public incentives for retirement depend on whether they are active or passive savers. Considering two components of the Danish

14. Van der Klaauw and Wolpin (2008) offer an examination of the relationship between Social Security and saving for low-income families.

retirement system—the automatic contributions and the tax subsidies—the authors argue that active savers, who are sensitive to the parameters of retirement policies, are more likely to substitute between public pensions and private assets, particularly in cases of automatic contributions. This suggests that retirement policies would target passive savers instead of active ones in order to maximize the increase in saving. With regards to the CPP, its design, with contribution rates linked to earnings, makes no attempt to explicitly target households based on their savings behaviour.

Table 2 summarizes the literature on social security and private savings by author and year, data, dependent variable, methodology, and results.[15]

In light of the most recent research on the effect of public pensions on private saving, the authors of the present study chose to measure this effect in Canada using regression analysis to exploit variation in the CPP contribution rate driven by program reforms over time. The latest major reform to the CPP, in 1997, offers an opportunity to examine whether Canadian households substitute between public and private savings. In the next section, we develop our empirical strategy, which incorporates the most important features of past studies reviewed above.

15. Additional studies not included in the table that have examined the crowd out effect of compulsory government savings include Hong (2012) and Karunarathne and Abeysinghe (2005). A key reason for omitting these studies is that they focus on economies fairly different from that of Canada. For instance, Hong (2012) estimates the effect of social security on private saving in Korea and quantifies the impacts on saving behaviour using the life-cycle model. The author uses household survey data from 2000 to 2002 to capture the effect to the 1999 pension reform. The study concludes that social security pensions reduce private assets by 5.2 to 9.9 percent for different age groups, with the effect being larger on older cohorts. He also estimates the "substitution effect" and the "inducement effect" set out by Feldstein (1974). The results show that overall the substitution effect accounts for the most of the change in assets holding, while the inducement effect is very small. Karunarathne and Abeysinghe (2005) examine the aggregate substitution effect in Sri Lanka and find that an increase of 1 percentage point in the mandatory savings rate will lead to a 2.73 percentage point decrease in the private savings as share of total GDP in the short run and a 1.73 percentage point decrease in the long run.

Table 2

Summary of past findings on social security and private saving

Author(s) (year)	Data	Dependent variable	Methodology
Feldstein (1974)	US macro time-series for: i) 1929-1971 (with the exception of 1941-1946); ii) 1947-1971	Consumer expenditure	Ordinary Least Squares. Two measures of social security: Gross social security wealth (SSWG) and net social security wealth (SSWN). Other explanatory variables include disposable income, retained earnings, and household wealth.
Results: Marginal propensity to consume SSWG and SSWN ranges from 0.021 to 0.075. Since SSW captures both asset-substitution and retirement effects, the results suggest that the former effect dominates the latter. In 1971, Social Security reduced personal saving by 30 to 50 percent ($44 to $63 billion dollars) depending on the specification of SSW variable.			
Leimer & Lesnoy (1982)	US macro time-series for: i) 1930-1974; ii) 1947-1974; iii) 1931-1974	Consumer expenditure	Replicates Feldstein (1974) methodology after correcting for computation errors and the number of Social Security beneficiaries.
Results: No statistically significant effect of the SSW on savings. SSW associated coefficients may be positive or negative. They are highly sensitive to the choice of time period.			
Page (1998)	Review of studies using the following approaches: i) time series (macro data); ii) cross-sections (micro data) and iii) cross-country (macro data)	i) Consumer expenditure; ii) Private saving; iii) National saving or consumption	Different empirical strategies are used in each approach. A SSW variable is computed and included in most regression equations. This variable consists of SS benefits net of paid taxes over a retirement period. Some studies also include the survival probability of the SS recipient for this period.
Results: i) SSW reduces private wealth between zero to 50 percent. Significant variations from one study to another in this range. Variations in the estimations stem from the sample size, the measure of the SSW and the discount rate; ii) Results from the time series approach are inconclusive and highly sensitive to the specification of SSW and time period; iii) Most cross-country studies find no effect of SSW on savings. Positive and negative coefficients of SSW can also be found in some research, depending on the regression specification and data.			
Attanasio & Brugiavini (2003)	Micro data: The Survey of Household Income and Wealth. Sample of households for two periods before (1989, 1991) and after (1993, 1995) the Amato pension reform in Italy in 1992	Saving rate (income minus consumption divided by income)	Difference-in-difference estimator. Regression equations control for age and occupation. Other controls include family composition and education.
Results: For an average individual, 10 percent increase in the ratio of pension wealth to current income reduces the saving rate by 50 percent. This substitution effect is the highest for the 35-45 age group. Lower substitution of private and pension wealth for younger and older age groups.			
Bottazzi et al. (2006)	Micro data: The Survey of Household Income and Wealth, From 1989 to 2002 (Before and after the Amato reform)	Private wealth relative to disposable income	Ordinary Least Squares and difference-in-difference estimator. Divide the sample in terms of the expectation error, which is defined as the difference between the expected and the statutory replacement rate (after the reform). Control variables include dummy variables for time, employment, middle-aged individuals, interaction of employment with middle-age and time, education and regions. Regressions also control for age and income.
Results: A substitution effect of 29 percent between the pension wealth and private wealth. If they are part of the informed group, i.e. those with an expectation error of lower than one, this effect increases to 38 percent. For uninformed individuals, whose expectation error is higher than one, the substitution effect drops to 24 percent.			

Table 2 continues on page 15

Table 2, continued

Summary of past findings on social security and private saving

Author(s) (year)	Data	Dependent variable	Methodology
Attanasio & Rohwedder (2003)	i) Basic State Pension (BSP): Flat rate pension scheme; ii) State Earnings-Related Pension Scheme (SERPS): Earnings-related pension scheme, from 1975 to 1981	Saving rate	Instrumental Variable Approach (interaction of group and year dummies are used as instruments for pension wealth). The coefficients for SSW estimated for different age groups.
Results: Significant substitution effect for SERPS: This effect increases with age. The substitution is 65 percent for 43-53 year olds and 75 percent for 54-64 year olds. No substitution effect was found for BSP.			
Chetty et al. (2013)	41 million observations from the Danish income tax records for 1995–2009	Total and net saving rates	Regression Discontinuity Design (by earnings levels). Differentiates between active savers and passive savers. Active savers are sensitive to change in retirement regime, in contrast to passive savers who are insensitive to such change.
Results: The study estimates that 85 percent of Danish tax filers are passive savers and associates an insignificant offset in private savings with automatic pension contributions.			

Empirical analysis: Data and model

We use microdata files produced by Statistics Canada from both the Survey of Family Expenditures (for earlier years) and the Survey of Household Spending (for later years).[16] Specifically, we use three surveys before the implementation of the sharp increase in the CPP rate starting in 1997 (that is, surveys from 1986, 1992, and 1996) and three surveys after the rate increase ended in 2003 (2004, 2006, and 2008). In a separate round of estimations, using a different measure for the change in CPP, we add two surveys from 2000 and 2002.

We use OLS estimates with White robust errors. The model we use is adapted from the literature, taking into account the availability of Canadian data (that is, the non-availability of panel data tracking households over time) and the information found in the dataset (possible measures of savings and household characteristics).

The dependent variable is the private savings rate of households, defined as the difference between disposable income (income after personal taxes) and consumption, which is then divided by disposable income and multiplied by 100. Savings include various items such as bank/credit union deposits, mutual funds, and money in registered pension plans (RRSPs and RPPs). To be clear, savings here is the amount a household puts aside each year, not its stock of accumulated savings from prior years. It therefore does not include capital accumulation included in mortgage payments.

The independent variables are:

Age: We expect the private savings rate to generally increase with age (up to retirement).[17] The age variable is a set of eleven dichotomous variables: those older than 74 are excluded from the sample. The most common age is in the interval of 40 to 44.

16. The Survey of Family Expenditures was replaced by the Survey of Household Spending as of 1997.

17. The age is the age of the household reference person. Respondents are informed that the household reference person is the member of the household mainly responsible for its financial maintenance; see <http://www.statcan.gc.ca/pub/62f0026m/2014001/part-partie1-eng.htm#h2_4>. This also applies to the education variable.

Marital status: We expect higher private saving for multi-adult households compared to single adult households given the economies of scale in consumption associated with two adults sharing one household. Thus we group together married and common-law couples (0), and we group together widowed, divorced, and never married people (1), to create a dichotomous variable with an expected negative sign.

Household mortgage: Home ownership is a form of wealth with mortgage payments including a savings component. Thus we divide households into three groups: owners without a mortgage, owners with a mortgage, and tenants. We expect cash savings to be higher for tenants than owners; but we are unsure of the effect on home owners' savings of holding a mortgage, as it indicates less wealth than for mortgage free homes but may create cash flow constraints.

Number of children: A higher number of children in the household is expected to increase spending and reduce private saving.[18] This variable takes the value 0 for no children, 1 for one child, and 2 for two or more children, and is treated as a continuous variable in regression analysis.[19]

Rural versus urban household: This is a dichotomous variable: 0 for urban and 1 for rural. It is not obvious how this influences savings; rural households in general face lower housing costs but may need more savings to finance access to urban based education facilities. However, they may need less savings for retirement if they remain in their rural environment.

Province: We create five dummies: Quebec, Ontario, Manitoba/Saskatchewan, Alberta, and British Columbia (the Atlantic region is the reference category in the regressions). There is no specific expectation as to where saving would be higher or lower.

18. For more discussion on the effect of children on retirement saving, see Biggs and Schieber (2015: 8–9).

19. Statistics Canada's Survey of Family Expenditures (our primary data source for 1986, 1992, and 1996) reports the number of children in each household under 15 years old. The Survey of Household Spending (the data source in all later years) includes two relevant variables: one counting the number of children four years old and younger and another counting those from 5 to 17 years old. Therefore, in all years following 1996 our measure of the number of children includes individuals up to (and including) 17 years old, while 16 and 17 year olds are not included as children in early years.

Disposable income: This is income after personal income taxes. We express household income in 2008 dollars and take the natural logarithm.[20] We expect the private savings rate to increase with income.

Education: We divide households into four groups: no diploma, high school diploma, college or some post high school education, and bachelor degree or higher. A household's level of education attainment is determined by the survey's reference person. More educated households are likely to save more than less educated households.[21]

Table 3 presents some characteristics of the sample data based on both the six and eight survey years.

We take two approaches to measuring the effects of the rapid change in the CPP rate. The first is to treat contribution rate changes and reforms between 1996 and 2004 as a single shock to Canadian households. The life-cycle model predicts that the shift in public pensions and current disposable income should lead households to re-evaluate their retirement savings decisions and save less privately. Statistical analysis of the effect of this "CPP shock" is based on data from 26,677 unique households over three years prior to the shock (1986, 1992, and 1996) and 31,538 households over three years following (2004, 2006, and 2008).

The second approach is to include the statutory CPP contribution rate (employee portion only) as an explanatory variable in our empirical model of private savings. Analysis using this measure relies on data covering 82,405 households from eight survey years. In this approach, we also include an interest rate variable given by the Canada Savings Bond rate. We chose this rate as it is a relatively low risk investment option widely available to households. Its impact on savings can be either positive (price effect) or negative (income effect). Households may save more when they earn higher interest payments for a given amount of savings, but may be unaffected if they already have enough income from savings before an increase in the interest rate. The effect also depends on whether the household is a saver or borrower. In our empirical analysis, we use a one year lag of the real interest rate (adjusted for inflation using the Consumer Price Index) as an explanatory variable. We opt for a lagged measure since the current interest rate may be determined, at least in part, by the current level of household savings. The direction of causality between a prior year's interest rate and current private saving is clearer and less likely to bias the regression analysis.

20. We use Statistics Canada's *Table 326-0021: Consumer Price Index* to adjust the data for inflation.

21. This information is not found in the 2000 and 2002 surveys, thus the education variable is not used in the estimations with the rate variable, which include data from eight survey years.

Table 3

Socio-demographic characteristics of households in the sample based on six and eight survey years, Canada, 1986–2008

	Based on six survey years	Based on eight survey years
Share of sample %		
<25	4.8	5.0
25-29	8.9	8.7
30-34	10.8	10.7
35-39	12.1	12.1
40-44	12.1	12.4
45-49	11.4	11.7
50-54	10.1	10.3
55-59	9.0	9.0
60-64	7.8	7.5
65-69	7.0	6.8
70-74	6.0	6.1
Owners without mortgage	30.0	30.4
Owners with mortgage	37.0	36.8
Tenants	33.1	32.8
Single	36.0	36.1
Couple	64.0	64.0
Rural	15.6	18.3
Urban	84.4	81.7
No diploma	18.3	N/A
High school diploma	40.0	N/A
College and part post high school	25.0	N/A
Bachelor degree and higher	16.7	N/A
Average		
Average number of children	0.6	0.6
Average disposable income (2008 dollars)	52,376	51,744

Notes: The six survey years are for 1986, 1992, 1996, 2004, 2006, and 2008. The eight survey years are for 1986, 1992, 1996, 2000, 2002, 2004, 2006, and 2008. The education variable is not available in the 2000 and 2002 surveys.

Average income in the above summary statistics is the actual average (in 2008 dollars) whereas the regression uses the natural logarithm of household income.

Source: Authors' calculations based on microdata files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

Table 4 displays, for eight survey years, the average private savings rate for households in three income groups with each made up of one third of the households ordered by disposable income (i.e., lowest, middle, and highest income groups). It also shows the average savings rate for all households each year. **Figure 3** presents the average private savings rate for all households for select years from 1986 to 2008.

Table 5 displays the CPP contribution rate (employee portion only) and the one-year lagged real Canada Savings Bond interest rate for the eight survey years in our sample. The CPP employee contribution rate almost triples in value from 1.80 percent (in 1986) to 4.95 percent (in 2004). While there is fluctuation in the Canada Savings Bond rate over the period, the one-year lagged real rate falls from a peak of 4.55 percent in 1992 to -0.35 percent in 2004.

Table 4

Private savings rate by income group based on eight survey years, Canada, 1986–2008

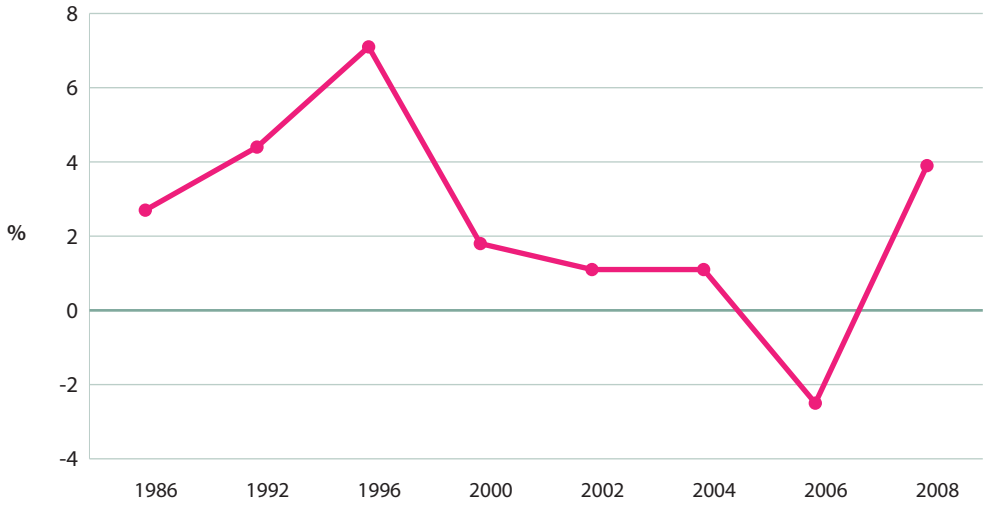
	1986	1992	1996	2000	2002	2004	2006	2008
Less than $34,140	-12.2%	-11.1%	-10.5%	-14.1%	-16.7%	-18.4%	-27.9%	-15.5%
Between $34,140 and $59,920	4.7%	6.9%	10.0%	5.1%	4.1%	5.1%	0.8%	5.1%
More than $59,920	16.0%	18.5%	21.5%	17.3%	16.8%	16.8%	16.9%	18.0%
All households	2.7%	4.4%	7.1%	1.8%	1.1%	1.1%	-2.5%	3.9%

Note: Each income group is made up of one third of the households ordered by disposable income in 2008 dollars.

Source: Authors' calculations based on microdata files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

Figure 3

Average private savings rate for all households based on eight survey years, Canada, 1986–2008



Source: Authors' calculations based on micro data files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

Table 5

CPP contribution rate (employee portion only) and one-year lagged Canada Savings Bond rate, 1986–2008

	1986	1992	1996	2000	2002	2004	2006	2008
CPP rate (employee portion only)	1.80%	2.36%	2.93%	3.90%	4.70%	4.95%	4.95%	4.95%
Nominal Canada Savings Bond rate (1 year prior)	8.50%	7.50%	5.25%	4.40%	1.80%	1.75%	2.00%	3.25%
Real Canada Savings Bond rate (1 year prior)	3.62%	4.55%	1.52%	2.16%	-0.25%	-0.35%	1.04%	-0.33%

Sources: CSB rate from http://www.csb.gc.ca/wp-content/uploads/2012/03/historical_rates_csb_cpb.pdf; Statistcs Canada, 2015; authors' calculations.

In all specifications, the dependent variable (the private savings rate, which is expressed in percent) is corrected for extreme values by removing observations with positive values above 60 percent and negative values below -300 percent. We also remove households with disposable income above $200,000 (these households represent less than one percent of the sample).

To estimate the drop in the private savings rate associated with the CPP shock, we specify five dichotomous variables indicating whether a household is observed in 1986, 1992, 2004, 2006, or 2008 (1996 is used as the reference year). In a regression of the private savings rate on the year indicators and controls listed above, the coefficient on the 2004 indicator is the difference in the household savings rate between 1996 and 2004 that demographic variables cannot explain.

It is also useful to directly relate changes in the CPP contribution rate to private savings. To this end, we regress a household's private savings rate on demographic controls, the one-year lagged real interest rate, and the statutory CPP contribution rate (employee portion only). Our sample contains eight years of survey data. We do not observe CPP reform in many different macroeconomic environments, making it impractical to adjust results for the broader state of Canada's economy. Nevertheless, our results control for determinants of the household private savings rate that have evolved alongside the CPP.

Econometric results

Table 6 presents estimates of the CPP shock effect (using a full set of year indicators) and the CPP rate effect (using the statutory CPP employee contribution rate) for *all households*. There are two models with two different sets of results.[22]

In some cases, the control variables have the expected impact: for example, older and tenanted households save more. In the case of education, however, more educated households save less. This might be because they have greater access to employer-provided pension plans. Meanwhile, as expected, households with children or a mortgage save less. Both specifications find a similar relationship between income and the private savings rate, suggesting a one percent increase in household income leads to an average increase between 0.3256 and 0.3579 percentage points in the private savings rate. The one-year lagged real interest rate (that is, the rate of return from low risk investments in the previous year) has a statistically insignificant relationship with the private savings rate.

In both models, the CPP variable is associated with a reduced private savings rate. Our estimate of the CPP's shock effect is a 6.71 percentage point drop in the average household's private savings rate between 1996 and 2004, holding their demographic characteristics constant (given by *model 1* in table 6). This represents a substantial drop in the household savings rate from the 1996 average of 7.1 percent of income. Moreover, in *model 2*, we estimate that a one percentage point increase in the employee portion of the total CPP contribution rate reduces the private savings rate by 1.79 percentage points.[23]

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22. We do not include the interest variable in models with a full set of year indicators, since interest rates only change over time. One can always identify the interest rate a household faces based on the year in which they were observed. All of the information carried in the interest rate is captured by year indicators; both cannot be included in the same regression.

23. If we omit data from 2006, the year when the average private savings rate dropped below zero (see table 4), and re-estimate *model 2*, this results in a coefficient on the CPP rate variable of -1.14 with a standard error of 0.198 and R-squared of 0.214. This indicates that our results do not hinge on data from 2006.

Table 6

Determinants of private savings rate, all Canadian households, 1986–2008: OLS estimates

Dependent variable = private savings as a percent of income

	Model 1: CPP shock		Model 2: CPP rate	
Year (1996, last year before shock, omitted)				
1986	-4.73***	(0.46)		
1992	-3.04***	(0.46)		
CPP shock (2004)	**-6.71*** **	**(0.47)**		
2006	-11.96***	(0.51)		
2008	-7.81***	(0.53)		
CPP rate			**-1.79*** **	**(0.20)**
Real interest rate (1 year lag)			0.11	(0.12)
Log income	35.79***	(0.47)	32.56***	(0.37)
Age (<25 years old omitted)				
25-29	8.07***	(1.01)	8.99***	(0.87)
30-34	10.80***	(0.98)	12.04***	(0.84)
35-39	10.94***	(0.98)	12.35***	(0.84)
40-44	8.79***	(0.98)	11.04***	(0.84)
45-49	7.80***	(0.99)	10.38***	(0.84)
50-54	10.29***	(1.01)	12.73***	(0.86)
55-59	10.80***	(1.05)	13.21***	(0.89)
60-64	12.78***	(1.08)	14.88***	(0.93)
65-69	14.75***	(1.11)	16.97***	(0.95)
70-74	20.36***	(1.12)	23.17***	(0.95)
Mortgage (owners without mortgage omitted)				
Owners with mortgage	-6.33***	(0.39)	-6.34***	(0.32)
Tenants	4.40***	(0.49)	4.81***	(0.41)
Marital status (couple omitted)				
Single	8.23***	(0.41)	7.01***	(0.34)
Number of children	-3.59***	(0.21)	-3.39***	(0.17)
Urban/rural (urban omitted)				
Rural	2.00***	(0.44)	2.93***	(0.34)
Provinces (Atlantic omitted)				
QC	-2.45***	(0.43)	-2.05***	(0.36)
ON	-7.66***	(0.45)	-7.75***	(0.39)
MB and SK	-2.19***	(0.46)	-1.43***	(0.38)
AB	-8.79***	(0.57)	-8.74***	(0.48)
BC	-9.61***	(0.56)	-9.18***	(0.46)
Education (no diploma omitted)				
High school diploma	-5.54***	(0.47)		
College and part post high school	-8.48***	(0.54)		
Bachelor degree and higher	-10.70***	(0.61)		
Constant	-373.81***	(5.19)	-346.77***	(4.19)
Number of observations	58,215		82,405	
R-Square	0.236		0.222	

Notes: The CPP contribution rate variable used here is equal only to the employee portion. Including the employer portion would double the contribution rate value and therefore halve the coefficient and standard error estimates for that variable.

White standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Model 1 is based on data using six survey years; Model 2 is based on data using eight survey years.

Source: Authors' calculations based on microdata files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

Since the CPP reform included a 2.15 percentage point increase in the statutory employee portion of the contribution rate, the CPP rate model associates up to a 3.85 percentage point drop in the private savings rate with the reform (2.15 multiplied by 1.79). This effect is notably smaller than our direct estimate of the CPP shock effect of 6.71 percentage points. The latter attributes the entire 1996-to-2004 drop in the savings rate, which is not explained by controls, to the CPP reform. In practice, this effect likely captures the influence of other things such as a falling real interest rate over this time (see table 5). For the two estimates shown in table 6, the CPP rate model is more conservative. Our key finding, however, that changes in the CPP were followed by a reduced private savings rate among households, is generally robust to reasonable changes in our econometric specification.

While the results under both the CPP shock and CPP rate models produce a range of effects, they are large. Some of this is likely explained by the fact that the program moved away from a pay-as-you-go model to partial funding, increasing the expectation Canadians had of actually receiving the government's promised CPP benefits. In fact, a 1996 report by the CPP Consultations Secretariat highlighted the concerns about the program before subsequent reforms were announced. For instance, the report stated: "Many Canadians, particularly the young, told the consultation panels that they fear the plan will not be around when they retire unless it is reformed now" (1996: 15). The report also noted results from a survey that found "only 29 percent of respondents between the ages of 18 and 29 believed that they will receive the CPP, and even among the 50 to 64 year-olds the number only rose to 47 percent" (1996: 15). This suggests that a future expansion of the CPP, all things equal, may have a more tempered effect on the private savings rate of households, since the program is now on a more sound footing.

Interpreting the results of the CPP rate model

Our econometric model associates changes in private savings over time with the employee portion of the CPP contribution rate. However, a rational household would adjust its savings not only in response to changes in employee contributions, but also contributions made by their employer. After all, the total of both, in principle, equals the total compulsory savings going to the CPP. Each dollar an employee contributes to the CPP reduces their budget for current consumption by a dollar and increases contributions to the CPP on their behalf by two dollars (since their contributions are matched by their employer). From this perspective, every percentage point increase in our CPP rate variable actually results in a two percentage point increase in the total CPP contribution rate. A percentage point increase in the total CPP contribution rate should then be associated with half of the coefficient estimate from our rate model. For example, *model 2* in table 6 associates a 0.895 percentage point decrease in the household's private savings rate with a one percentage point increase in the total CPP contribution rate (1.79 divided by two).

Variation in saving response by age and income group

As explained in Lammam et al. (2013) and our literature review, a CPP increase will likely affect Canadians at different stages of the life-cycle differently (figure 2). Younger cohorts (under age 30) will generally save less voluntarily than their older counterparts (aged 50–64), largely independent of public policy considerations. These differences may be accentuated by the actuarial improvements made to the CPP as part of the 1997 reforms. A household that was only a few years from being eligible to collect CPP benefits at the time might have seen this payout as far more certain than one which would have needed the program to remain solvent for decades. Improving the CPP's long term outlook increased its value, especially for the young. Younger households saw a jump in expected pension wealth well above their CPP contributions, and are expected to have offset private savings more than they would have given an isolated rate increase.

To capture variation in the CPP's effect across the age distribution, we have repeated our analysis using subsets of our sample containing young, mid-career, and older households. **Table 7** presents coefficient estimates of the CPP rate model by age group. This model is used because it produces our most conservative estimate of the effect of the CPP reform. The analysis is for the following three age groups: younger than 30, 30–49, and 50–64. The 50–64 age group is defined using the "standard" retirement age in Canada over the period, as determined by the current age of eligibility for Old Age Security benefits. In general, this group can be seen as including individuals that are too close to retirement to significantly adapt to changes in CPP rates.

Table 7 shows that the CPP rate's relationship with the private savings rate varies significantly across age groups, with the effect being larger for younger cohorts. Indeed, our estimate is largest among the youngest age group (a 2.15 percentage point drop in the savings rate per point increase in the employee contribution rate), and closer to the average effect shown in column 3 of table 6 for the 30–49 group. These results are not surprising, since we would expect the CPP shock to have had a larger effect on younger households—older workers wouldn't react to the same degree because they would expect to receive their full benefits anyway. The negative (yet very imprecisely estimated) interest rate effect on the youngest households may be driven by a large number of borrowers in this group. Focusing on the 50–64 group reveals that this model associates a relatively small response to the CPP contribution rate with these households.

Table 7

Determinants of private savings rate, three age groups of Canadian households, based on eight survey years, 1986–2008: OLS estimates (CPP rate model)

Dependent variable = private savings as a percent of income

	< 30		30–49		50–64	
CPP rate	**-2.15*** **	**(0.60)**	**-1.61*** **	**(0.26)**	**-0.85** **	**(0.40)**
Real interest rate (1 year lag)	-0.21	(0.39)	0.12	(0.16)	0.59**	(0.24)
Log income	37.38***	(1.06)	31.66***	(0.55)	32.48***	(0.64)
Mortgage (owners without mortgage omitted)						
Owners with mortgage	-3.22	(2.16)	-6.18***	(0.46)	-7.64***	(0.53)
Tenants	4.34*	(2.22)	3.84***	(0.61)	8.25***	(0.79)
Marital status (couple omitted)						
Single	4.86***	(0.90)	5.54***	(0.49)	8.38***	(0.67)
Number of children	1.32***	(0.48)	-3.80***	(0.20)	-7.00***	(0.53)
Urban/rural (urban omitted)						
Rural	5.01***	(1.13)	1.26***	(0.48)	2.81***	(0.65)
Provinces (Atlantic omitted)						
QC	-0.35	(1.20)	-1.18**	(0.48)	-2.96***	(0.73)
ON	-6.45***	(1.25)	-7.52***	(0.52)	-8.14***	(0.79)
MB and SK	-2.02*	(1.22)	-0.87*	(0.50)	-2.05***	(0.75)
AB	-11.40***	(1.34)	-8.47***	(0.65)	-7.61***	(0.96)
BC	-6.04***	(1.36)	-9.54***	(0.63)	-9.89***	(0.90)
Constant	-392.28***	(12.10)	-325.23***	(6.07)	-336.68***	(7.14)
Number of observations	11,179		38,486		22,160	
R-Square	0.259		0.210		0.228	

Notes: The CPP contribution rate variable used here is equal only to the employee portion. Including the employer portion would double the contribution rate value and therefore halve the coefficient and standard error estimates for that variable.
White standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on microdata files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

Table 8 presents the OLS results by income group, again using the CPP rate model. The reason for the income regrouping is that we expect CPP increases to have different effects on Canadians with different income levels (Lammam et al., 2013). We thus break down households into three income groups (each made up of one third of the households in the full eight year sample): those with a disposable income below $34,140, between $34,140 and $59,920, and above $59,920 (all in 2008 dollars).

Examining the regression results for the three income groups in table 8, we find that the CPP rate increases are associated with the largest drops in the private savings rate for households in the lowest income group. Specifically, a percentage point increase in the CPP employee contribution rate coincides with a 3.11 percentage point reduction in the private savings rate for households in the lowest income group and a 1.44 percentage point

Table 8

Determinants of private savings rate, three income groups of Canadian households, based on eight survey years, 1986–2008: OLS estimates (CPP rate model)

Dependent variable = private savings as a percent of income

	Lowest income group		Middle income group		Highest income group	
CPP rate	**-3.11*** **	**(0.46)**	**-1.44*** **	**(0.30)**	**-0.07**	**(0.25)**
Real interest rate (1 year lag)	0.39	(0.29)	0.00	(0.18)	0.16	(0.15)
Age (<25 years old omitted)						
25-29	13.60***	(1.58)	6.70***	(1.09)	6.86***	(1.41)
30-34	18.11***	(1.56)	9.55***	(1.07)	7.84***	(1.38)
35-39	18.55***	(1.58)	9.93***	(1.08)	8.08***	(1.38)
40-44	18.85***	(1.58)	7.91***	(1.10)	7.30***	(1.37)
45-49	20.07***	(1.62)	6.66***	(1.12)	6.12***	(1.36)
50-54	21.64***	(1.65)	8.27***	(1.15)	7.65***	(1.37)
55-59	20.02***	(1.65)	8.05***	(1.20)	7.87***	(1.40)
60-64	21.22***	(1.60)	8.05***	(1.23)	8.30***	(1.47)
65-69	27.95***	(1.54)	8.39***	(1.26)	5.86***	(1.64)
70-74	35.50***	(1.49)	11.59***	(1.31)	6.73***	(1.75)
Mortgage (owners without mortgage omitted)						
Owners with mortgage	-8.29***	(1.12)	-7.78***	(0.52)	-6.78***	(0.37)
Tenants	5.87***	(0.83)	-2.14***	(0.57)	-5.29***	(0.57)
Marital status (couple omitted)						
Single	4.84***	(0.67)	2.38***	(0.44)	-1.84***	(0.51)
Number of children	-1.11**	(0.51)	-4.66***	(0.28)	-3.72***	(0.22)
Urban/rural (urban omitted)						
Rural	4.17***	(0.78)	1.16**	(0.48)	-1.43***	(0.46)
Provinces (Atlantic omitted)						
QC	-2.22***	(0.80)	-0.21	(0.54)	-1.72***	(0.48)
ON	-9.79***	(1.02)	-4.25***	(0.60)	-2.47***	(0.45)
MB and SK	-2.85***	(0.87)	0.24	(0.54)	0.40	(0.46)
AB	-10.75***	(1.31)	-5.47***	(0.75)	-3.45***	(0.54)
BC	-11.89***	(1.14)	-6.19***	(0.70)	-4.26***	(0.54)
Constant	-26.47***	(2.63)	10.17***	(1.72)	20.01***	(1.75)
Number of observations	27,503		27,441		27,461	
R-Square	0.053		0.048		0.044	

Notes: The CPP contribution rate variable used here is equal only to the employee portion. Including the employer portion would double the contribution rate value and therefore halve the coefficient and standard error estimates for that variable.

White standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Lowest income group = less than $34,140; Middle income group = between $34,140 and $59,920; Highest income group = more than $59,920. Each income group is made up of one third of the households ordered by disposable income. All incomes are in 2008 dollars.

Source: Authors' calculations based on microdata files from Statistics Canada's Survey of Family Expenditures (1986, 1992, and 1996) and Survey of Household Spending (2000, 2002, 2004, 2006, and 2008).

decrease for middle income households. Our estimates indicate no statistically significant impact from a changing CPP rate on the private savings rate of higher income households.

The differential effect on the private savings rate by income group is consistent with our expectations. Recall that CPP contributions are calculated on annual earnings up to a maximum amount, after which individuals no longer contribute (this is referred to as the maximum annual pensionable earnings—see table 1). This maximum increases each year as it is linked to the nominal increase in industrial earnings in Canada.[24] Lammam et al (2013: 13) argue that individuals earning between $10,000 and $50,000 are most likely to experience the substitution effect in the context of CPP versus RRSP substitution. Canadians in this income range are within the upper bound of the maximum annual pensionable earnings amount for CPP contributions. In addition, the disincentive to save privately for retirement when compulsory savings increase will be stronger for lower income individuals, since government programs such as Old Age Security and the Guaranteed Income Supplement will generally provide sufficient income replacement rates. In our analysis, households in our highest income group will tend to have earnings beyond the maximum. As a result, CPP contributions will tend to constitute a smaller share of current income for higher income households than those with lower income. This will bring about a weaker response from private savings to changes in CPP contributions for higher income households, similar to the response expected for higher income individuals.

Overall, the regression results clearly show that past CPP increases (both the shock and the rate change) were followed by reductions in the private savings rate of Canadian households. However, the results (using the CPP rate model) vary depending on household age and income levels.

Estimating the rate of substitution between public and private savings

We estimate the substitution rate as the ratio of the reduction in private savings to the total increase in CPP contributions (in dollars). The private savings reduction is estimated using the regression results and the total CPP contribution increase is calculated based on the program's total contribution rate and earnings thresholds (shown in table 1).

24. Specifically, according to the 26th actuarial report on the Canadian Pension Plan (OSFI, 2013: 68), the maximum annual pensionable earnings amount "increases each year to the extent warranted by the percentage increase, as at 30 June of the preceding year, in the 12-month average of the average weekly earnings of the Industrial Aggregate (as published by Statistics Canada)."

As the calculations that follow make clear, the substitution rate will vary across households depending on their income and how it is split among the household's wage earners. Here we consider a household with income equal to the 1996 average, split evenly between two earners (adjusted for inflation to 2008 dollars).[25]

First, we calculate the total CPP contribution increase. From table 1, we know that in 1996 each wage earner contributed a total of 5.6 percent of earnings above $3,500 and below $35,400 to the CPP in 1996 dollars. Transformed into 2008 dollars, this is 5.6 percent of earnings above $4,492 and below $45,435. In our sample, the 1996 average household income from wage and salaries was $45,620 (in 2008 dollars). Split evenly between two earners, this gives each $22,810, of which $18,318 is pensionable (above the minimum of $4,492). Therefore, each earner in this household would have contributed 5.6 percent of $18,318, or $1,026. Adding the contributions from both earners gives us this household's 1996 CPP contributions of $2,052 (in 2008 dollars).

In 2004, the total contribution rate increased to 9.9 percent of earnings, and the minimum pensionable earnings declined to $3,814 in 2008 dollars. Each earner would now have $18,910 in pensionable income and the household would pay a total of $3,761 in CPP contributions. This household's CPP contributions increased by $1,709 between 1996 and 2004—this is the denominator of the substitution rate.

Now we calculate the total private savings reduction in dollars. *Model 2* in table 6 associates a 1.79 percentage point decrease in the private savings rate with a one percentage point increase in the employee CPP contribution rate. Between 1996 and 2004, the employee contribution rate increased by 2.15 percentage points (from 2.8 percent to 4.95 percent of income). This implies a private savings rate reduction of 3.85 percentage points (2.15 multiplied by 1.79) of after tax income for each household. In our sample, the average 1996 household income from all sources was $50,835 after taxes (in 2008 dollars). A savings reduction of 3.85 percent of this income is $1,956 in forgone private savings—the numerator of the substitution rate.

Dividing the reduction in private savings of $1,956 by the increase in contributions of $1,710 gives a substitution rate of 1.14 dollars of private savings lost for every dollar contributed to the CPP.

If this household had the same income, but only a single earner, we estimate that they would forgo the same amount of private savings, but have a different substitution rate. In 1996 this household would contribute $2,293 to the CPP; more than with two earners because they get half the exemption from the minimum pensionable income. In 2004, their contributions would be $3,992—a $1,699 increase in contributions. This single earner household

25. Figures may not add up exactly due to rounding.

leads to a substitution rate of 1.15. Further analysis (**Appendix A**) finds that these results can be interpreted as roughly equivalent to dollar-for-dollar substitution rates given statistical margins of error, whereby a one dollar increase in CPP contributions is offset by approximately a dollar decrease in private savings.

Table 9 presents estimates of the rate of substitution between public and private savings by age and income groups. The incomes used to calculate the substitution rates in each group are shown in **Appendix B**. Substitution rates decrease with age. We associate an 88 cent drop in private savings with a dollar increase in CPP contributions for two earner households in the 30–49 age group, and a 60 cent drop for those aged 50–64. While these estimates vary in magnitude across age groups, they are all statistically indistinguishable from dollar-for-dollar substitutions (see Appendix A).

We find strong variation in estimated substitution rates across income groups. Large drops in private savings and small dollar values of CPP contributions imply very large substitution rates among low income households. Substitution rates are close to dollar-for-dollar among middle income households and negligible in the highest income group.

Table 9

Substitution rate estimates by age and income groups

	One earner household	Two earner household
All households		
Average	1.15	1.14
Age group		
<30	1.18	1.28
30–49	1.15	0.88
50–64	0.56	0.6
Income group		
Lowest	5.29	9.73
Middle	0.9	0.98
Highest	0.07	0.04

Note: Lowest income group = less than $34,140; Middle income group = between $34,140 and $59,920; Highest income group = more than $59,920. Each income group is made up of one third of the households ordered by disposable income. All income in 2008 dollars.

Source: Authors' calculations based on microdata files from Statistics Canada's 1996 Survey of Family Expenditures, and CPP parameters shown in table 1.

Conclusion

This paper examined the impact of previous increases to the CPP contribution rate on the private savings rate of Canadian households. To do this, we created a database merging 58,215 households based on six years of survey data and a database merging 82,405 households based on eight years of survey data. Controlling for various household characteristics such as age, income, and home ownership, we found that increases in the compulsory CPP contribution rate between 1996 and 2004 led to decreases in the private savings rate of Canadian households, particularly among young/mid-career and low/middle income households.

While our results provide evidence that increasing the CPP contribution rate decreased private savings, they must be interpreted cautiously. CPP changes between 1996 and 2004 did not occur in a vacuum; they coincided with many factors that may have affected the savings behaviour of households in unpredictable ways. Nonetheless, we have uncovered a negative relationship between historical CPP expansion and reduced private savings that cannot be explained solely by demographic shifts. This result is supported by past studies in such places as Italy and the United Kingdom, and should not be ignored. Further empirical work may be required to yield more precise estimates of the substitution effect and we welcome such contributions to the policy debate.

The implications from the analysis are relevant to the current debate about expanding the CPP and creating new compulsory provincial programs such as the Ontario Retirement Pension Plan. The benefits of these policy ideas in terms of retirement savings (and thus income) are being overstated, since Canadians will to some degree offset the increased compulsory savings resulting from these government programs with reduced private savings. The debate about expanding or creating new government pension plans should therefore account for the impact on private savings.

The consequences of CPP rate increases may come in the form of less RRSP savings (a key type of private savings for retirement). In this case, the costs would include a loss of flexibility as RRSPs allow Canadians to tailor their investment strategy to their preferences and circumstances. They also afford more choice compared to the CPP. With RRSPs, the assets accumulated

over time can be fully transferred to a beneficiary upon death, increasing their value to savers (the CPP only offers reduced benefits to survivors). For those who are young and interested in buying a house, RRSPs can help through the Home Buyers' Plan by allowing penalty and tax-free withdrawals up to $25,000. Similarly, for those who are middle-aged and looking to transition to a new field of work, the Lifelong Learning Plan allows them to withdraw RRSP savings up to $10,000 per year penalty and tax free. Finally, RRSP savings can be used if someone has a terminal illness or needs emergency funds, albeit with negative tax consequences.

These benefits are lost when Canadians are required to save more in CPP or new government pensions and then offset those increases with decreases in private savings. Other aspects of this trade-off, such as the benefits of the CPP (defined benefit in retirement) compared to the benefits of private savings such as RRSPs (flexibility and choice), also need to be assessed and discussed.

The key to providing retirement income through savings is a set of rules that allows for an optimal mix of savings for different people in different stages of life and with different preferences. The benefits to a compulsory expansion of the CPP or of similar provincial policies (i.e., the ORPP) need to be weighed against the costs, which as our analysis shows will include a reduction in voluntary private savings.

Appendix A

Testing the substitution rates

In this appendix we account for statistical uncertainty in the substitution rates shown in table 9. Since these substitution rates are calculated for representative households in each demographic group, estimates of the drop in savings associated with the CPP rate increase are the only source of statistical uncertainty. This uncertainty is measured by the standard errors on the CPP rate coefficients in tables 6, 7, and 8. We scale these standard errors by the same factors used to estimate substitution rates (see **Estimating the rate of substitution between public and private savings**) and calculate confidence intervals around these estimates.

Table 10 presents 95 percent confidence intervals around the substitution rate estimates shown in table 9. Confidence intervals that overlap one—a dollar-for-dollar substitution between public and private savings—are bolded. Ten of the fourteen substitution rates calculated can be interpreted as equivalent to dollar-for-dollar substitutions given statistical margins of error. The exceptions are in the lowest income group, where estimates are large and confidence intervals are relatively wide, and the highest income group, where confidence intervals do not rule out zero substitution.

Table 10

Confidence intervals (at 95 percent) around substitution rates

	One earner household		Two earner household	
	Lower bound	*Upper bound*	*Lower bound*	*Upper bound*
All households				
Average	**0.90**	**1.40**	**0.89**	**1.40**
Age group				
<30	**0.53**	**1.83**	**0.58**	**1.98**
30–49	**0.79**	**1.51**	**0.60**	**1.16**
50–64	**0.04**	**1.08**	**0.04**	**1.16**
Income group				
Lowest	3.76	6.82	6.91	12.55
Middle	**0.53**	**1.27**	**0.58**	**1.38**
Highest	-0.45	0.59	-0.21	0.29

Note: Lowest income group = less than $34,140; Middle income group = between $34,140 and $59,920; Highest income group = more than $59,920. Each income group is made up of one third of the households ordered by disposable income. All income in 2008 dollars.

Source: Authors' calculations based on microdata files from Statistics Canada's 1996 Survey of Family Expenditures, and CPP parameters shown in table 1.

Appendix B

Incomes used to calculate substitution rates

Table 11

Incomes (in 2008 dollars) used to calculate substitution rates

	Average wage and salary income in 1996	Average total income after tax in 1996
All households		
Average	$45,620	$50,835
Age group		
<30	$40,874	$41,674
30–49	$57,763	$56,653
50–64	$42,335	$51,721
Income group		
Lowest	$9,355	$21,852
Middle	$40,111	$46,496
Highest	$87,733	$84,423

Source: Authors' calculations based on microdata files from Statistics Canada's 1996 Survey of Family Expenditures.

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