CROWD-OUT, EDUCATION, AND EMPLOYER CONTRIBUTIONS TO WORKPLACE PENSIONS: EVIDENCE FROM CANADIAN TAX RECORDS

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Abstract—This study assesses whether workplace pensions help individuals overcome knowledge barriers to saving for retirement. Using administrative data from Canada and exploiting unique features of the pension system, I find compelling evidence that each $1 contributed to workplace pensions partially crowds out other retirement saving by approximately $0.50—among interior savers—in a regression kink design, centering on unionized workers for methodological reasons. Further analysis indicates that active versus passive decisions are influenced by education, exploiting compulsory schooling reforms for identification. I conclude by showing that pension and education reform are both viable mechanisms for boosting saving from a life cycle perspective.

I. Introduction

Changes in the economic landscape over the past several decades have led to reductions in the generosities of public and employer-sponsored pensions in many OECD countries. Governments have increased retirement ages and strengthened work incentives in order to improve the sustainability of their pension systems amid pressures from increasing life expectancies, aging populations, poor investment performance, and greater economic uncertainty (OECD, 2012). Employers have also responded by moving from traditional, defined-benefit pensions toward defined-contribution plans to mitigate the costs and investment risks of providing such programs (OECD, 2013). These trends imply that the onus to save for retirement is increasingly being left to individuals.

Alongside these changes, savings rates in some countries have declined sharply in recent years, raising concerns about the future retirement prospects of today’s workers (de Serres & Pelgrin, 2003). The standard approach of offering tax incentives on assets held in designated accounts is often regarded as an ineffective way to boost retirement wealth (Attanasio, Banks, & Wakefield, 2004). Instead, many economists now advocate greater use of nonfinancial mechanisms for assisting or prescribing individuals to save. Pension features such as automatic enrollment, active decisions, simplification, and commitment devices have been found to raise saving in workplace accounts (Madrian & Shea, 2001; Choi et al., 2004; Thaler & Benartzi, 2004; Carroll et al., 2009; Madrian, 2012).

Despite these innovations to the approaches used for changing pension plan outcomes, the effect of random variation in workplace saving on total wealth accumulation remains unresolved. While the illiquidity of pensions implies these plans raise the overall saving of individuals who face borrowing constraints (Hubbard, 1986), for others the effect is ambiguous. Workplace pensions may induce individuals to actively reduce nonpension wealth, as less is needed to hit a target level of consumption in retirement. As annuities, pensions may also reduce saving by providing insurance against an uncertain life span (Hubbard, 1987).

Workplace pensions likely raise the overall saving of individuals who save for nonretirement purposes (Gale, 1998). If savers are passive (Chetty et al., 2014), pension saving passes through into greater total wealth accumulation for such reasons as mental accounting, rule-of-thumb saving, or bounded rationality (Thaler, 1990; Rubinstein, 1998; Benartzi & Thaler, 2001; Card & Ransom, 2011). Passive behavior may reflect a wider problem that individuals do not understand how to save adequately on their own. In this case, the life cycle effect of shifting consumption from working years to retirement is unclear, since the costs of inducing some workers to oversave can be as great as the consumption losses to others in retirement from myopia (Whitehouse, 2013). The objective of this study is to investigate the interconnections between how individuals respond to changes in their workplace saving and how they save for retirement.

The study makes three contributions. First, I assess the extent to which employer pension contributions increase total wealth accumulation or crowd out saving in other retirement accounts. This analysis adds to a large literature examining the effects of public and workplace pensions on saving outcomes (Bernheim, 2002). I provide credible new insight into this unresolved empirical issue by estimating the effect of random variation in saving arising from a unique institutional feature of pensions in Canada. Specifically, the identification exploits the fact that employer contribution rates increase discontinuously on earnings above the average industrial wage. The magnitude of the change in employer contributions and its displacement effect on other retirement saving are jointly estimated in a two-stage regression kink design (RKD). The results indicates that among unionized workers who save in both types of plans but below their contribution limits, each $1.00 of workplace saving partially displaces other retirement saving by approximately $0.50, on average.

The second contribution of this study is to provide new insight into the factors behind active versus passive choice.
Specifically, I investigate the extent to which education affects such decisions. To this end, I obtain schooling measures from unique data sets that link tax records for nearly 800,000 individuals to their 1991 or 2006 Census responses. As in the returns-to-education literature, compulsory schooling reforms are used to obtain exogenous variation in education to identify this effect (Acemoglu & Angrist, 2000; Oreopoulos, 2006b). The results show that workers with high education respond to a change in workplace pension contributions by reducing other saving, while those with low schooling are passive. Hence, active versus passive choice in part results from human capital traits that are amenable to change through education policy. To the extent that education affects the knowledge-based costs of active decision making as these results suggest, workers with low adjustment costs are indeed more responsive than those with high costs. The third contribution is to consider the relationship between active versus passive choice and life cycle saving. Since passive behavior is to some extent explained by low levels of schooling, workers with low education must also be found to save less than those with high education for any intervention that shifts consumption from working years to retirement to be desirable from a life cycle perspective. I examine whether this condition likely holds in practice by estimating the effect of education on individuals’ savings rates in tax-preferred accounts. The results show that compelling individuals to complete high school raises savings rates by 3 to 6 percentage points annually, an effect that persists remarkably throughout normal working years. This finding is robust to controlling for a wide set of channels through which education indirectly affects saving, including family composition, employment, permanent income, home equity, and health.

Taken together, the findings indicate that many individuals respond to changes in workplace saving, but that total wealth accumulation increases for those who likely benefit the most. However, education reform may be a substitute for interventions that target saving: more schooling reduces the need for, and effectiveness of, such policies as workers learn to save on their own, a finding that warrants consideration when designing programs for encouraging individuals to save.

This study contributes to three related literatures. The first addresses the longstanding issue of whether workplace pensions raise or redistribute total saving. Whereas several studies find these plans create new saving (Poterba et al., 1994; Venti & Wise, 1996; Gelber, 2011; Beshears et al., 2014), others find they tend to crowd out contributions to other plans (Beshears et al., 2013), worker mobility (Chetty et al., 2014), and mandatory pension reform (Euwals, 2000). In contrast, I analyze a nuanced change in workplace saving that only affects workers who are already pension members, irrespective of age or job tenure. In this sense, the second set of literature to which this study relates concerns how nonfinancial mechanisms and nudges affect retirement saving (Madrian & Shea, 2001; Choi et al., 2004; Thaler & Benartzi, 2004). Whereas rational agency predicts that individuals respond to changes in workplace saving by adjusting contributions to other plans, underresponses may occur due to behavioral factors, including inertia or procrastination.

The study proceeds as follows. Section II presents a conceptual model to guide the empirical analysis; section III reviews institutional details of Canada’s retirement income system; section IV describes the data sets used; sections V through VII present results for crowd-out, effects of education on saving responses, and returns to education, respectively; and section VIII concludes.

II. Conceptual Framework

This section presents a stylized model of life cycle saving to help guide the empirical analysis. I extend models of active versus passive choice by Chetty et al. (2014) and Bernheim et al. (2015) by positing that the costs of active choice depend in part on human capital, providing a testable prediction of the factors behind such behavior.

A. Model Setup

There are $I$ agents, $i \in \{1, 2, \ldots, I\}$, who live for two periods, $t \in \{1, 2\}$. In the first period, each agent supplies one unit of labor in exchange for earnings $E$ and a pension contribution $P$. Each agent can then invest in taxable and tax-preferred saving plans, $S_t$ and $R_t$, respectively, to purchase consumption $\{C_{i,1}, C_{i,2}\}$ to maximize utility $U_i(C_{i,1}, C_{i,2})$, subject to:

$$C_{i,1} \equiv c_1(E, S_t, R_t, P, r_0) = E - (1 + \phi)S_t - (R_t + P),$$

(1)
Lowers are both at corner solutions in a reduced-form version of a three-period model. Positions or lock-in pension provisions (Gale & Scholz, 1994; Milligan, explicitly in utility (Chetty et al., 2014) or in a three-period setting with short variables as minus savings, and

\[ C_{i,2} = c_2(E, S_i, R_i, P, r_0) = r_0(S_i + R_i + P), \]  

(2)

\[ S_i \geq \bar{S}, \]  

(3)

\[ R_i \geq 0, \]  

(4)

\[ R_i + P \leq L. \]  

(5)

Preferences satisfy the assumptions for risk aversion. For each \( t \), \( \partial U_i(\cdot) / \partial C_{i,t} > 0 \); \( \bar{\partial}^2 U_i(\cdot) / \partial C_{i,t} < 0 \); and \( \partial^2 U_i(\cdot) / \partial C_{i,t} \partial C_{i,t} \geq 0 \), for each \( t \neq l \). Consistent with tax regulations, \( L \) is a contribution limit. Hence, \( C_{i,1} \) equals income minus savings, and \( C_{i,2} \) equals wealth accumulated from the first period. The term \( \phi \in (0, 1) \) ensures that \( R_i \) and \( P \) yield a higher rate of return than \( S_i \); the minimum level of taxable saving, \( \bar{S} \in (0, E) \), is imposed as a money liquidity requirement on the basis that assets held in taxable accounts are generally more liquid than those held in pensions or retirement saving accounts.\(^1\)

In this section, I assume \( r_0 = 1 \) is known with certainty, although this is later relaxed. For ease of notation, denote utility as a function of the choice variables as \( U_i(S_i, R_i) \) and, similarly, the marginal utility of consumption as \( U_{i,t}(S_i, R_i) = \partial U_i(\cdot) / \partial C_{i,t} \), for each \( t \).

### B. Optimal Behavior

Given that retirement saving dominates taxable saving, agents prefer to save in the former, absent any liquidity or contribution limit constraints. I distinguish three types of savers.

First, an agent is a “limit” saver if \( U_{i,1}(\bar{S}, L - P) \leq U_{i,2}(\bar{S}, L - P) \). Shifting consumption from the first period to the second via \( R_i \) is (weakly) desired but not possible due to the contribution limit, \( L \): the optimal saving is \( S_i^* = \arg \max \bar{S}_i U_i(S_i, L - P) \) and \( R_i^* = L - P \), where \( S_i^* \geq \bar{S} \). Second, an agent is financially “constrained” if \( U_{i,1}(\bar{S}, 0) \geq U_{i,2}(\bar{S}, 0) \). The liquidity restriction leads to excess saving, and borrowing from \( R_i \) is (weakly) desired but not possible due to the nonnegativity constraint; the optimal saving is \( S_i^* = \bar{S} \) and \( R_i^* = 0 \). Limit and constrained savers are both at corner solutions in \( R_i \). Third, an agent is an “interior” saver if neither the contribution limit nor the nonnegativity constraint binds; the optimal saving is \( S_i^* = S \) and \( R_i^* = \arg \max \bar{R}_i U_i(S_i, \bar{R}_i) \), where \( R_i^* \in (0, L - P) \).

The empirically observed levels of saving, \( \{\bar{S}, \bar{R}\} \), may differ from the optimal choices for various reasons, discussed in section VII. As such, programs for increasing total wealth accumulation may be desirable under certain conditions.

### C. Comparative Statics

I consider how each type of agent is expected to respond to a (small) change in employer pension contributions, \( dP \). For limit and interior savers, the model predicts \( dS_i^* = 0 \) and \( dR_i^* = -dP \). This result is a mechanical effect of the binding contribution limit constraint if the agent is a limit saver and \( dP > 0 \). Otherwise, this result arises from \( R_i \) and \( P \) being perfect substitutes under the tax code, whereas \( S_i \) and \( P \) are not due to \( \phi \). For constrained savers, if \( dP > 0 \), first-period consumption falls and total wealth accumulation necessarily rises by this full amount because these agents are at a lower corner solution in saving and are unable to respond, \( dS_i^* = 0 \) and \( dR_i^* = 0 \). However, if \( dP < 0 \), first-period consumption may increase by this full amount, or some additional saving may be made in the retirement account, \( dS_i^* = 0 \) and \( dR_i^* > 0 \), depending on preferences.

An agent will underrespond to \( dP \) if the costs outweigh the associated benefits. The gain from adjusting saving is \( G_i = G_i(S_i^*, R_i^*; dP) = U_i(S_i^* - dS_i^*, R_i^* - dR_i^*; dP) - U_i(S_i^*, R_i^*; dP) + V_i(R_i^* + P + dP - L) \). This reflects the difference in utility from reoptimizing saving relative to not responding, conditional on \( dP \). The last term is an opportunity cost of the penalty from not adhering to the contribution limit, subject to \( V_i(x) = 0 \), \( \forall x \leq 0 \); and \( V_i(x) > 0 \) and \( dV_i(x)/dx < 0 \), \( \forall x > 0 \). I posit that the adjustment cost depends on human capital \( h_i \), which I assume is dichotomous: \( h_i \in \{0, 1\} \). The total cost is \( k_i \equiv k_i(h_i, q_i; \xi) = \xi f(h_i) + (1 - \xi) q_i \), where \( \xi \in [0, 1] \). The human capital element reflects costs of attentiveness and learning, \( f(0) < f(h_i) \): other costs are reflected by \( q_i \), where \( q_i > 0 \) and \( q_i \perp h_i \), for each \( i \). An agent crowds out \( dP \) if and only if \( G_i \geq k_i \), which leads to the definition (Chetty et al., 2014) of active versus passive choice:

**Definition 1.** Given \( dP \), an agent is an active saver if the taxable and tax-preferred saving chosen are \( \{S_i^* - dS_i^*, R_i^* - dR_i^*\} \), and a passive saver if \( \{S_i^*, R_i^*\} \) remain chosen.

This model gives two predictions that form the basis of the first two sections of the empirical analysis. First, the baseline prediction is \( dR_i^* = -dP \) for interior and limit savers, but the aggregate response may be weaker due to adjustment costs, which is testable if \( dP \) is well identified. Limit savers are the most likely to exhibit perfect crowd-out because of the penalty on overcontributions. Second, crowd-out is expected to be dichotomous based on \( h_i \) (unless \( \xi = 0 \)), which is testable if exogenous variation in human capital exists.

### III. Institutional Details

This section briefly reviews the institutional features of Canada’s retirement income system, focusing on the details most relevant to the empirical analysis.

#### A. Public Pensions

The first two tiers of this system comprise Canada’s public pensions. First, there is a citizenship-based pension available to most Canadians aged 65 or older who meet residency

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\(^1\) Other approaches to model the money liquidity requirement are to do so explicitly in utility (Chetty et al., 2014) or in a three-period setting with short positions or lock-in pension provisions (Gale & Scholz, 1994; Milligan, 2002). As in Chetty et al. (2014), the approach used here can be viewed as a reduced-form version of a three-period model.
### Table 1: Summary Statistics

<table>
<thead>
<tr>
<th>Has Workplace Pension</th>
<th>No Workplace Pension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All (1)</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
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<tr>
<td>Age</td>
<td>44.5</td>
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<tr>
<td>Female</td>
<td>48.6</td>
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<tr>
<td>Married</td>
<td>79.1</td>
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<tr>
<td>Employment</td>
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<tr>
<td>Employed</td>
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<tr>
<td>Self-employed</td>
<td>2.9</td>
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<tr>
<td>Unionized</td>
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<tr>
<td>Has unemployment insurance</td>
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<tr>
<td><strong>Employment</strong></td>
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<tr>
<td>Employment income, gross</td>
<td>47,300</td>
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<tr>
<td>Self-employment income, net</td>
<td>1,700</td>
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<td>Other income</td>
<td>3,600</td>
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<tr>
<td>Total income</td>
<td>49,700</td>
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<td><strong>Saving participation</strong></td>
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<td>Has workplace pension</td>
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<tr>
<td>Has employee pension contributions</td>
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<tr>
<td>Contributes to voluntary accounts</td>
<td>53.6</td>
</tr>
<tr>
<td>Withdraws from voluntary accounts</td>
<td>6.4</td>
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<tr>
<td>Has unused contribution room</td>
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<tr>
<td><strong>Conditional saving</strong></td>
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<tr>
<td>Total workplace pension contributions</td>
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</tr>
<tr>
<td>Employee pension contributions</td>
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</tr>
<tr>
<td>Contributions to voluntary accounts</td>
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<tr>
<td>Withdrawals from voluntary accounts</td>
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<tr>
<td>Unused room in voluntary accounts</td>
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<tr>
<td><strong>Conditional total saving</strong></td>
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<tr>
<td>Saving</td>
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</tr>
<tr>
<td>Savings rate</td>
<td>15.9</td>
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</tbody>
</table>

The results pertain to the years 1991–2010 inclusive. The “conditional” statistics refer to the mean values conditional on those values being nonzero. The savings rate is defined as net saving in workplace and voluntary retirement accounts relative to total income. Currency values (rounded to the nearest $50) are expressed in nominal dollars.

Source: Longitudinal Administrative Data Bank (LAD).

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requirements; this Old Age Security (OAS) is funded out of general tax revenues. As of December 2010, the maximum monthly entitlement was $522. Benefits are linked to inflation and are taxable as income. For low-income recipients, a supplement can be available of $658 and $435 per person for single and married individuals, respectively, as of December 2010.

The second tier comprises income-tested pensions: the Canada Pension Plan (CPP) and Quebec Pension Plan (QPP). The CPP operates across Canada except in the province of Quebec, where the QPP provides similar benefits. The CPP and QPP are designed to replace approximately 25% of workers’ mean lifetime earnings up to the average industrial wage. In 2010, the maximum monthly benefit payment was $934. Benefits are determined by a complex function of earning histories, length of time spent contributing, age at which benefits start to be collected, and other factors such as time spent child rearing. These programs are funded out of matching employer and employee payroll deductions, where both contribute a fraction of earnings (4.95% in 2010) between a basic exemption ($3,500 in 2010) and the year’s maximum pensionable earnings (YMPE), which is indexed to the average industrial wage ($47,200 in 2010). On earnings above this amount, the marginal contribution rates of both employers and employees fall to 0, a program feature that I exploit in the crowd-out analysis.

**B. Private Pensions and Voluntary Retirement Accounts**

Private pensions and retirement saving accounts constitute a third tier of this system. Using these plans is important for middle- and high-income households to prevent significant drops in living standards at retirement (LaRochelle-Côté, Myles, & Picot, 2010). Workplace pensions, called registered pension plans (RPP), have historically played an important role in this process. These plans can be defined benefit, defined contribution, or hybrid arrangements to provide income to retired employees in the form of periodic payments. Employers offering workplace pensions must contribute at least 1% of earnings annually, and employees also make positive contributions around 75% of the time. Contributions are nontaxable, investment income accumulates tax free, and assets lock in after a short vesting period. Income from these plans is subject to income taxes at retirement. For the sample of tax filers used in this study, table 1 compares demographic, income, and saving characteristics by whether they have workplace pension and union coverage. Notably, workers with pensions earn and save more than those who do not have such coverage.

A unique feature of workplace pensions in Canada that I exploit in the crowd-out analysis is that most plans are integrated with contribution schedules of second-tier public pensions. When these programs were introduced in 1966,
they imposed additional labor costs on employers already sponsoring workplace plans. This led many employers to amend their pensions in recognition of these added costs and the fact that the public pensions somewhat duplicated existing coverage (Frenken, 1996)—for example, “The pension per year of service may be 1.3% of earnings up to the YMPE [the average industrial wage] and 2.0% of earnings over the YMPE, with members being able to make contributions of 4.8% of their earnings up to the YMPE and 7.5% of earnings above it” (Statistics Canada, 2003, p. 3). The same principle applies to defined-benefit plans, where benefits accrue at lower rates on earnings up to the average industrial wage than on earnings above it (Baldwin, 2007). This feature has persisted over the past fifty years; in 1994, for example, 80% of workplace pension members had integrated plans (Statistics Canada, 1996, 2003).

Integration results in a typical workplace pension contribution schedule that kinks upward at the average industrial wage, which gives plausibly exogenous variation for identifying crowd-out since this feature is determined at the firm level. While employers’ total labor costs remain relatively constant around the average industrial wage, the change in saving from workers’ perspective is more discernible. This is because workers’ eventual benefit entitlements in retirement from the public pensions are not directly tied to contributions. In 1997, for example, reforms were enacted that gradually increased the combined employer-employee contribution rate to public pensions from 5.85% to 9.9% in 2003 and beyond, whereas benefits were reduced (Pesando, 2001). Marginal deviations in earnings around the average industrial wage have larger effects on workplace saving than on future income from public pensions.

Individuals may also save for retirement in voluntary, defined-contribution accounts called registered retirement savings plans (RRSP), which are set up and maintained through financial institutions. Contributions to these plans are tax deductible, the income taxes being owed when funds are withdrawn. The maximum amount that may be contributed annually into these accounts is the lesser of 18% of income and a preset threshold ($22,000 in 2010), but any unused contribution room has carried forward indefinitely since 1991 so most tax filers do not contribute close to their limits (Messacar, 2015). Individuals are permitted to overcontribute a cumulative lifetime amount of $2,000 to these accounts, but excess contributions incur a penalty of 1% per month. For savers with workplace pensions or deferred profit-sharing plans, contribution room is reduced dollar-for-dollar by the amount saved in these other plans.

IV. Data and Sample Selections

I use several administrative tax databases from Statistics Canada in this study. These data provide rich longitudinal information on Canadian tax filers’ saving behavior in workplace pensions and voluntary retirement accounts. The data sets and sample selections are described in this section.

The Longitudinal Administrative Databank (LAD) is a panel file comprising a 20% representative sample of Canadian tax records, derived from the central income tax register. The LAD contains information about demographics, earnings, income, taxes, credits and allowances, transfers, and saving for the individuals represented and their census families. Although information on taxable saving or other wealth, such as home equity, is not available because it is not reported on tax forms, the LAD is one of the most comprehensive databases for studying retirement saving in Canada.

The following sample restrictions are imposed. I condition on the years 1991 to 2010, which coincides with the first year that data on workplace pension coverage are available and runs up to the last year of data availability when this study began. I restrict to individuals between the ages of 25 and 49 in 1991 (44 and 68 in 2010). The upper age limit (68 in 2010) accounts for the fact that individuals are required to start collecting from their workplace pensions by the time they turn 69 years of age. I focus the analysis on individuals satisfying these criteria who are observed filing their taxes on time in at least eighteen out of the twenty years. While relaxing this assumption does not change the main results, this restriction allows me to exploit the longitudinal component of the data in later stages of the analysis. Finally, I omit observations where individuals are observed collecting public or private pension income to center the analysis on preretirement saving behavior. Taken together, the sample comprises approximately 34 million observations on 1.8 million tax filers.

The LAD does not provide schooling information, since this is not collected by tax authorities. For this, I turn to newly created data sets that link individuals’ 1991 or 2006 census of Canada responses to panels of their tax records (hereafter referred to as the census-tax linkages). This file is limited in that it does not contain the breadth of information or sample size needed to carry out every crowd-out analysis that I perform with the LAD. However, replicating the baseline results is possible; in addition, the census has information on respondents’ reported highest level of education. I impose the same sample restrictions in the linkages file as before, except that I condition on individuals aged 25 to 68 at any time over the period 1991 to 2010 and do not specify a minimum number of repeat occurrences to increase the sample size for the RKD analysis. I also restrict to individuals who were born in a Canadian province in order to assign compulsory schooling laws, which vary by province and cohort, to individuals based on their province of birth as reported in the census. The census-tax linkages file comprises observations on nearly 800,000 individuals.

V. Crowd-Out Analysis

This section estimates whether an exogenous change in employer pension contributions raises overall saving or
induces workers to reduce contributions to voluntary retirement accounts. I first describe the empirical method and then present results and robustness checks.

A. Empirical Strategy

The identification exploits a change in employer pension contributions arising from the integration feature of these plans. The local average change in workplace saving at the kink (the average industrial wage), and its resulting displacement effect on voluntary retirement saving, are jointly estimated using a two-stage RKD:

\[ P_{it} = \alpha_1 + \beta_1(E_{it} - T_i) + \gamma_1(E_{it} - T_i)D_{it} + \chi_{i}^\prime \xi + \nu_{it}, \]  
\[ R_{it} = \alpha_2 + \beta_2(E_{it} - T_i) + \gamma_2(E_{it} - T_i)D_{it} + \chi_{i}^\prime \theta + \xi_{it}, \]

conditional on \((E_{it} - T_i) \in [-B, B]\), where \(B\) is the estimation bandwidth. The variables \(E_{it}\), \(P_{it}\), and \(R_{it}\) are labor earnings, workplace pension contributions, and voluntary retirement savings for individual \(i\) at time \(t\), respectively. Denote \(X_{it}\) as a vector of observable covariates and \(D_{it} = 1(E_{it} \geq T_i)\) as an indicator of whether earnings exceed the kink point \(T_i\) in the reference year. Individuals are constrained, interior, or limit savers if \(R_{it} = 0\), \(R_{it} + P_{it} \in (0, L_i)\), or \(R_{it} + P_{it} \geq L_i\), respectively. The empirical analysis focuses primarily on interior savers, although all three types are considered.

Equation (6) estimates the first-stage effect of workplace pensions being integrated with the public pensions, whereas equation (7) estimates the second-stage effect on voluntary retirement saving, and crowd-out is \(\gamma = -\frac{\beta_2}{\gamma_1}\). I estimate these equations as seemingly unrelated regressions and obtain standard errors for crowd-out using the delta method. Standard errors are clustered by individual to account for unit-specific correlations of the residuals (Lee & Lemieux, 2010).

The estimator makes two identifying assumptions. First, the change in voluntary retirement saving comes from the effect of integration on workplace pensions and not from a response by workers to the public pension discontinuity, which likely holds for reasons discussed in section IIIB. Second, the estimator provides a test of substitution between workplace and non-workplace retirement saving holding constant total compensation given that the running variable is employment income. However, the RKD assumes workers’ earnings are randomly assigned around the kink, which I assess using the density test of McCrary (2008). These results (in the online appendix) indicate that sorting occurs in the full sample, but that the effect is driven by nonunionized workers, perhaps because collective bargaining makes it difficult to control earnings at the individual level. This leads me to condition this analysis on unionized workers.\(^3\)

B. Salience of the Treatment Effect

The measure of annual contributions to workplace pensions available in tax records is called the pension adjustment (PA). The PA reflects saving in traditional pensions, deferred profit-sharing plans (DPSPs), and some unregistered accounts.\(^4\) For defined-contribution plans, the PA is the amount contributed in a year. For defined-benefit plans, the PA translates the accrued pension compensation from the past year into a dollar equivalent and is interpreted as the net present value of saving. The PA is disseminated in two ways. Workers receive a statement of remuneration from their employers each year during tax season stating their PA, and all tax filers receive a deduction limit statement each year from the central tax authority stating their PA and the amount they can contribute to voluntary retirement accounts. Thus, workers need not have a deep understanding of how their pensions operate (Luchak & Gunderson, 2000, show this is often the case) to know roughly how much they saved in these plans in the past year.

C. Results

The graphical inspection and regression estimates of the primary RKD analysis, given by equations (6) and (7), are shown in figure 1. This analysis centers on interior savers so that the results are not affected by those who are unable to respond or a mechanical effect of contribution limits.\(^5\) Note that only approximately 50% of workplace pension members also contribute to voluntary retirement accounts in a given year. These workers have higher total income ($54,750 versus $43,850), are less likely to be unionized (64.1% versus 71.9%), to collect unemployment insurance (8.1% versus 14.8%), and to make employee pension contributions (72.1% versus 79.1 percent) compared to those not saving in voluntary retirement accounts. However, the results for other savers will also be considered.

The results indicate, first, that employer contributions increase by an average of $0.025 per $1.00 of employment income beyond the kink among interior savers, which

\(^2\)Restricting the analysis to unionized workers ensures that an assumption of the RKD is satisfied but introduces the possibility of sample selection bias. This issue must be recognized given that the statistical inferences are based on standard errors computed from the restricted sample. This issue is to some extent mitigated by clustering the standard errors at the individual level.

\(^3\)The PA slightly overestimates pension coverage due to DPSPs (Morissette & Ostryvsky, 2006). However, changes in the PA are expected to be driven by the effect of interest. I exclude individuals with pension contributions or voluntary retirement saving above the 99th percentile, which tend to far exceed the contribution limits, to exclude individuals with very large DPSPs or erroneous saving information in the empirical analysis.

\(^5\)By restricting the analysis to interior savers, this potentially introduces bias from selection of the sample based on the endogenous variable. The crow-out results for other types of savers, including the unrestricted sample, are also presented below.

\(^4\)This is analogous to estimating the effect of \(P_{it}\) on \(R_{it}\), conditional on \((E_{it} - T_i)\) and \(X_{it}\), in a two-stage least squares approach using \((E_{it} - T_i)D_{it}\) as the excluded instrument.
represents a rise in saving of 36.2% from the base (pretreatment) rate of $0.069 per $1.00. The magnitude of this effect is consistent with expectations: since employers’ contribution rate to the public pensions averaged $0.032 per $1.00 over the time period 1991 to 2010, and 80% of workplace pension members had integrated plans in 1994, the public pensions displace employer contributions by $0.025 ÷ ($0.032 ÷ 80%) = $0.977, nearly a dollar-for-dollar response. Second, no effect is observed for the employees’ share of contributions. While Frenken (1996) notes that employee contributions may be integrated, such an arrangement is not pronounced enough to be discerned empirically.

The corresponding decrease in voluntary retirement saving at the kink is estimated to be $0.015 per $1 of employment income, a 33.3% decline relative to the base savings rate of $0.045 per $1.00 earned. As column 1 of table 2 shows, these RKD results imply that each $1.00 contributed to workplace pensions displaces other retirement saving by an average of $0.60, while the remaining $0.40 passes through into greater total wealth accumulation. These results control for demographic, income, and other characteristics observed in the tax data, listed in the table notes. The p-values reported from the t-tests of whether perfect pass-through (γ = 0) and perfect crowd-out (γ = −1) are rejected empirically indicate this result is consistent with partial displacement.

To explore the robustness of this result, I augment the primary RKD analysis in two ways. First, I estimate the model controlling for individual and year fixed effects (FE), forcing the estimator to exploit variation in saving within individuals who move around the (nonstationary) kink over

\[ \text{Slope} = 0.069^{***} (0.001) \]
\[ \text{Kink} = 0.025^{***} (0.002) \]

\[ \text{Slope} = 0.045^{***} (0.002) \]
\[ \text{Kink} = -0.015^{***} (0.003) \]

\[ \text{Slope} = 0.101^{***} (0.003) \]
\[ \text{Kink} = 0.001 (0.006) \]
time, similar to bracket creep (Saez, 2003). Second, to check that the response is driven entirely by the effect of interest and is not confounded by the public pensions, the procedure is applied to workers who save in voluntary retirement accounts but do not have a workplace pension. As figure 1 shows, this “placebo” test does not detect any change in saving at the kink, consistent with expectations. I augment the statistical model to a difference-in-differences (DD) framework with panel data if treatment is random, but their inclusion should not meaningfully affect results (Lee & Lemieux, 2010). The RKD-FE and RKD-DD results, shown in columns 2 and 3 of table 2, are very similar to the findings from the primary model specification and suggest that each $1.00 contributed to workplace pensions crowds out other retirement saving by $0.464 and $0.643, respectively. The latter result is not significantly different from unity, although the point estimate is consistent with the results of the primary model and the estimator’s precision is weakened by the DD augmentation. In the online appendix, I also show that these findings are robust to standard RKD robustness checks: bandwidth sensitivity, polynomial order, optimal bandwidth selection (Calonico, Cattaneo, and Titunik, 2014); and the permutation test (Ganong & Jäger, 2016).

The remaining columns of table 2 extend the analysis to different types of savers to test predictions from section II for these groups. For example, among limit savers, each $1 contributed to workplace pensions is estimated to crowd out other retirement saving by an average of $1.405; this effect is significantly different from 0 but not from the prediction of perfect crowd-out from the model. Limit savers also have a higher pretreatment savings rate of $0.059 per $1.00 earned in voluntary retirement accounts compared to interior savers, which is to be expected since they are saving at, not below, their limits. Among all savers, the estimated crowd-out, of $0.273 per $1.00, is approximately half of the response observed among unconstrained (interior and limit) savers, of $0.616 per $1.00. This result follows from the fact that only around half of workplace pension members also save in voluntary retirement accounts, as shown in table 1. Among constrained savers, employer pension contributions pass through into greater total wealth accumulation notwithstanding any adjustments in taxable saving or other forms of wealth not observed in the data.

### Table 2—RKD Baseline Results

<table>
<thead>
<tr>
<th></th>
<th>Interior (1)</th>
<th>Fixed Effects (2)</th>
<th>Difference-in-Differences (3)</th>
<th>Limit (4)</th>
<th>Unconstrained (5)</th>
<th>Nonlimit (6)</th>
<th>All (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Workplace Pensions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Slope</strong></td>
<td>0.118***</td>
<td>0.077***</td>
<td>0.118***</td>
<td>0.121***</td>
<td>0.119***</td>
<td>0.119***</td>
<td>0.120***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Kink</strong></td>
<td>0.026***</td>
<td>0.017***</td>
<td>0.026***</td>
<td>0.022***</td>
<td>0.025***</td>
<td>0.026***</td>
<td>0.024***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>B. Voluntary Retirement Accounts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Slope</strong></td>
<td>0.045***</td>
<td>0.037***</td>
<td>0.045***</td>
<td>0.059***</td>
<td>0.051***</td>
<td>0.041***</td>
<td>0.049***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Kink</strong></td>
<td>-0.015***</td>
<td>-0.008***</td>
<td>-0.016***</td>
<td>-0.031***</td>
<td>-0.015***</td>
<td>-0.008***</td>
<td>-0.007***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td><strong>C. Crowd-Out</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crowd-out</strong></td>
<td>0.600</td>
<td>0.464</td>
<td>0.643</td>
<td>1.405</td>
<td>0.616</td>
<td>0.297</td>
<td>0.273</td>
</tr>
<tr>
<td></td>
<td>(0.124)</td>
<td>(0.175)</td>
<td>(0.308)</td>
<td>(0.416)</td>
<td>(0.126)</td>
<td>(0.073)</td>
<td>(0.080)</td>
</tr>
<tr>
<td><strong>H0: γ = 0</strong></td>
<td>[.000]*****</td>
<td>[.008]*****</td>
<td>[.037]*****</td>
<td>[.001]*****</td>
<td>[.000]*****</td>
<td>[.001]*****</td>
<td>[.001]*****</td>
</tr>
<tr>
<td><strong>H0: γ = -1</strong></td>
<td>[.001]*****</td>
<td>[.002]*****</td>
<td>[.247]</td>
<td>[.330]</td>
<td>[.002]*****</td>
<td>[.000]*****</td>
<td>[.000]*****</td>
</tr>
<tr>
<td><strong>Individuals</strong></td>
<td>225,270</td>
<td>225,270</td>
<td>283,289</td>
<td>89,260</td>
<td>255,342</td>
<td>367,901</td>
<td>403,129</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>735,682</td>
<td>735,682</td>
<td>949,804</td>
<td>185,863</td>
<td>921,545</td>
<td>1,660,048</td>
<td>1,945,197</td>
</tr>
</tbody>
</table>

"All" includes constrained, interior, and limit savers; "Nonlimit" includes constrained and interior savers; and "Unconstrained" includes interior and limit savers. The "Primary" model is given by equations (6) and (7). The bandwidth used is δ = 6.00. Results are for the years 1991 to 2010, inclusive. The slope estimates refer to the slope of the savings function before the kink. The difference-in-differences slope estimates and kink estimates correspond to the effects for workplace pension members net of the effects for those not covered by a workplace pension. The following covariates are included in every regression: female, married, province of residence, has unemployment insurance, has self-employment income, age, age squared, disability and medical expense tax allowances, and other income (total income before taxes less employment income). Standard errors (in parentheses) are clustered by individual. The p-values are reported separately for the t-tests of the null hypothesis (H0) that there is perfect pass-through (γ = 0) or perfect crowd-out (γ = -1) of the change in workplace pension contributions. Significant at ***1%, **5%.

Source: LAD.
Overall, a $1.00 increase in employer pension contributions crowds out other retirement saving by approximately $0.50 among interior savers. This finding raises the question of why dollar-for-dollar substitution was not detected based on the model’s prediction. There are several reasons why workplace pensions and voluntary retirement accounts may be imperfect substitutes. Due to the lock-in provisions of workplace pensions, such assets are intended for retirement, whereas the Canadian tax code does not penalize preretirement withdrawals from the voluntary accounts. Thus, assets held in voluntary retirement accounts may reflect saving for such reasons as income-smoothing, precautionary purposes (Mawani & Paquette, 2011), home equity, and retirement. I expect crowd-out to be larger for individuals who use these plans only for retirement.

While tax records do not reveal how savers intend to use voluntary retirement accounts, the longitudinal data show how they are actually used. Table 3 assesses how crowd-out varies based on withdrawal behavior. In particular, column 1 uses net saving (contributions less withdrawals in the reference year) in voluntary retirement accounts. Columns 2 and 3 exploit the longitudinal nature of the LAD data to condition the analysis on individuals who are not, or who are, ever observed withdrawing from their voluntary retirement accounts before retirement. Column 4 uses investment income as the dependent variable in the second-stage regression. In this case, the sample is restricted to interior savers but defined as individuals who have both a workplace pension and strictly positive investment income. See table 2 for more information about the regression specifications. Significant at ***1%, **5%.

### VI. Active versus Passive Choice and Education

In this section, I investigate the extent to which exogenous variation in educational attainment affects active versus passive choice, predicated on the hypothesis that the costs of reoptimizing saving depend at least in part on human capital acquisition.

To motivate this analysis, figure 2 shows that the primary crowd-out result of approximately $0.50 per $1.00 for interior savers can be decomposed based on workers’ propensities to save in voluntary retirement accounts. Exploiting the longitudinal data, panel a shows that workers who contributed frequently to voluntary retirement accounts in the past are more likely to crowd out workplace saving than nonfrequent savers. In addition, panel b shows that crowd-out approaches 0 as the sample is conditioned progressively on workers with larger unused contribution room. As discussed in section III, unused contribution room carries forward such that, holding everything else constant, individuals with more room have saved less in these plans over their lifetimes. Therefore, workers who save more regularly appear to understand how to substitute adequately between the two saving plans, which could occur due to gradual learning from repeated interactions.

In columns 2 and 3 of table 4, crowd-out is decomposed by workers’ reported highest level of educational attainment. Specifically, individuals are sorted according to whether they have at least a high school diploma (“high education”) or not (“low education”). The results indicate, first, that the treatment effect is homogeneous across groups. Second, workers with low education underrespond compared to workers with comparatively high education, which suggests human capital partly determines active versus passive choice.

To control for the possibility that saving adjustments are endogenous with education, columns 4 and 5 condition on a predicted measure of education that exploits compulsory schooling reforms. I estimate the incidence of completing high school, given by

\[
\mathbb{I}(HS_{pc} = 1) = \omega + \delta M_{pc} + \bar{X}_{ipc}'A + \bar{Z}_{ipc}'\Omega + \bar{K}'\Phi + \nu_{ipc},
\]

where \(HS_{pc}\) indicates high school completion and \(M_{pc}\) is the mandatory years of schooling required by province-of-birth \(p\) and cohort \(c\). The regression (shown in column 3 of table 5

8The census-tax linkages file does not provide data on respondents’ total number of years of schooling but indicates the highest level of attainment. Since this analysis exploits exogenous variation in education from compulsory schooling, which affects attainment at lower levels of schooling, the groups were separated by high school completion.

9I match individuals to the entry age that was in effect in their province of birth at 6 years old and to the exit age in effect at 14 years old. The census-tax linkage sample consists of individuals who were 14 years of age from 1938 to 1995, so the reforms exploited span this time period.
and discussed in the next section) controls for covariates $X_{ipe}$, and other factors $Z_{ipe}$ from the census-tax linkages file listed in the table notes. While education is observed only from 1991 or 2006 census responses, the tax data set is longitudinal. Hence, I construct $X_{ipe}$ and $Z_{ipe}$ as inflation-adjusted averages of $X_{ipe}$ and $Z_{ipe}$ for each individual across all observed years. To control for endogeneity between schooling reforms and other institutional factors affecting education (Stephens & Yang, 2014), I include education policy covariates $K_{ipe}$ listed in the table notes, province-of-birth and cohort fixed effects, and province-of-birth specific cohort trends. Using the results of equation 9, I separate individuals into low- and high-education groups to keep sample sizes similar to actual attainment, which yields nearly an
The data permit me to exploit reforms to compulsory schooling laws that were enacted between 1938 and 1995. See table 2 for more information about the regression specifications.

85% success rate. Overall, the results using predicted education are similar to the baseline findings. Columns 6 and 7 condition on workers with high levels of schooling; as expected, crowd-out is the largest for these groups. These findings indicate that workers with high education are more active savers than those with low education, suggesting that active versus passive choice to some extent results from knowledge-based traits that are amenable to change through educational attainment.

Finally, I assess whether underlying differences in observable characteristics drive these results. Figure 3 shows how earnings and saving differ by education. Since the distributions of voluntary retirement saving perfectly overlap across groups, the results are not likely due to low-education workers being unable to cut back their saving by as much because they save less. Second, the characteristics of workers in the RKD sample are comparable: low- and high-education workers are about the same age (45.0 versus 44.5, respectively), have similar average incomes from nonemployment ($2,750 versus $3,000), are child labor age; an indicator of whether a restrictive labor law was in place; an indicator of whether exemptions existed; the log of school expenditure; and the number of schools and teachers per capita (see Oreopoulos, 2006a, for more details). Province-of-birth polynomial cohort trends are used to control for unobserved factors across provinces that may have changed over time that affected educational attainment. The data permit me to exploit reforms to compulsory schooling laws that were enacted between 1938 and 1995. See table 2 for more information about the regression specifications. Significant at ***1%, **5%, and *10%.

A. Extensions of the Conceptual Framework

The conceptual framework is extended to account for two classes of models in which actual saving may not be optimal: agents are present biased and characterization failure occurs. I show that a role for raising saving exists only under certain conditions when these issues are determined by human capital and that the welfare justification is different in each case. Denote actual saving as a function of human capital as $\{S_i(h_i), \tilde{R}_i(h_i)\}$.

Present-biased agents. Suppose agents are present biased for such reasons as hyperbolic discounting or rational temptation (Laibson, 1997; Gul & Pesendorfer, 2001). I model present bias in a reduced-form approach: $U_i(C_{i,1}, C_{i,2}) = u_i(C_{i,1}, C_{i,2}) + b_i w_i(C_{i,1}, C_{i,2})$, where $u_i(\cdot)$ is forward-looking utility and $w_i(\cdot)$ is a present-biased component (< Krussel, Kurcuşu, & Smith, 2010). Both terms satisfy assumptions for risk aversion, and $u_{1i}(\cdot)/u_{2i}(\cdot) < w_{1i}(\cdot)/w_{2i}(\cdot)$ so that $w_i(\cdot)$ tilts preferences to the first period.

VII. Saving Behavior and Education

This section assesses the life cycle implications of shifting consumption from working years to retirement via workplace pensions. While previous studies subsume a role for redistribution (Carroll et al., 2009; Chetty et al., 2014; Bernheim et al., 2015), these frameworks are extended here to endogenize this role. In particular, I consider the case in which saving adequacy is affected by human capital, motivated by the previous result that education affects active versus passive choice and the growing literature that finds education has wide-spanning effects on financial literacy, stock market returns, diversification, and the use of financial planners (Calvet, Campbell & Sodini, 2009; Lusardi & Mitchell, 2010; Lusardi, Michaud, & Mitchell, 2013). I then empirically assess the relationship between active versus passive choice and saving adequacy using the model to help guide this analysis.
The term $b_i$ affects the level of present bias and depends on human capital according to $b_i = 1(h_i = 0)$. Thus, $\tilde{S}_i(h) = S^*_i$ and $\tilde{R}_i(h) = R^*_i$, since high-education agents are forward looking. For low-education agents, $\tilde{S}_i(0) = \tilde{S}$ and $\tilde{R}_i(0) \leq R^*_i$ (with strict inequality if $R^*_i > 0$), unless the contribution limit binds, in which case $\tilde{S}_i(0) < S^*$ and $\tilde{R}_i(0) = L - P$, since myopia leads to undersaving.

In this setting, there may be a role for $dP > 0$ to help uninformed agents if the social planner is paternalistic and overvalues the forward-looking utility relative to the present-biased utility compared to agents’ valuations. From a planner’s perspective, agents are heterogeneous along two dimensions: active versus passive and forward looking versus present biased. Denote $u_i(\tilde{S}_i(h_i), \tilde{R}_i(h_i))$ as the forward-looking utility as a function of the choice variables. Provided that a planner only values forward-looking utility, the aggregate welfare effect of $dP > 0$ is

$$A = \sum \left\{ \mathbb{1}(G_i < k_i) \left[ u_i(\tilde{S}_i(h_i), \tilde{R}_i(h_i)) + dP \right] - u_i(\tilde{S}_i(h_i), \tilde{R}_i(h_i)) \right\} - \mathbb{1}(G_i \geq k_i)k_i. \quad (10)$$

This effect is negative for active agents, since adjustment costs are incurred and consumption is unaffected. For passive savers, the effect depends on how they save before treatment: forward-looking agents are worse off since they save optimally on their own, $u_i(\tilde{S}_i(h_i), \tilde{R}_i(h_i))$, which follows from $\tilde{S}_i(h_i) = S^*_i$ and $\tilde{R}_i(h_i) = R^*_i$ being the solution to the maximization problem in $u_i(\cdot)$; present-biased nonlimit savers stand to benefit, $u_i(\tilde{S}_i(0), \tilde{R}_i(0) + dP) \geq u_i(\tilde{S}_i(0), \tilde{R}_i(0))$ (with strict inequality if $R^*_i > 0$); and present-biased limit savers are worse off, assuming the penalty on excess contributions exceeds the gain from redistribution. Thus, $A > 0$ only if there are sufficiently many nonlimit savers who are both passive and present biased.

**Characterization failure.** Even if all agents are forward looking, $b_i = 0$ for each $i$, saving inadequacy may stem from an imperfect understanding of financial systems. This problem could occur due to bounded rationality or financial illiteracy, such as incomplete knowledge of how inflation, interest compounding, or diversification affects...
savings (Lusardi & Mitchell, 2010; Choi et al., 2011; Beshears et al., 2013). As in Ambuehl, Bernheim, and Lusardi (2014), these issues can be modeled in a complexly framed setting where agents have different information about how investments map into future consumption.

Suppose that \( r_0 \) is known to both the social planner and agents with \( h_1 = \bar{h} \), but agents with \( h_1 = 0 \) are uncertain about this mapping and have beliefs about \( r_0 \) given by the random variable \( r \), subject to \( r > 0 \). Thus, for informed agents, \( S_i(\bar{h}) = S_i^* \) and \( R_i(\bar{h}) = R_i^* \). For uninformed agents, \( \{\hat{S}_i(0), \hat{R}_i(0)\} \in \text{arg} \max_{\{S_i, R_i\}} \mathbb{E}_i[U_i(S_i, R_i)] \) subject to equations (1) to (5), except \( C_{ij} \equiv c_i(\bar{E}, S_i, R_i, P, r) \) for each \( t \). The aggregate welfare effect of \( dP > 0 \) continues to be that of equation (10) in this case; however, uninformed agents may under- or oversave resulting from the competing substitution and income effects of the interest rate uncertainty (Sandmo, 1970). Thus, \( A > 0 \) only if there are sufficiently many nonlimit savers who are passive and uninformed and undersave on their own.

In this setting, agents’ decisions are based on incomplete information about opportunities to save, which affects utility through its effect on consumption; hence, characterization failure occurs (Chetty, Looney, & Kroft, 2009; Ambuehl et al., 2014; Bernheim, Fradkin, & Popov, 2015). Given the information asymmetry about \( r_0 \) between some agents and the planner, there is a possible benefit to redistributing saving to correct this problem, the value of which can be assessed through the framework for welfare analysis of Bernheim and Rangel (2009) without paternalistic judgment on preferences.

B. Empirical Analysis

The welfare justification for shifting consumption from working years to retirement depends on why saving inadequacy occurs. Based on the model’s implications and the previous finding that education affects active versus passive choice, a necessary empirical condition for \( dP > 0 \) to target individuals who stand to benefit the most is \( d\hat{R}_i(h_i)/dh_i > 0 \).

To test this condition, I estimate the effect of compelling individuals to complete high school on their savings rates in tax-preferred accounts over the life cycle in an instrumental variables (IV) framework that exploits the compulsory schooling reforms. The first-stage regression is given by equation (9), and the second-stage effect of high school completion on savings rates is

\[
\hat{s}_{ipc} = 1 + \eta \cdot (HS_{ipc} = 1) + \hat{X}_{ipc}' \Gamma \\
+ \hat{Z}_{ipc}' \Pi + K_{ipc}' \Psi + \pi_{ipc}.
\]

Using the average values of saving, income, and other variables helps to control for permanent-income effects that would otherwise be omitted if only the 1991 and 2006 cross-sectional data were used. Saving adequacy is assessed using exogenous variation in education on the basis that more schooling should not influence savings rates if individuals were already acting optimally, controlling for observed channels through which education indirectly affects such behavior.

The first- and second-stage results are shown in table 5. These findings indicate that high school completion induces individuals to raise savings rates in tax-preferred accounts by 3 to 6 percentage points. The inclusion of additional income and demographic controls does not alter the regression estimates, suggesting that income is the primary channel through which education indirectly affects saving and that other omitted variables are not a significant concern. In figure 4, the effect of high school completion on the savings rates is illustrated. Those with high education save the most in tax-preferred accounts over the life cycle up to the point of retirement, when savings rates fall significantly for all groups. The finding that education raises individuals’ savings rates even at early ages suggests there are large cumulative returns to schooling on wealth in retirement.

Overall, the data are consistent with a necessary condition for programs that shift consumption from working years to retirement via workplace pensions to be desired. Passive savers likely stand to benefit the most, and active savers reoptimize at low (human capital) cost. It is important to recognize, however, that many individuals with high education may oversave for retirement. The extent to which saving inadequacy occurs in Canada is a contended issue. The first two tiers of the retirement income system, which include a demogrant, provide high replacement rates to current retirees who had low incomes during working years, especially by international standards (LaRochelle-Côté et al., 2010; Whitehouse, 2010). However, depending on the data set and empirical methodology used, and the assumptions over what constitutes an acceptable replacement rate, existing studies find that between 17% and 50 percent of middle-income working Canadians will experience meaningful drops in living standards when they retire (LaRochelle-Côté, Myles, & Picot, 2008; Moore, Robson, & Laurin, 2010; Horner, 2011; Wolfson, 2011). Additional saving in workplace pensions would therefore benefit at least a substantial minority of workers who do not prepare financially for retirement on their own, especially among constrained savers who tend to contribute very little to nonworkplace pensions and are the focus of much of policy.

VIII. Conclusion

This study provided new insight into the extent to which employer pension contributions increase total wealth accumulation versus simply induce workers to reduce how much they contribute to other retirement saving accounts. The results from Using administrative tax records from Canada and exploiting unique institutional features of the retirement income system indicated that each $1.00 contributed by employers to workplace pensions partially displaces other retirement saving by approximately $0.50 among interior
savours. This finding was consistent across a range of robustness checks and model extensions. Therefore, programs that shift consumption from working years to retirement via workplace pensions appear to be viable policy levers for boosting aggregate private saving, although many individuals are very responsive to such distortions.

These results raise the question of why the saving responsiveness observed here is greater than in the related literature. For example, several studies in public finance estimate that pensions increase overall saving (Poterba et al., 1994; Venti & Wise, 1996; Gelber, 2011; Chetty et al., 2014) but that the effect diminishes as broader measures of nonpension wealth are used (Gale, 1998). In contrast, this analysis detected crowd-out focusing only on wealth accumulation in similar types of retirement saving plans. Recent lessons from behavioral economics also suggest most workers remain passive to workplace saving distortions (Madrian & Shea, 2001; Choi et al., 2004). Those studies tend to analyze the effects of default enrollment or other nudges on the saving outcomes of new employees within firms. However, firm switches are significant events from workers’ perspectives; in such cases, passive decisions may arise from too much choice (Choi et al., 2009), lack of knowledge about new pensions (Luchak & Gunderson, 2000), or a view that the program is implicit financial advice. New hires are also younger and have less experience with pensions and saving than the typical worker. In contrast, this study estimated the effect of a change in workplace saving arising from a permanent feature of the retirement income system, with uniform effects across most workers irrespective of firm tenure. The way in which contribution limits to voluntary retirement accounts are linked to the amounts saved in workplace pensions may also increase the salience of the treatment effect. While the analysis is limited in that the results are local estimates for unionized workers near the average industrial wage for methodological reasons, this group is an interesting point of focus from a policy perspective.10

Further, in this study I showed that programs that shift consumption from working years to retirement likely help

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10 In Canada and other countries, public pensions provide adequate replacement incomes in retirement to low-income groups, whereas high-income earners have sufficient resources to save adequately. For those in between, public pensions do not provide high replacement rates, but saving inadequacy may arise due to financial constraints or other factors.
individuals save who stand to benefit the most without dis-
advantaging others who save adequately on their own. The
welfare justification for such interventions depends on the
reason why saving inadequacy occurs. Workers with low
education save less than those with high education but
remain passive to such a distortion, whereas workers with
high education reoptimize saving across accounts at low cost.
Thus, active versus passive choice to some extent depends
on human capital. The finding that education affects saving
suggests programs aimed at improving schooling outcomes
or financial literacy may be imperfect substitutes for pro-
grams that directly target savings rates. The efficient mix of
policies that assist or prescribe individuals to save, educate,
and simplify choice (Choi et al., 2005, 2011; Beshears et al.,
2013) remains an unresolved issue with implications for the
future design of retirement income systems.

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