Retirement incentives and Canada's social security programs

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Abstract
Since the mid-1990s in Canada, the employment and labor force participation rates of older men and women have increased steadily. In this study, we document Canadian trends alongside measures of the incentives to continue working at older ages embodied in Canada's social security programs. The social security benefit an individual or couple receives largely depends on their career earnings. We demonstrate that Canada's programs offering means-tested play an important role in the incentives one has to continue working at older ages. While the main pension program (the Canada Pension Plan) offers higher annual benefits when labor force departure and claiming are delayed, every dollar gained by a low-income senior in annual CPP benefits results in a loss of means-tested benefits. We represent this as an implicit tax on continued work. Since the late 1980s, it appears this implicit tax has been declining.

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1. Introduction

The labor force participation rates of older men and women in Canada increased after the mid-1990s, reversing decades of decline. There are several factors that may be driving these trends, including improvements in health and longevity, increasing educational attainment over time, and the greater career attachment of women at older ages (Milligan and Schirle, Forthcoming, Schirle, 2008). Several studies have demonstrated the importance of public pension programs and the retirement incentives contained therein (Baker and Benjamin, 1999a, 1999b, Au et al. 2005, Baker, Gruber and Milligan, 2003, 2007, Schirle 2010).

The purpose of this study is to document trends in employment rates over the years 1980-2016 in Canada alongside measures of retirement incentives embodied in Canada's social security system. We begin by providing some Canadian context, describing the trends in older men's and women's participation in the labor force since 1980 and key components of Canada's retirement system. We then describe how we create measures used to summarize retirement incentives. These measures are then used in simulations for three scenarios. In the first, we consider individuals described by the common synthetic environment (in terms of their age-earnings profiles, mortality, and taxation) used throughout this volume. This allows us to understand cross-national differences in public pension policy while putting aside differences in national environments. Second, we consider a scenario where Canadian age-earnings profiles and mortality rates are used, but the taxation

assumed in the common synthetic environment is maintained. Third, we consider a scenario with a full Canadian environment that also allows the Canadian tax system to be imposed, including changes in taxation over time.

2. Labor force participation of older Canadians

[insert Figure 1 here]

In Figure 1 we present the labor force participation rates for men and women at ages 55-59, 60-64, and 65-69 over the years 1980-2016. Until the mid-1990s, the participation rates of older men declined steadily. For men aged 60-64, participation rates fell 21 percentage points between 1980 and 1996. In the mid 1990s, the trend for older men reverses. For men aged 60-64, 2016 labor force participation rates have nearly reached their 1980 levels. For men aged 65-69, 2016 participation rates (at 32 percent) far exceed those seen in 1980 (at 22 percent). For women, participation rates prior to the mid-1990s follows a very different trend than for men. Among women aged 60-64, participation rates were steady around 25 percent until 1997 and then increase, reaching 49 percent in 2016.

[insert Figure 2 here]

In Figure 2, we present the trends in participation among men and women aged 60-64 within education groups. Among those with relatively low education (having

high school or less, including those with some non-certificate post-secondary education) we see lower labor force participation rates than those with higher education (post-secondary certificates or diplomas, or those with a university bachelor's degree or higher). All education groups, however, show the same general trends over time.

3. Canada's social security programs.

For older Canadians, there are two major components of the social security system that we consider in this study (and are summarized in Figures 3 and 4). First, there are programs designed to guarantee a minimum income for seniors. The main part of this program is Old Age Security (OAS), which provides an old age pension to all individuals over age 65. A history of contributions is not required. However, individuals must meet residency requirements. A 15 percent clawback of OAS benefits is applied to high individual incomes.[1] The Guaranteed Income Supplement (GIS) is a means-tested benefit for those receiving OAS and is clawed back at a rate of 50 percent for taxable income earned by an individual or their spouse (see Milligan and Schirle 2008, 2014 for details). The Allowance, available since 1975, provides additional means-tested benefits for married seniors aged 60-64 whose spouse is an OAS recipient. This means-tested benefit was extended to widows and widowers aged 60-64 in 1985 as a Survivors' Allowance. There have been few

[1] In 2016, the OAS clawback applies to income above CAD $73,756. According to Office of the Superintendent of Financial Institutions (2017, p. 24) 6.9 percent of Old Age Security recipients were affected by the OAS clawback in 2016, with 2.2 percent having their benefits reduced to zero.

substantial changes to these programs since their introduction. There were slight increases in GIS benefit generosity over the 2000s and 2010s. In 2013, the option to defer OAS payments up to age 70, with an actuarial adjustment factor, was introduced. However, take-up of this option is projected to be low.[2]

[Insert Figure 3 here]

[Insert Figure 4 here]

The second major component is represented by the public pensions for which pension payments largely depend on an individual's earnings history and contributions: the Canada Pension Plan (CPP) and Quebec Pension Plan (QPP).[3] The CPP and QPP are funded with a payroll tax applied to earnings above a basic exemption and below the Year's Maximum Pensionable Earnings (YMPE), which was set at $54,900 and increases with average earnings.

Until 1986, the statutory eligibility age (SEA) for the CPP was 65. In determining the relevant earnings history, earnings since 1966 (or age 18) would be considered as part of the CPP contribution period in the basic (full) annual benefit calculation. From this, individuals could drop up to 15% of the lowest earnings from their

[2] See Office of the Superintendent of Financial Institutions (2017, p. 45). The Chief Actuary projects a medium scenario in which 10 percent of males and 7 percent of females chose to voluntarily defer Old Age Security receipt.
[3] The CPP and QPP programs are administered separately but coordinate benefits for individuals who have worked in both Quebec and other Canadian provinces. With few exceptions, the structure of CPP and QPP have been nearly identical.

history before calculating their benefits. The calculation of annual CPP benefits in 1986 or earlier can be summarized as follows:

$$Benefit_t = .25 * \left(\frac{\sum_{j=1}^{N} \max(\frac{Earn_j}{YMPE_j}, 1)}{N} \right) * \left(\frac{YMPE_t + YMPE_{t-1} + YMPE_{t-2}}{3} \right)$$

where *j* indexes earnings years included in the contribution period of N years, and the earnings history is updated using a 3 year moving average of the YMPE. We highlight from this benefit formula that past and current YMPE thresholds, and the length of time since 1966 or age 18, will play an important role in determining the benefits one is eligible for.

The basic benefit formula has changed very little over time. The most substantial change to CPP occurred in 1987, at which time an early eligibility age (EEA) at age 60 was introduced. (QPP made this change in 1984.) The basic benefit (for claiming at age 65) remained the same as above, however early or later claiming of CPP benefits would result in an adjusted benefit (similar to an actuarial adjustment) by 6 percent per year of delayed claiming. The earlier eligibility age also meant that the contribution period for the purposes of benefit calculation was potentially shorter. For example, if someone left the labor force at age 55 and planned to claim CPP benefits as early as possible, the contribution period would only include earnings (including zeros) until age 60. Before 1987, all zero earnings up to age 65 would have been included as part of the contribution period.

Since 1987, there are few changes to Canada's public pensions, as summarized in Figure 3. There have been no changes in eligibility ages for key programs (Figure 4). In the mid-1990s a major review of the CPP's sustainability led to an increase in employer and employee contribution rates, so that the pension became partially pre-funded. At this time there was a small change the formula, so that earnings would be updated using a 5-year moving average of the YMPE rather than a 3-year moving average.

The next modest change to the CPP benefit formula began in 2011 as new adjustment factors were introduced (see Laurin, Milligan and Schirle 2012). When fully phased in for 2016, there is a 7.2% reduction in annual benefits for every year the person claims CPP benefits before age 65 and a 8.4% increase in annual benefits for every year the person claims CPP benefits after age 65. Other changes to social security programs do not substantially change the way benefits are determined, although there is some increase in generosity for the lowest income seniors.

[Insert Figure 5 here]

In Figure 5 we summarize the participation of men (Figure 5a) and the average benefits received by participants from each program (Figure 5b), with analogous figures for women as well (Figures 5c and 5d). The participation rates of men in Canada's OAS and GIS programs (Figure 5a) has always been near 100%, especially by age 70. Delays in claiming OAS between ages 65 and 69 reflect a need to apply for

the benefit (as opposed to auto-enrolment) prior to 2013. The average OAS and GIS benefits (Figure 5b) has declined over time, despite maximum benefits remaining fairly constant (or becoming more generous) over time. This will reflect reduced reliance over time on GIS benefits as the private retirement income and earnings of individuals age 65 and over increase over time. The participation of men in the CPP and QPP increased over the 1980s and early 1990s, as did average benefits received, as individuals would have longer contribution periods since 1966. We see very little changes for men after the mid-1990s.

For women, however, we see important changes in CPP and QPP over time as more women have the work histories required to qualify for benefits. The trends in CPP/QPP participation and average benefits for women in Figures 5c and 5d largely reflect increases in women's labor force participation and career development at younger ages.

For most Canadians, there is but one pathway into retirement. CPP and QPP offer the only social security program benefits that depend on an individual's work history and offers monthly benefits for the rest of a person's life. Claiming of CPP and QPP does not require leaving employment permanently. There is a long-term disability benefit available (CPP-Disability) to individuals unable to work before age 65, however at age 65 a person will lose their CPP-Disability benefit and be moved into the CPP retirement benefits. As Milligan and Schirle (2016) show, the CPP-Disability program does not create incentives distinct from the CPP retirement

program. Other programs that supplement income tend to be short-term or provide very low benefits. For example, Canada's Employment Insurance program provides income (with up to 55% replacement) for several months to individuals who are laid off from their jobs while they search for new employment. This would not cover someone who quite their job or was not actively searching for work. Provincial social assistance programs provide a small means-tested (and often asset-tested) benefits, with benefit amounts depending on family status and the ability to work. In this context, the main path to retirement for us to consider is a full departure from the labor force, claiming CPP and QPP benefits as soon as one reaches the early eligibility age.

4. Measuring incentives in the Canadian system

4.a. Incentives measures

In what follows, we create several measures to summarize the evolution of Canada's social security programs for older individuals, and the incentives to leave the labor force embodied therein. The measures created here are common to the literature and are structured similarly to those in Milligan and Schirle (2008). To begin, we evaluate the benefits a person would expect to receive from social security programs for the rest of their lives, as those benefits depend on the policy environment in place at the time they are forming expectations, the timing of their

departure from the labor force, and the time at which they initiate a claim for social security benefits.

As a first measure, we consider the extent to which income from the social security programs will replace career earnings. To do this, we create a replacement rate represented by

$$RR_{l|R} = {}^{B_{71|l,R}}\Big/_{Earn_{55}}$$

where *l* denotes the legal situation (year) when retirement plans are being formed, *R* denotes the age at which the person plans to leave the labor force (and claim benefits as soon as possible), and the Benefits (*B*) net of tax received at 71 are evaluated relative to the earnings (*Earn*) net of tax at age 55 that the individual could have earned.

To summarize the value of benefits received from the social security programs over an individual's lifetime, we construct a social security wealth measure (SSW) corresponding to the measures used in other chapters of this volume. This is given by:

$$SSW_{S,l}(R) = \sum_{t=R}^{T} B_{t,k,l}(R) \cdot \sigma_{S,t} \cdot \beta^{t-S} - \sum_{t=S}^{R-1} c_{t,l} \cdot Y_t \cdot \sigma_{S,t} \cdot \beta^{t-S}$$

Here, the individual, planning at age *S*, and given the legal environment in year *l*, will consider the social security contributions they will continue to make while working between ages *S* and *R-1* (stated here as a proportion *c* of earnings *Y*). They will also consider the net benefits (*B*, after tax) they receive while retired from ages *R* to their last age *T*. The individual discounts future benefits using a discount rate *r*, where $\beta=(1/1+r)$ and for their probability of survival to age *t* conditional on having lived until age *S*.

Postponing labor force departure (*R*) reduces SSW to the extent the individual gives up a year of benefits (B_t) from CPP (and potentially GIS) and pays contributions (*c*) if they continue working. Postponing labor force departure (*R*) may increase SSW, however, if a later R results in higher annual benefits in later years. In the Canadian system, the mechanisms affecting the impact of delayed retirement on SSW are the actuarial adjustment applied to CPP benefits when retirement is delayed (since 1987, and steepened in recent years) and an improved average earnings in the CPP benefit formula as more zero and low earnings periods can be removed from the earnings average. Important to keep in mind, however, is that for many low-income seniors, the boost from the CPP actuarial adjustment is dampened because any extra benefits from CPP due to delayed claiming will reduce benefits provided by the means-tested GIS program.

To consider the incentives Canadians have to leave the labor market and claim CPP benefits, we can evaluate the extent to which SSW increases or decreases by

delaying labor market departure (R) for one year – known as a one-year accrual (ACC). We define the implicit tax on continued work for one more year after age R as

$$ITAX_{l,R} = -\frac{ACC_{l,R}}{Y^{Net}}.$$

where Y^{Net} represents the income that could be earned during the year of delayed labor force departure. When the implicit tax is negative, social security wealth can be gained with delayed labor force departure and should be viewed as a reward for continued work. A positive implicit tax, however, indicates a penalty for continued work.

4.b. Environments and assumptions

i. General assumptions

In mapping out the incentives and disincentives for continued work in Canada, we want to consider different types of individuals. This allows us to understand the heterogeneity of incentives across the Canadian population. Within each stylized environment described below, we consider individuals with low, medium, and high age-earnings profiles. Given the means-tested benefits available in Canada's social security programs, we will need to assume individuals either have no private retirement income (such as income from an employer-sponsored pension plan) or they have some income. In the latter case, we assume private retirement income replaces 50 percent of earnings in the last year of work.

We also consider the situation of a single man, single woman, or a couple (headed by a man or a woman). Here, men and women have different age-earnings profiles and different survival probabilities. All individuals discount the future at a rate r=0.03. For couples, we assume a female spouse is 3 years younger than her male spouse and the spouses have the same earnings level (low, medium, or high). In this study, we do not consider couples' joint decision-making process. Rather, an individual will assess their own labor force departure and hold constant the decision of their spouse. The spouse is assumed to leave the labor force at age 65 and immediately claim benefits from social security programs.

We apply different scenarios for earnings histories and for taxes. Some of these scenarios use earnings, taxes, or mortality that are common across the countries in this volume, while others use Canada-specific earnings and taxes. These calculations reveal what aspects of retirement incentives are driven by Canada-specific rules, rather than Canadian trends in earnings, taxes, or mortality.

We consider these stylized individuals in the legal environment from 1980-2016, as defined in the Canada Pension Plan Act and Old Age Security Act in force at the time. Planning is done from the perspective of a 55 year old that is considering labor force departures between ages 55 and 69. Given the nature of potential retirement paths in Canada, we assume individuals will claim CPP benefits as soon as possible after leaving the labor force. We also assume individuals will apply for OAS, GIS and other means-tested benefits as soon as they reach the first age of eligibility.

ii. Common synthetic environment

Individuals described in this environment have earnings profiles that represent low, medium, and high skills groups based on data from the USA, Germany and Italy (as described in Börsch-Supan et al., This Volume). The profiles do not change over time. For time-invariant common survival rates of men and women, an average of the EU28 countries in Eurostat is used and adjusted to reflect differentials in life expectancy across skill groups. Canadian payroll taxes are based on the OECD tax data base (OECD 2018) and refer to all income taxes and employee and employer social security contributions. For Canada, the income tax rates applied to low, medium, and high skill groups are 26.9%, 31.7%, and 33.3%, respectively, and contribution rates are 11.6%, 11.8%, and 9.7% respectively. We recognize the contribution rates are higher than contribution rates for CPP (at 9.9% of earnings up to the YMPE in 2016), reflecting the inclusion of Employment Insurance premiums in the OECD estimates.

iii. Canadian environment with OECD tax

Individuals described in this environment have age-earnings profiles that represent low, medium, and high-educated groups based on the Canadian Income Survey, 2014. Low educated represents individuals who have completed high school or less,

and includes those with some post-secondary training without a diploma or certificate. Medium educated represents individuals with a post-secondary diploma or certificate less than a Bachelor's degree. High educated represents those with a Bachelor's degree or more education. Age and year specific survival probabilities of men and women are based on data from the Human Mortality Database (2015). The survival probabilities are not adjusted to account for longevity differences across education groups. In this environment we continue to use the OECD tax estimates from the common synthetic environment. Simulations from this environment will demonstrate how different earnings profiles and survival probabilities may affect our estimates of incentives to continue work, without adding variation that comes from tax provisions.

iv. Canadian environment with Canadian taxes

In this environment, we use the same age-earnings profiles and survival probabilities as described above for the Canadian environment. For taxes (and CPP contributions), we calculate tax liability using the Canadian Tax and Credit Simulator (Milligan, 2016). For each year 1980-2016, most aspects of the federal and provincial income tax environment are accounted for in the CTaCS program. We have assumed the individuals in our simulations live in the province of Ontario. Notably, apart from some relatively small tax credits that change over time, the Canadian income tax system taxes income from earnings, employer-sponsored pensions, CPP, and OAS at the same rates. Among the programs we consider, only

the means-tested benefits (GIS and Allowance) are not subject to income tax. Comparing results from this set of simulations to those in the Canadian environment with time-invariant OECD taxes will help demonstrate the influence of the income tax system in forming incentives to continue working.

5. Results

In the following sections, we present results of the simulations used to describe the incentives to continue working in Canada. We focus our attention on a medium earner that does not have private retirement income, but offer several other examples to demonstrate the importance of various social security program parameters.

5.a. Common synthetic environment

In Figure 6, we present the income replacement rates for medium education couples (with a female head) that do not have a private retirement income. Each of the lines represents the replacement rate that results when leaving the labor force at ages 55-69.

[insert Figure 6 here]

Consider first the replacement rates in Figure 6 based on the social security programs in 1986 or early. Recall that before 1987, age 65 was the earliest age at which a person could claim CPP benefits. For those considering retirement options in 1986 or earlier, each additional year of work between ages 55 and 65 can be used to replace a zero in their earnings history with some positive earnings, thereby raising their average earnings in their benefit calculation and their replacement rate. For delayed labor force departure after age 65, more low-earnings years can be removed from the contribution period when estimating average earnings, further raising the replacement rate when individuals continue working.

In 1987, the option of early claiming at age 60 is introduced, as are the adjustment factors for earlier or later CPP claims. Here, the lines representing replacement rates for each age of labor force departure between 60 and 69 fan out, illustrating the importance of adjustment factors.

After early take-up of CPP at age 60 is introduced, those who retire between ages 55 and 59 only need be concerned with zeros in their history before claiming CPP benefits at age 60. In our example, the 55 year old who is planning in 1987 will have a 25 year contribution window to consider (and be allowed to drop nearly 4 years from their history). Notice this drop-out provision allows for more years to be dropped with each policy year. A 55 year old who is planning in 2016 will have a 42 year history to consider (if taking up benefits at age 60), allowing them to drop out 6.3 years of low earnings before finding an average earnings. Continued work

between ages 55 and 59 now has a lower (or zero) payoff in terms of this replacement rate.

There are important interactions with the GIS clawbacks that can be seen in Figure 6. In the policy year 2016, we see very small gains in the replacement rate when labor force departure is delayed between ages 60 and 65, and much larger gains for later continued work. With delayed labor force departure, individuals may gain benefits in terms of higher average earnings, and through the application of the adjustment factors. However, when the female spouse is initiating CPP benefits between ages 60 and 65, those benefits will be relatively low in magnitude and the couple will be eligible for the GIS after age 65. For every dollar they gain in CPP payments for delayed claiming, they will lose 50 cents of their eventual GIS payment. When retiring at ages over 65, the couple's CPP income is high enough that they are no longer eligible for the GIS. As such, by delaying their benefit claim they will enjoy the full adjustment of CPP benefits without GIS clawbacks. Note that in the mid-1990s, the couple phases out of GIS eligibility at much earlier claiming ages, so that there are larger increases in replacement rates for delayed benefit claiming than in 2016.

In Figure 7, we present similar estimates for single men (7a) and single women (7b). Overall, the patterns are quite similar. Though difficult to see in the graphs, the differences in replacement rates increase slightly between ages 60 and 69 due to the introduction of steeper actuarial adjustments in 2011 (which also applied to couples

in Figure 6). Replacement rates tend to be lower for single men than couples, and highest for single women, which in part reflects the maximum benefits available from social security programs relative to each type's earnings while working. Over the period considered, single men and single women will qualify for GIS benefits at each age of labor force departure, with the exception of single men at age 69 in some years. In Figure 7a, for example, for single men considering retirement in 2015, there is a jump in replacement rates between ages 68 and 69. Similar to our couples in Figure 6, this is because the additional CPP benefits received by continuing to work one more year makes the individual ineligible for GIS benefits.

[insert Figure 7 here]

Most of the differences across individuals with respect to their replacement rates will reflect differences in average earnings over one's lifetime, and differences in their incomes in retirement, which determines their eligibility for GIS. Figure 8 is intended to demonstrate this. We offer two further examples, with (a) a single man who had high earnings and enters retirement with a private retirement income, and (b) a single man who had low earnings and no private income retirement income. In the first case of the high earner, there is more to gain over age with respect to the replacement rates because this person is not eligible for the GIS at any point. The replacement rates are relatively low because their high career earnings far exceeded the upper threshold for earnings that are covered by CPP, and OAS benefits are a fixed amount. For a lower earner (Figure 8b), the replacement rate is much higher,

but the low earner has less to gain when delaying retirement because any adjustment to CPP benefits is countered with a reduction in GIS benefits.

[insert Figure 8 here]

In Figure 9, we present the social security wealth estimated in the common environment for medium education couples (a), single men (b) and single women (c). For a couple headed by a female (so that we are considering the choice of when the woman stops working and claims benefits), before 1987 there is no increase in social security wealth for continued work between the ages of 60 and 64. This is primarily because there are no actuarial adjustments or changes to the assessed contribution period when labor force departure is delayed. After age 65, the couple gives up a year of CPP benefits if they delay claiming and are not adequately rewarded in terms of a higher CPP benefit to compensate them for the year of lost benefits. As such SSW declines after age 65.

[Insert Figure 9 here]

After 1987, among couples (in Figure 9a) there are slight increases in SSW for delayed retirement until age 62. After that, the additional benefits provided for delayed retirement are inadequate to compensate for the year of lost benefits. SSW falls with delayed retirement thereafter. We note the pattern is similar, but slightly different for a couple headed by a male (not shown here). From this perspective,

with different joint survival probabilities and the continuation of the younger spouse to work until age 65, SSW increases with continued work until the male head reaches age 65 and then declines for any later retirement.

For singles (Figures 9a and 9b), the overall patterns are similar except that (after 1987) we can clearly see the SSW declines steadily after age 60. Note the larger declines in SSW after age 65 than before age 65. This difference results from the fact that delayed benefit claiming before age 65 requires foregoing a year of CPP benefits. Delayed benefit claiming after age 65, with continued earnings, will require foregoing a year of CPP benefits and a year of GIS benefits.

In Figure 10, we present the one-year accrual of SSW that corresponds to each of the panels in Figure 9. Figure 10b, representing the accruals of single men makes the importance of GIS benefits clearer. Here, from ages 60-64 we see a steady negative accrual, representing the loss in CPP benefits for each year of continued work. At age 65, the negative accrual jumps downward, representing the additional loss of GIS benefits. With each year of continued work after age 65, there are smaller and smaller amounts of GIS benefits to forego since additional CPP benefit amounts for delayed claiming will reduce the GIS benefits the man was eligible for. In Figure 11, we present the corresponding implicit tax rates for a single man, representing the accruals in Figure 10b relative to the earning a person could have if they continued to work an additional year. We repeat these in Figure 12 for a single man by age and select years. The importance of policy parameters changing over time are made

slightly clearly here. In 1980 (Figure 12), implicit tax on continued work is negative (or zero) until age 65 when individuals are first eligible. Over these ages in 1980, only the opportunity to replace years of zero earnings in their contribution period will create incentives to continue working. After age 65, they lose years of CPP benefits with no actuarial adjustment for any years of continued work. After 1987, the loss of CPP benefits for continued work after age 60 results in a positive implicit tax on work that jumps at age 65 as individuals give up CPP and GIS benefits. The small changes in CPP policy parameters after 1987 have nudged the system towards being more neutral to continued work at older ages.

[Insert Figures 10, 11 and 12 here]

5.b. Canadian environments

We repeat the simulations using the Canadian environment (with age-earnings profiles and survival rates based on Canadian data) in the case where (a) we continue to use a time-invariant approximation to the tax rate using the OECD tax database and (b) we allow taxes to change over time and reflect existing tax policy at the time planning takes place.

[Insert Figure 13 here]

The resulting replacement rates are provided for single men with medium career earnings in Figure 13. When compared to rates presented for the common environment (in Figure 7a), the profile of replacement rates over time and across potential ages for labor force departure is nearly identical in the Canadian environment with OECD taxes (Figure 13a). When we introduce the Canadian tax system (Figure 13b), the general shape of the replacement rates profile remains the same. However, replacement rates generally appear higher, suggesting the OECD tax rates do not adequately reflect the progressivity of the Canadian tax system. Notably, Ontario's provincial and Canada's federal tax calculations include a substantial non-refundable tax credit for any individuals over the age of 65, effectively exempting a large part of income at older ages from the tax system. In this example, there also appears (since 1987) slightly larger increases in replacement rates with each age of continued work between ages 60 and 64 when representing the Canadian tax system. In part, this will reflect a larger part of benefits received at older ages coming from the non-taxable GIS program rather than taxable CPP and OAS benefits. For those benefits that are taxable, additional CPP income will enter brackets in which higher (positive) tax rates are applied. As such, the increase in replacement rates for labor force departure after age 64 in this example is smaller.

The corresponding social security wealth and implicit tax rates for a single man in the Canadian environment are presented in Figures 14 and 15. Both examples in Figures 14a and 14b reinforce the point that the loss of a year's CPP benefits

associated with continued work is not balanced by the increase in annual benefits received over future years. Differences between Figures 14a and 14b illustrate the importance of accounting for taxation. We noted that as we move toward 2016, the amount of SSW lost due to a year of continued work between ages 60 and 63 falls. We align this with large expansions of the non-refundable tax credit associated with income over age 65, so that any gains in annual benefits received over one's lifetime are made more valuable relative to the year of lost benefits for continued work at these earlier ages.

[Insert Figure 14 AND 15 here]

6. Implicit tax rates and employment rates

The broader goal of this study is to develop a better understanding of the decisions to remain employed, or not, at older ages as those decisions relate to parameters of our social security programs. In this section, we relate the implicit taxes rates that result from our simulated Canadian environment with Canadian taxes to observed employment rates over the 1980-2016 period. In Figure 16, we present this relationship between the employment rates of men (Figure 16a) and women (Figure 16b) by education and 5-year age group and the average implicit tax rates we estimate for single men and single women within each corresponding age and education group.

[Insert Figure 16 here]

For both men and women, there is a clear negative relationship between the employment rates at older ages and the implicit tax rates on continued work – when we see higher tax rates, we see lower employment rates. Much of this relationship, however, characterizes differences across education groups, reflecting differences in lifetime earnings: those with the lowest lifetime earnings generally have higher implicit tax rates. Moreover, older groups who tend to have the higher implicit tax rates on continued work would generally have lower employment rates given their health and preferences for leisure. However, even within groups there is some indication of a negative relationship between the implicit tax rates and employment rates worthy of further investigation.

7. Conclusions

The employment and labor force participation rates of older Canadian men and women have increased substantially since the mid-1990s. In this study, we have illustrated how Canada's social security program has evolved over the 1980-2016 period alongside these trends in employment. In particular, we develop estimates of the implicit tax on continued work, representing the extent to which a person can gain or lose lifetime benefits from social security programs if they delay their departure from the labor force.

Overall, we show that the benefits a person can receive – either annually or over their lifetime – will largely depend on their earnings history. For example, high career earners are eligible to receive the highest CPP benefits and thus the highest social security wealth. However, given the modest level of maximum benefits the replacement rates of high career earners are lower than those with low career earnings.

One of our main messages is that the means-tested benefits available to seniors play an important role in the incentives one has to continue working at older ages. For each year of delayed departure from the labor force, and delayed claiming of CPP benefits, individuals will gain in annual social security benefits from the actuarial adjustment applied to CPP. However, for every dollar gained in annual CPP benefits, low-income seniors will lose 50 cents of their GIS benefits, reducing the reward to continued work. For those with low career earnings, this results in a situation where each year of continued work results in a loss of social security wealth and high implicit tax rates. The relationship we find between the implicit tax rates for continued work and observed employment rates at older ages is worthy of further investigation.

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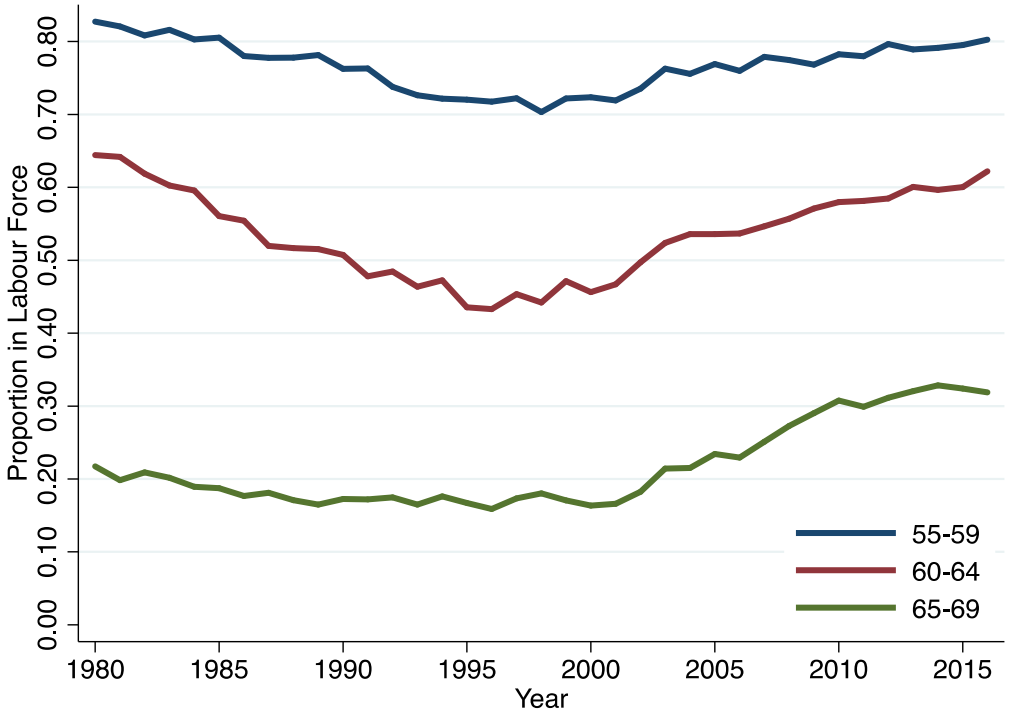
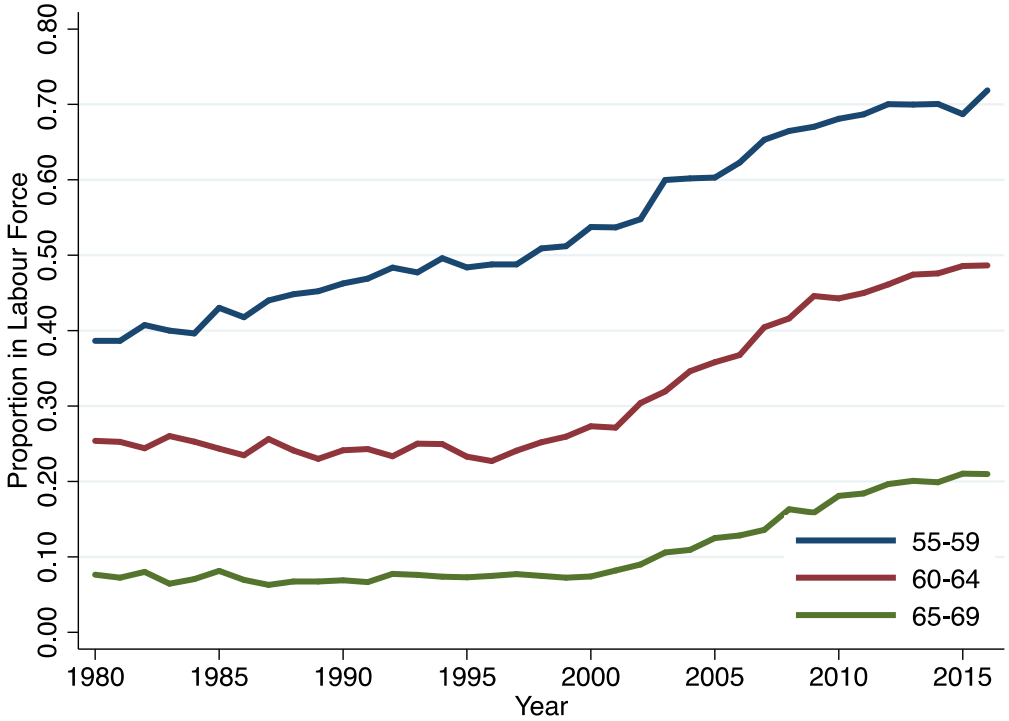
Figure 1. Labor force participation rates by age and gender

1.A. Men



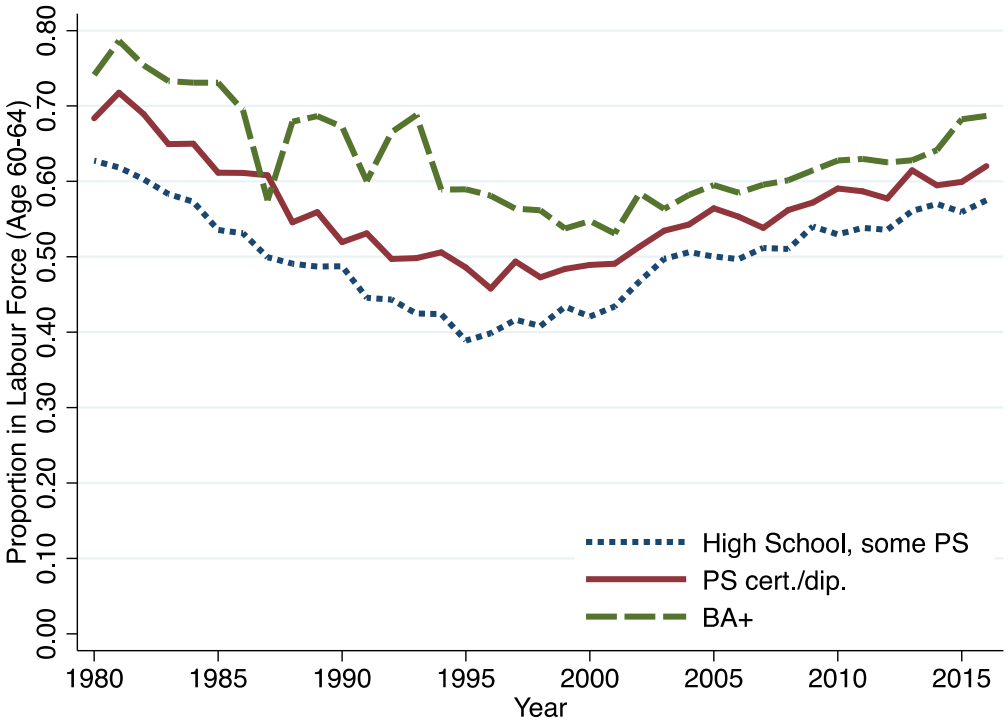
1.B. Women



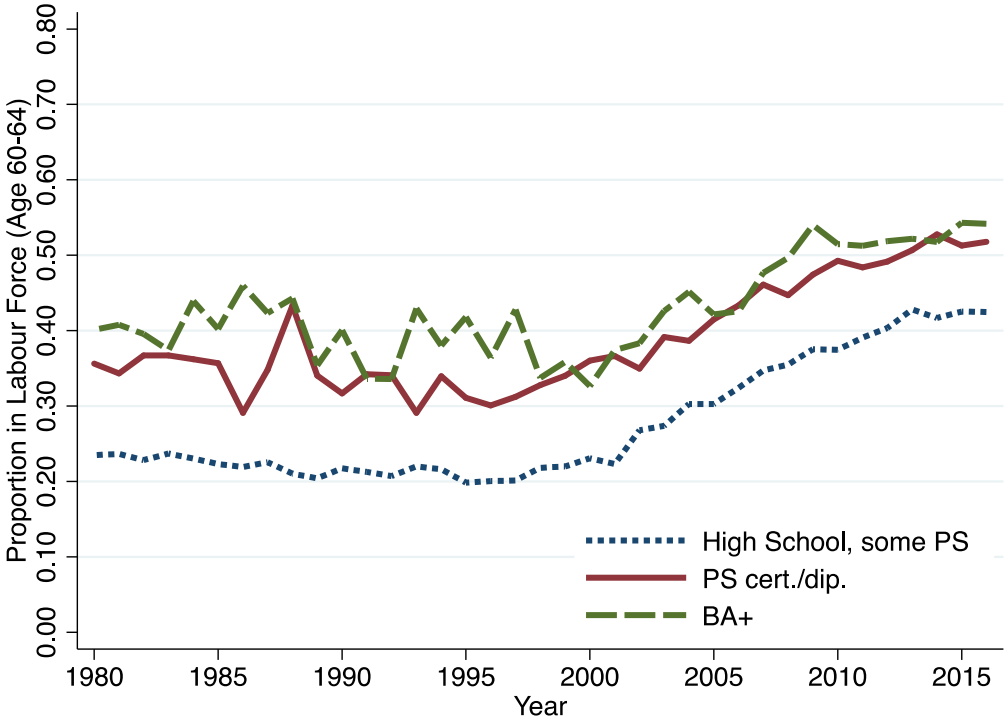
Source: Authors' tabulations from the Labour Force Survey

Figure 2. Labor force participation rates by education and gender (age 60-64)

2.a. Men



2.b. Women



Source: Authors' tabulations from the Labour Force Survey

Figure 3. Timeline of reforms to public pensions, 1980-2016

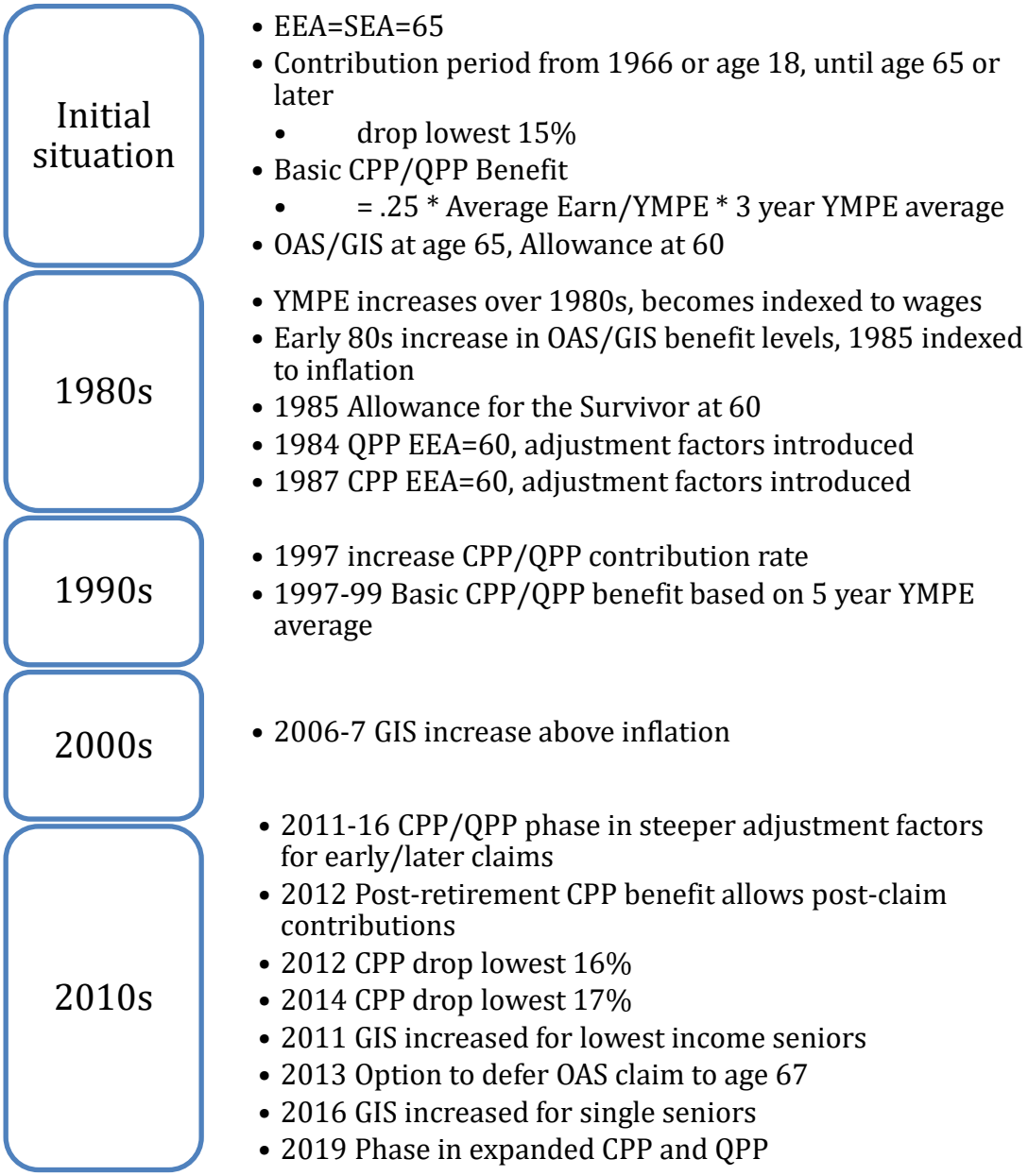
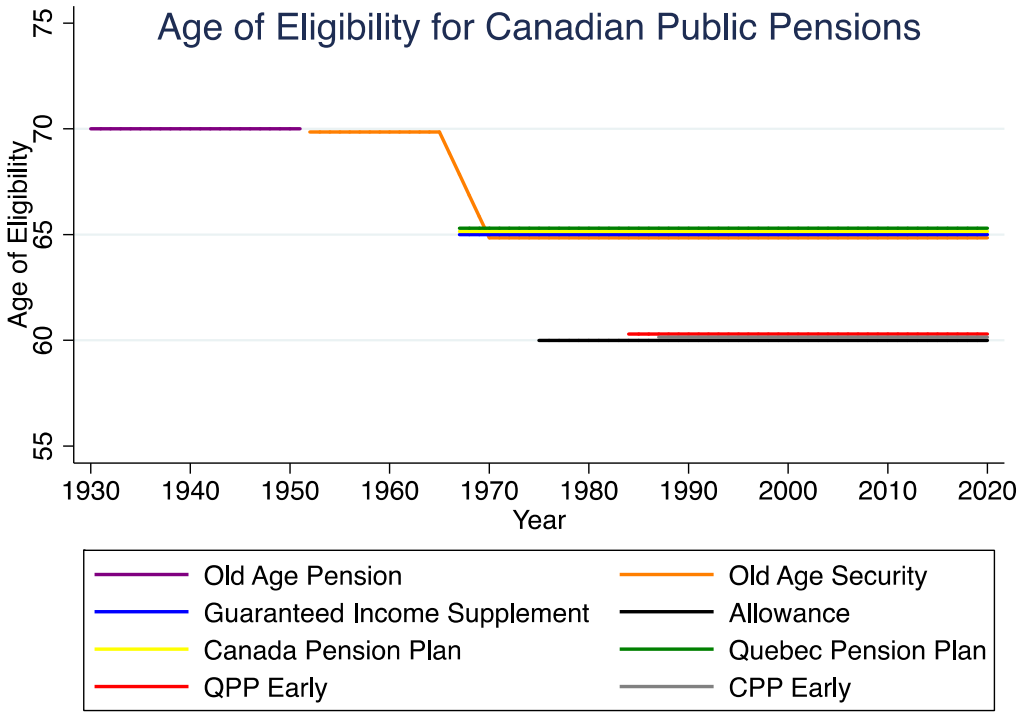


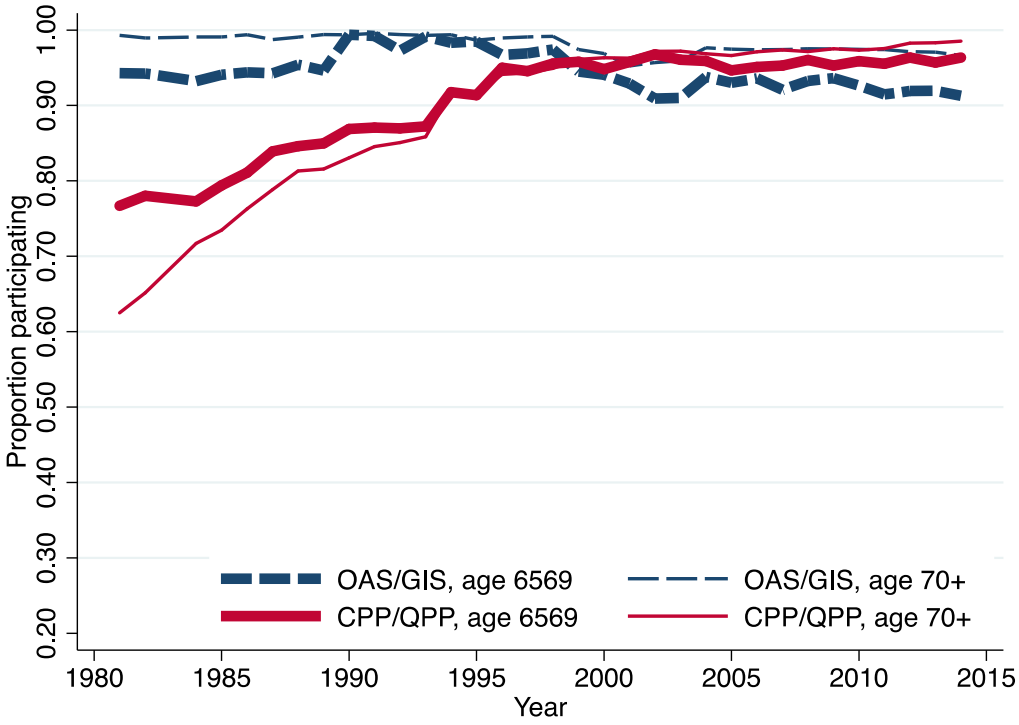
Figure 4. Eligibility ages for retirement income programs



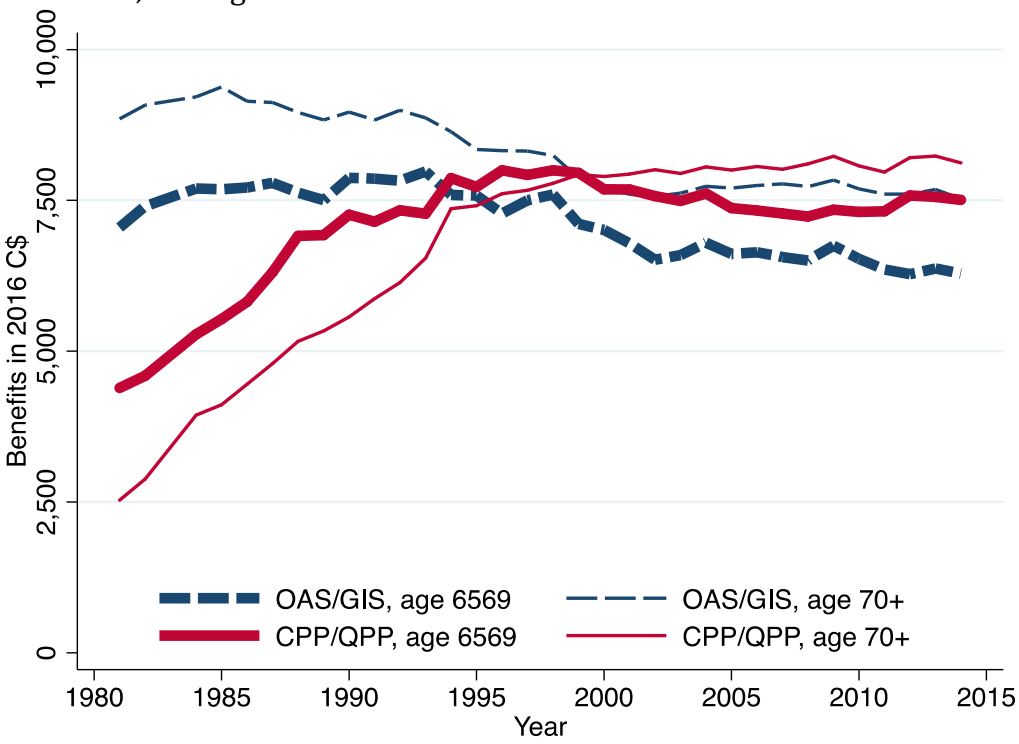
Source: Authors' tabulations

Figure 5. CPP/QPP and OAS/GIS receipt and average benefits, by gender

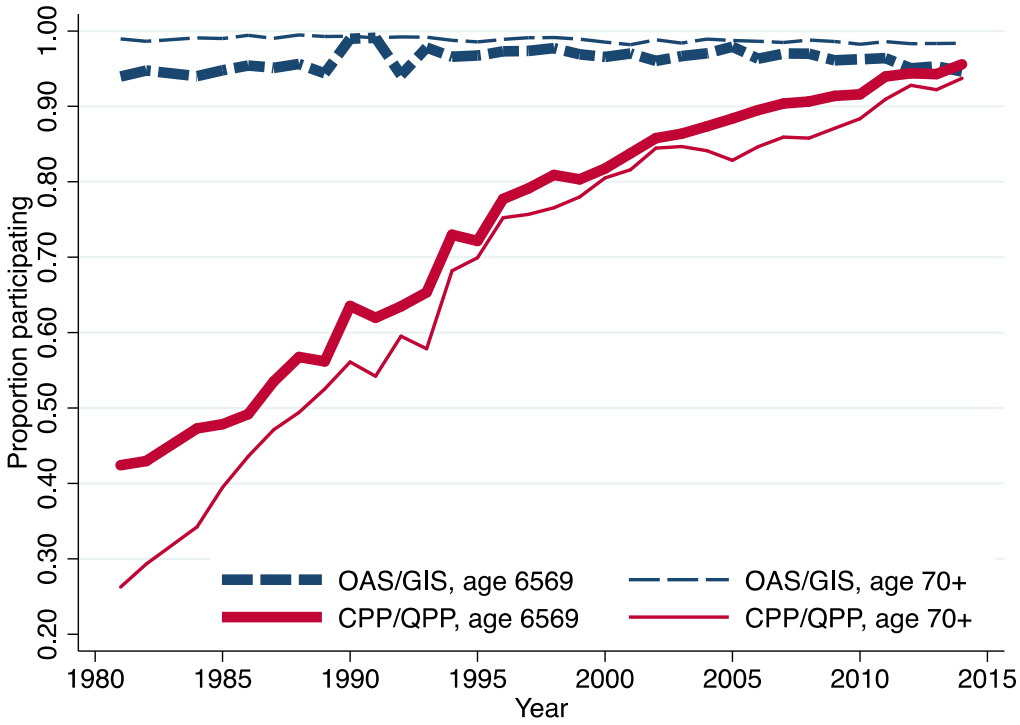
5.a. Men, Participation



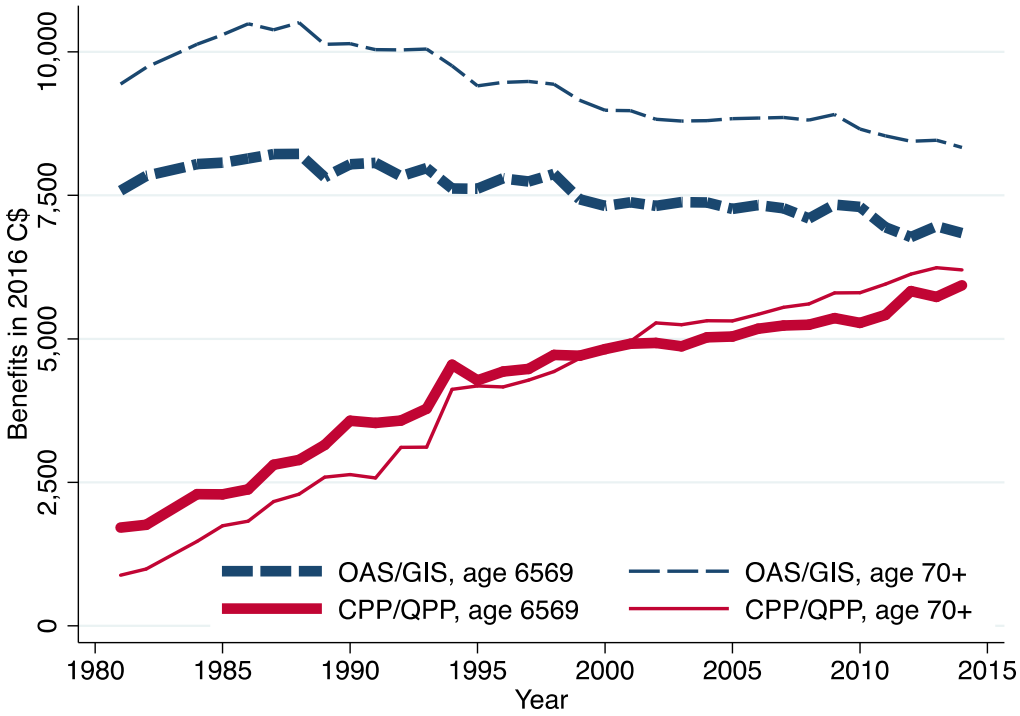
5.b. Men, Average benefits



5.c. Women, Participation

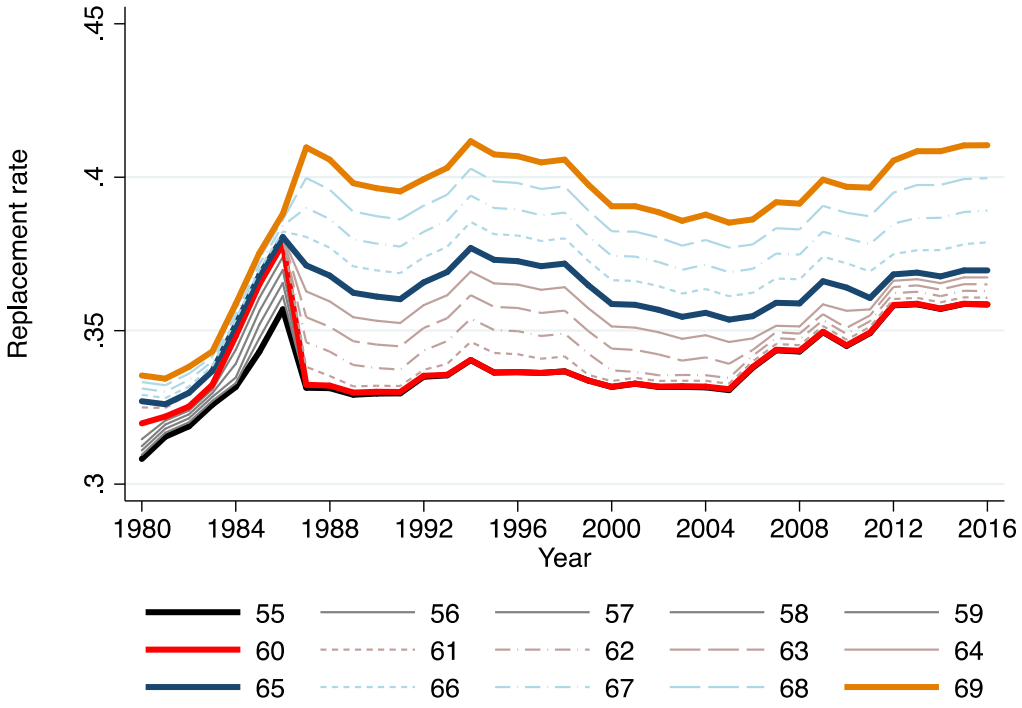


5.d. Women, average benefits



Source: Authors' tabulations from the Survey of Consumer Finances, Survey of Labour and Income Dynamics and the Canadian Income Survey

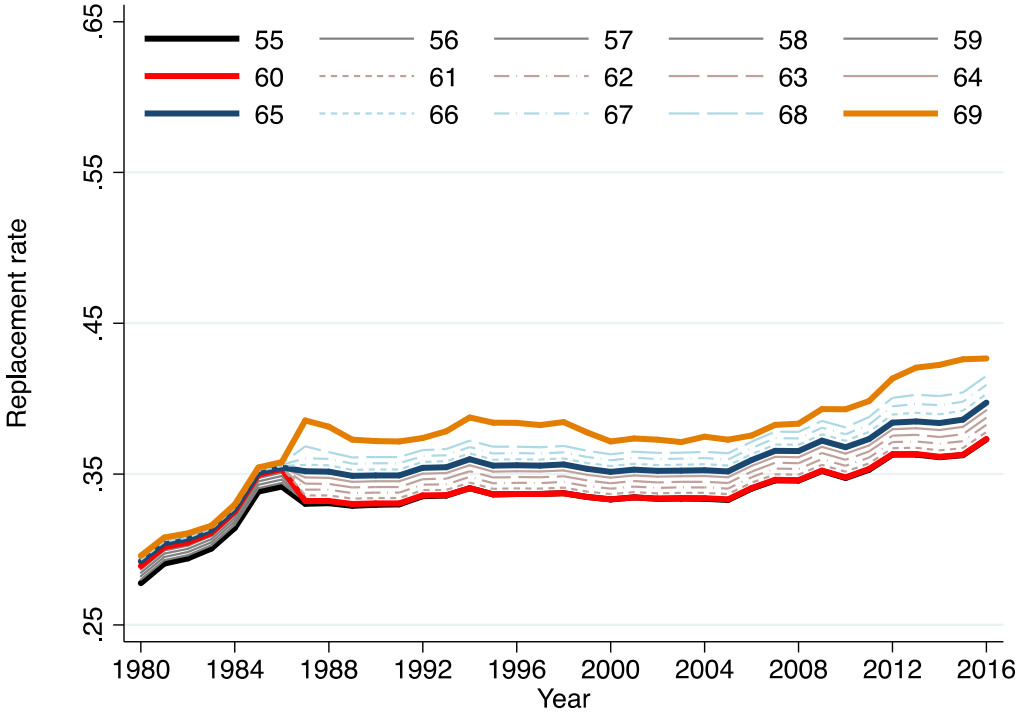
Figure 6. Replacement rates in the common environment, medium education couples



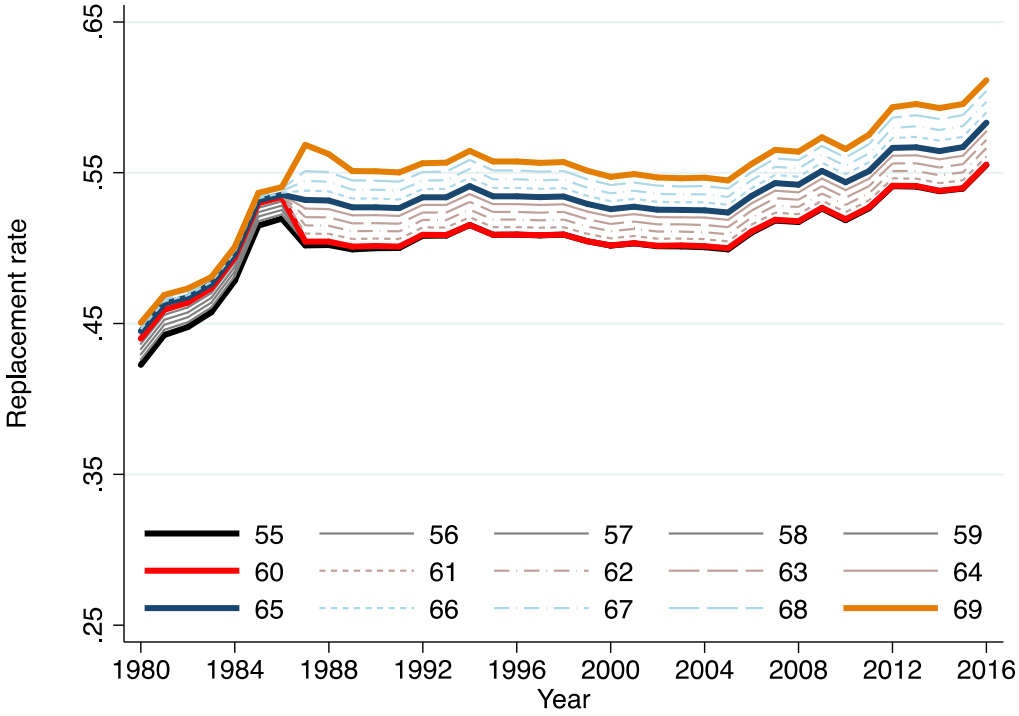
Note: Replacement rates are measured as the benefits at age 71 as a portion of earnings at age 55. Couples are assumed to have no private retirement savings.
Source: Authors' tabulations

Figure 7. Replacement rates in the common environment, medium education singles

7.a. Men



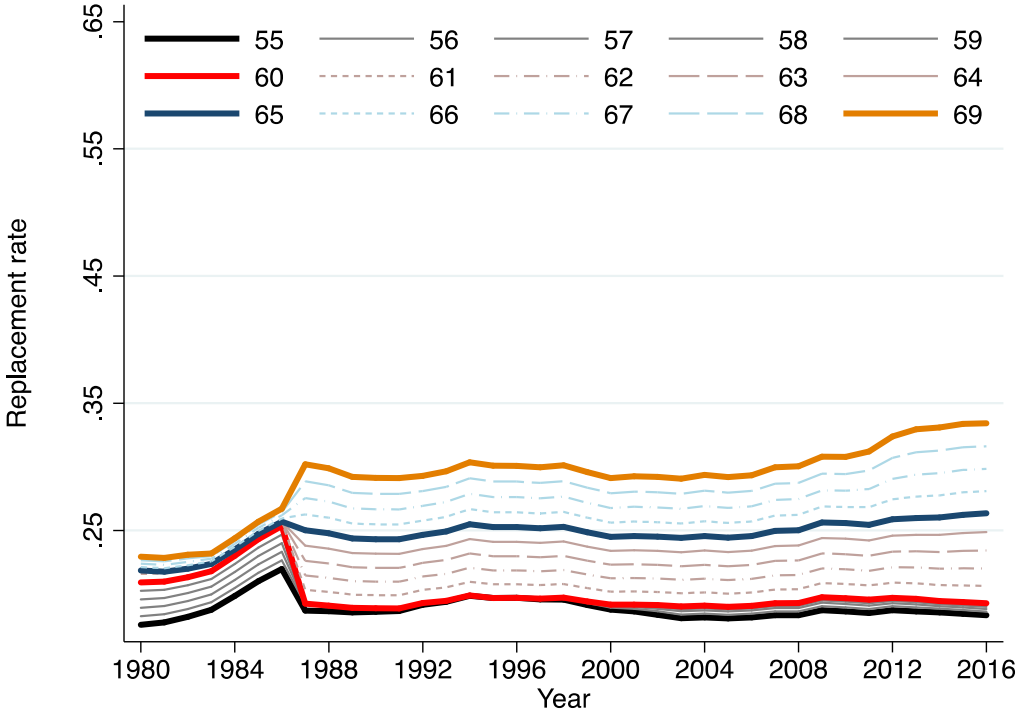
7.b. Women



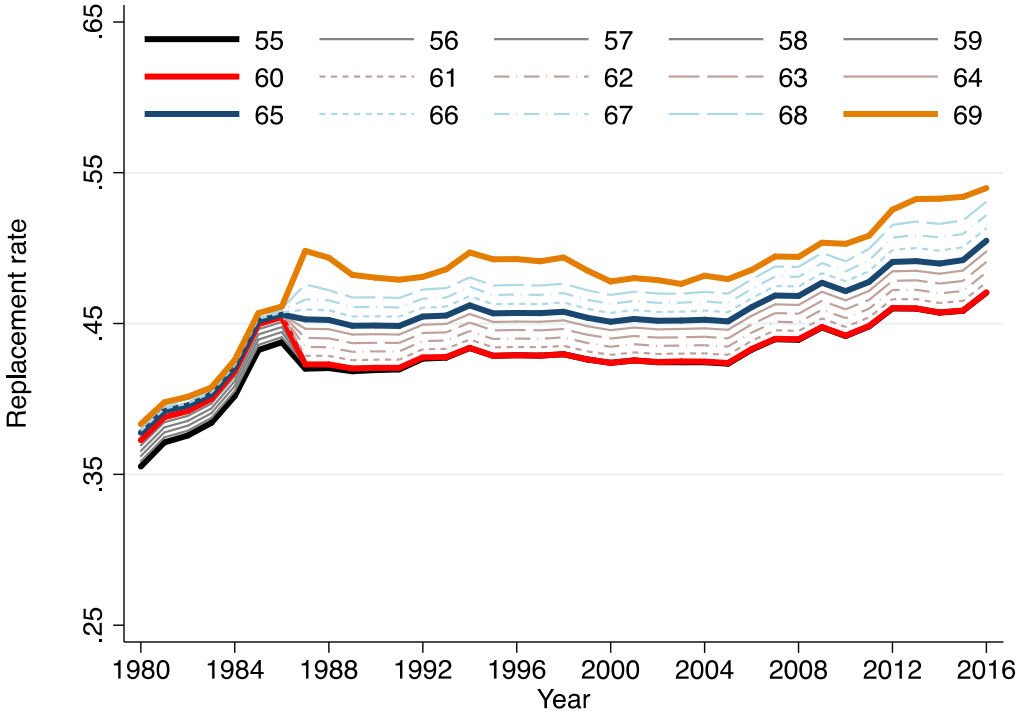
Note: Replacement rates are measured as the benefits at age 71 as a portion of earnings at age 55. Individuals are assumed to have no private retirement savings.

Figure 8. Replacement rates in the common environment, single men

8.a. High education, with private retirement income



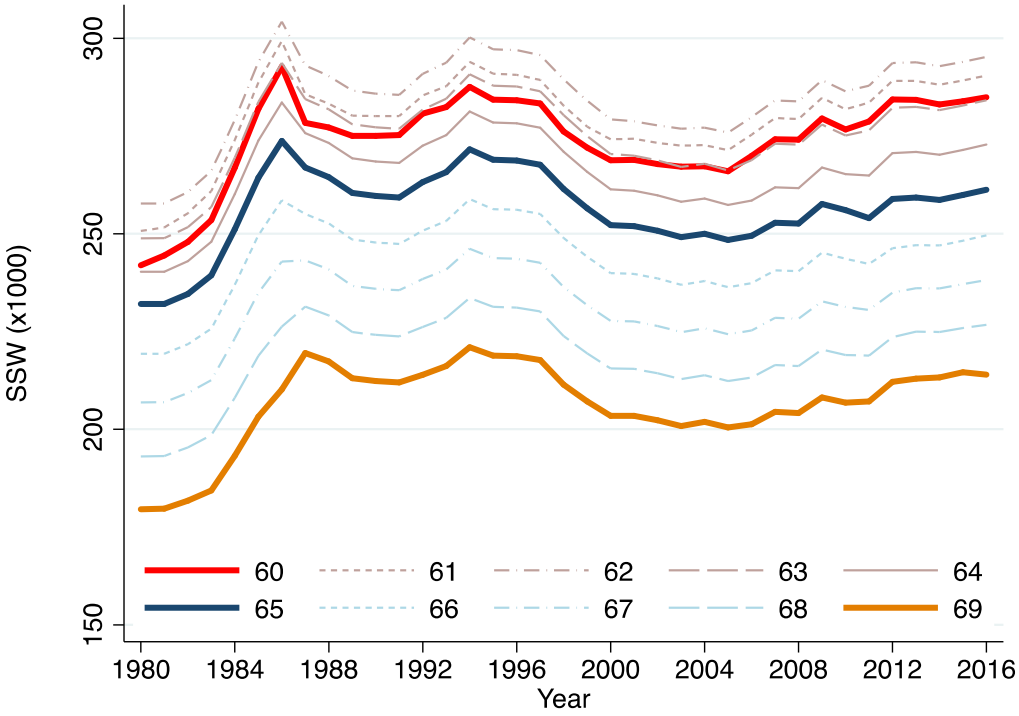
8.b. Low education, no private retirement income



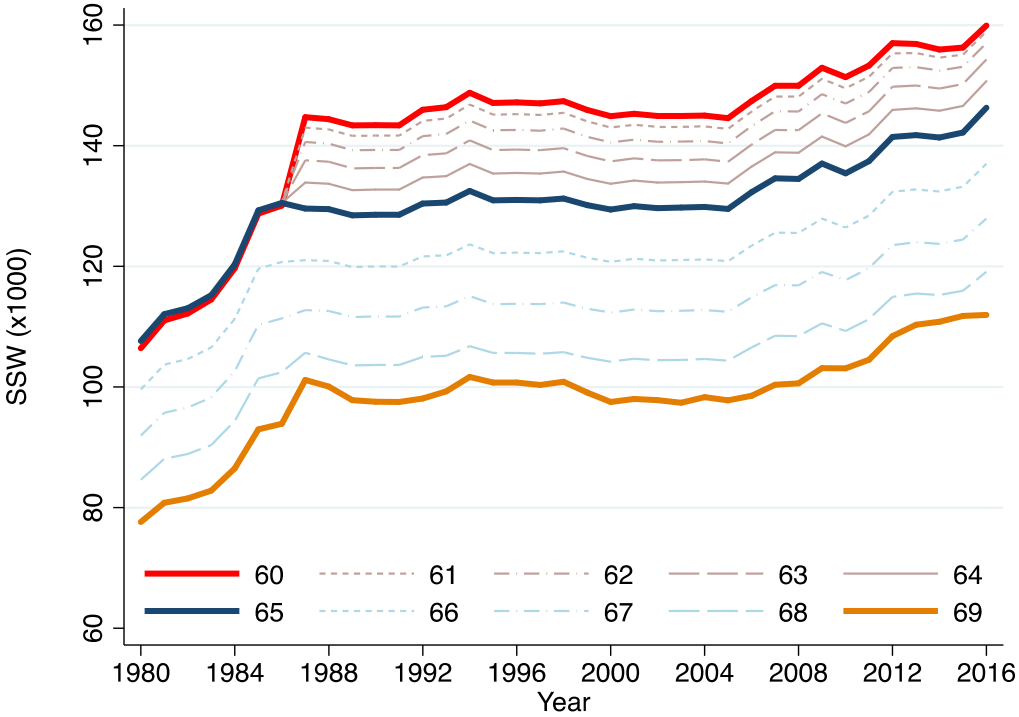
Source: Authors' tabulations

Figure 9. Social Security wealth in the common environment, medium education

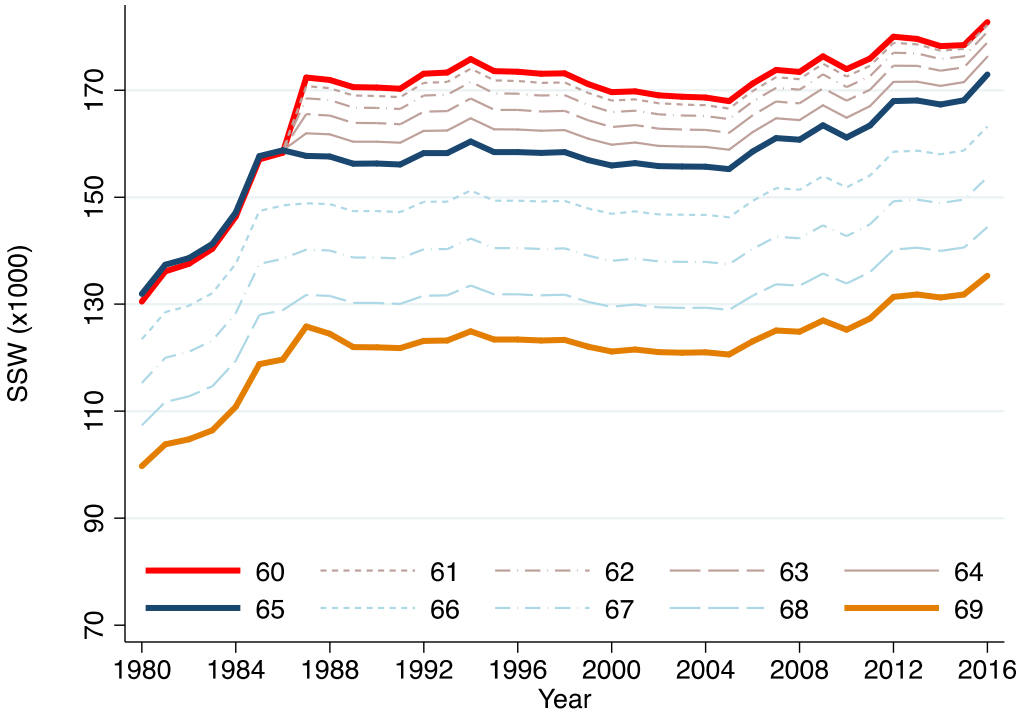
9.a. Couple (female head)



9.b. Single men



9.c. Single women

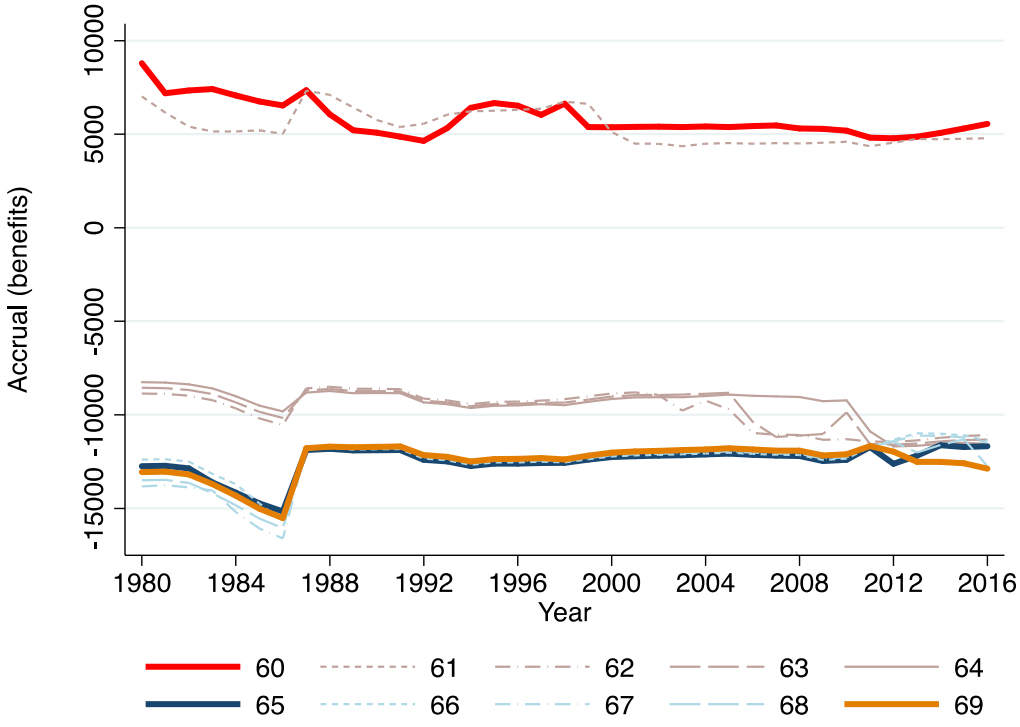


Notes: Medium education and no private retirement income are assumed.

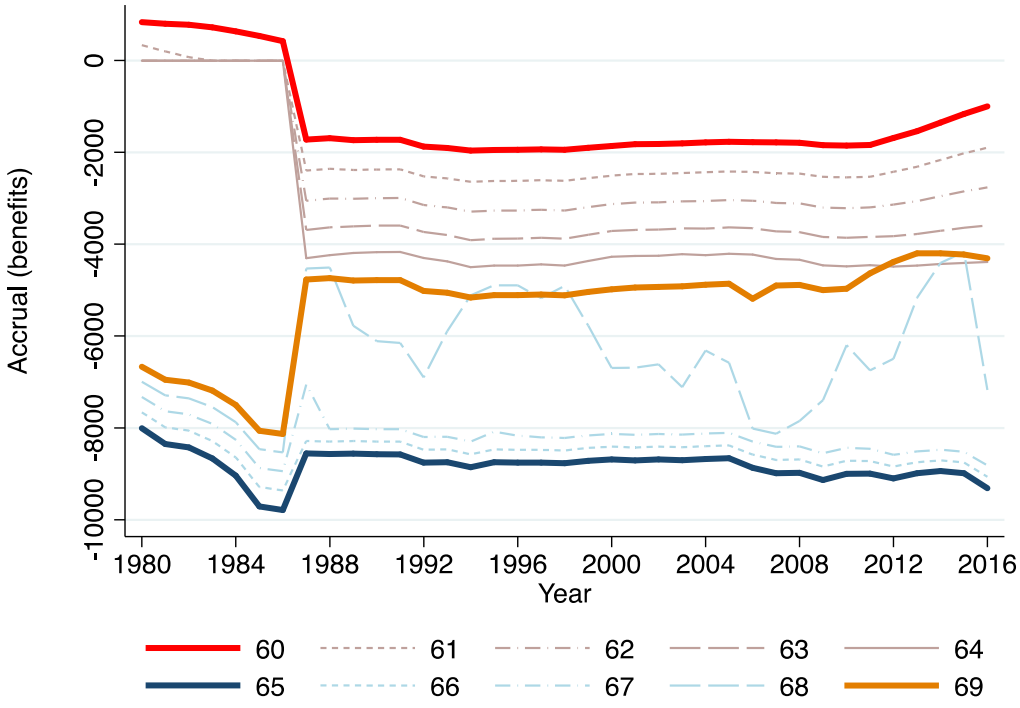
Source: Authors' tabulations

Figure 10. One year accrual in the common environment, medium education

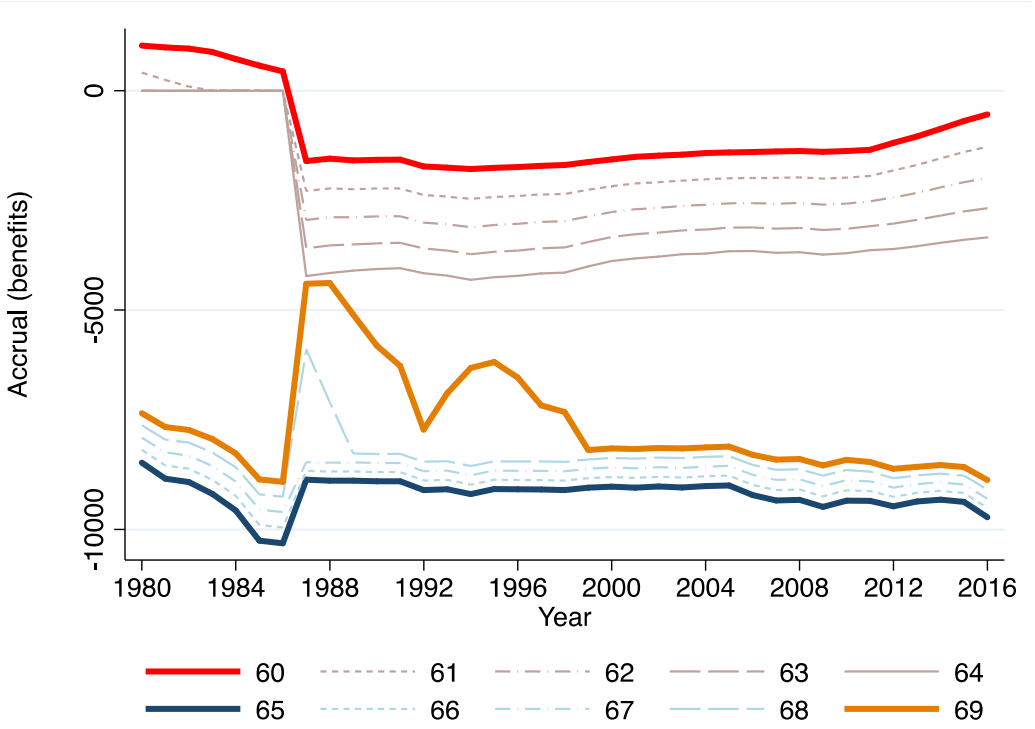
10.a. Couple (female head)



10.b. Single men

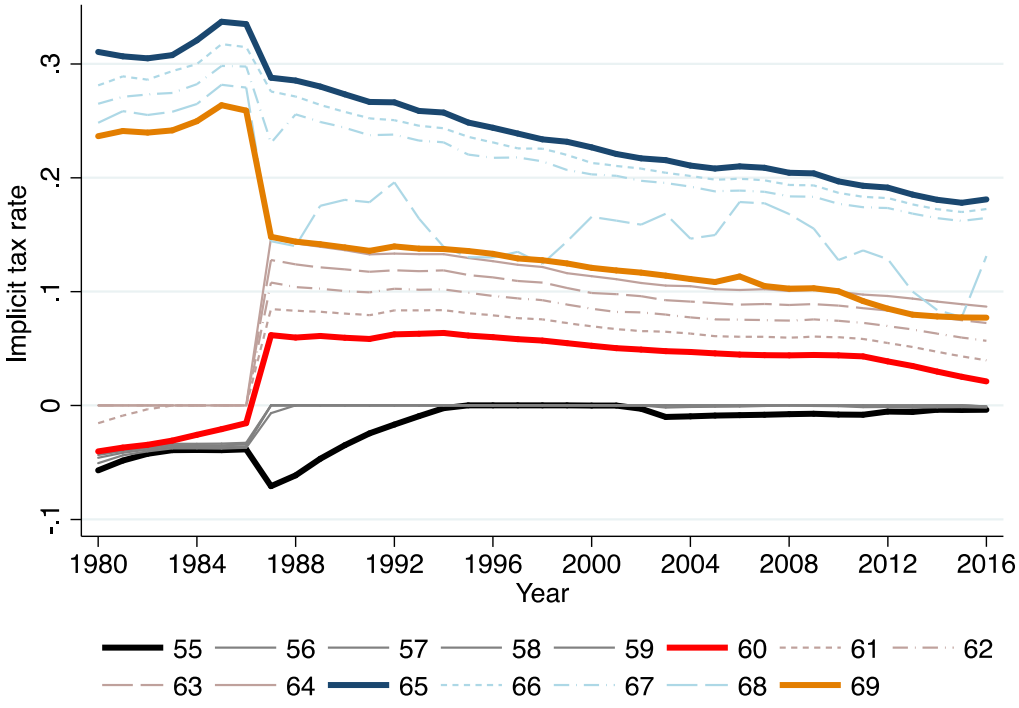


10.c. Single women



Source: Authors' tabulations

Figure 11. Implicit tax rates in the common environment, medium education, single men



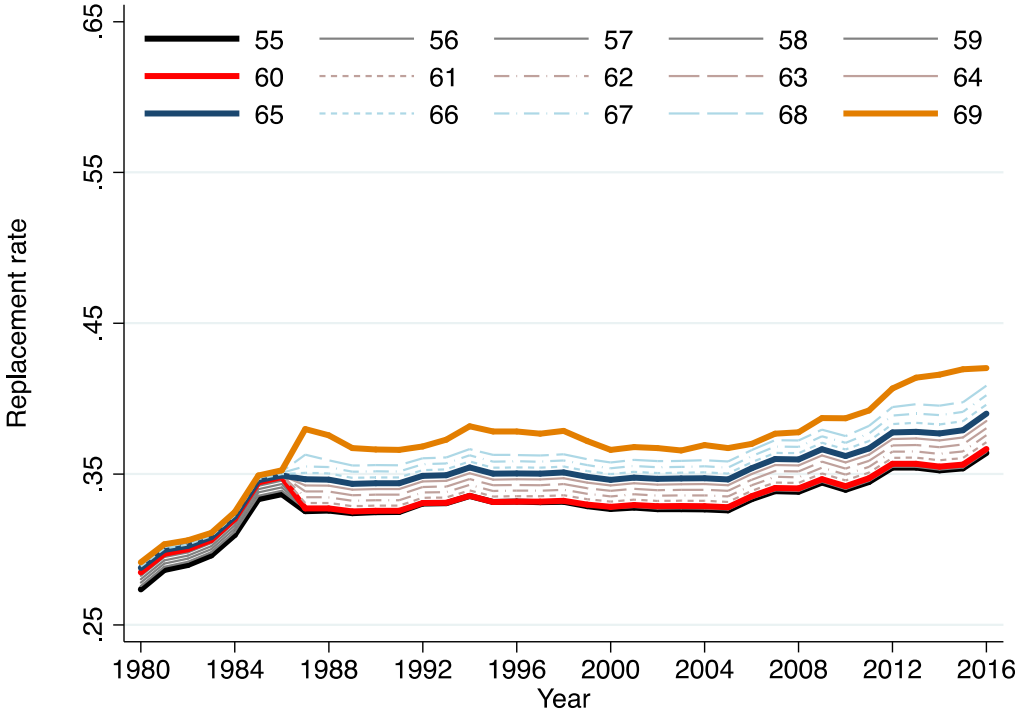
Source: Authors' tabulations

Figure 12. Implicit tax rates by age, select years, medium educated single men

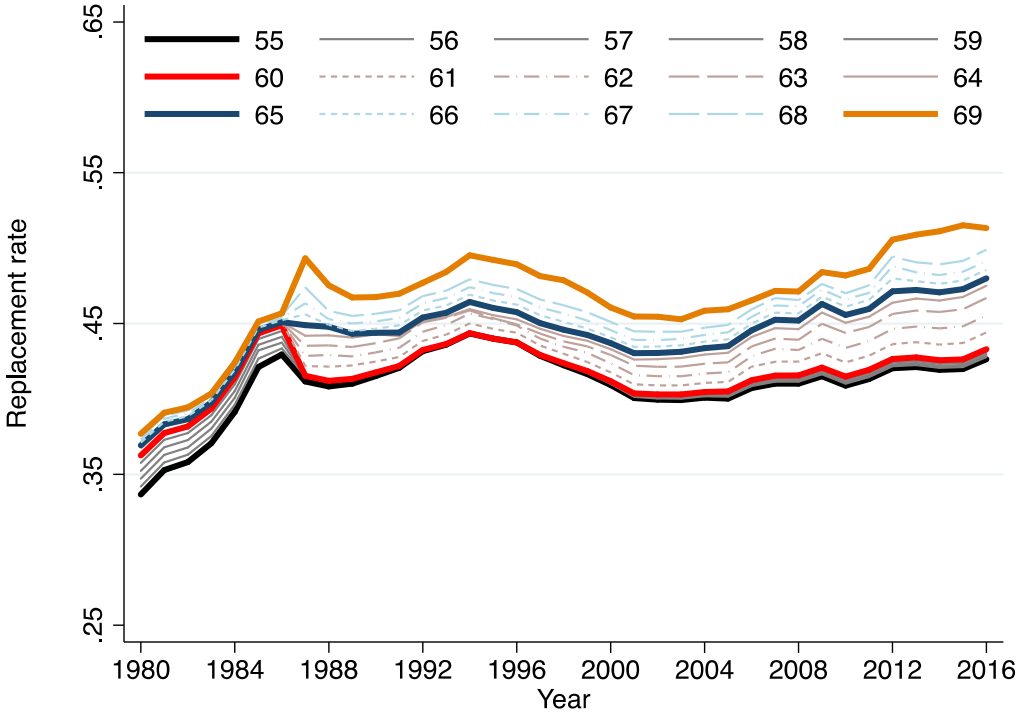
Source: Authors' tabulations

Figure 13. Replacement rates in the Canadian environment, single male

13.a. OECD taxes



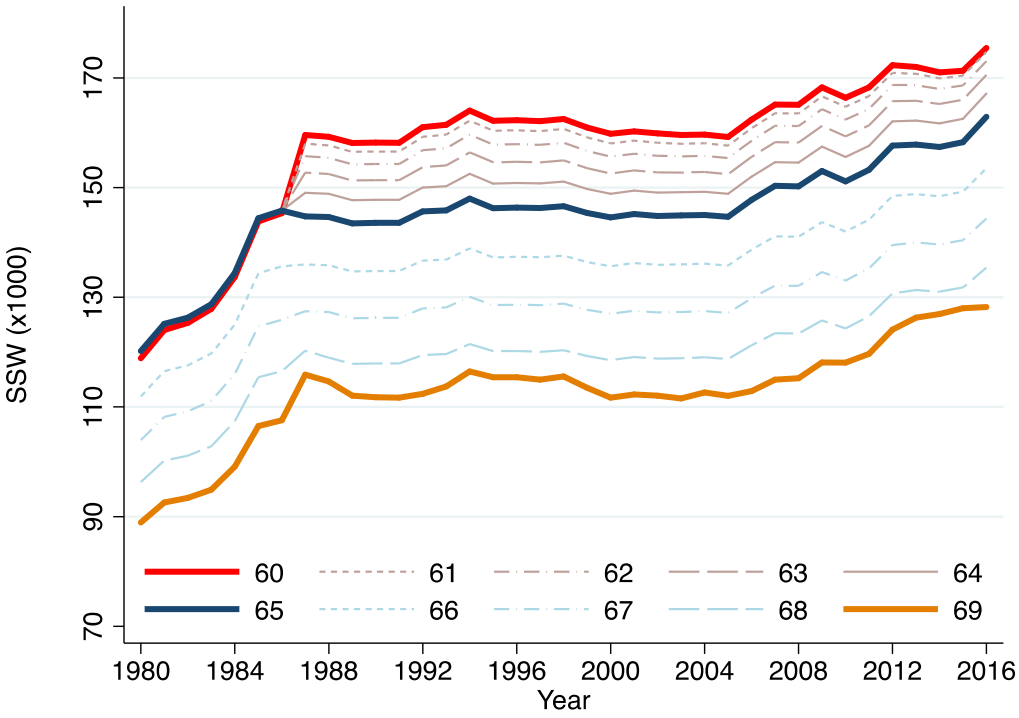
13.b. Canadian taxes



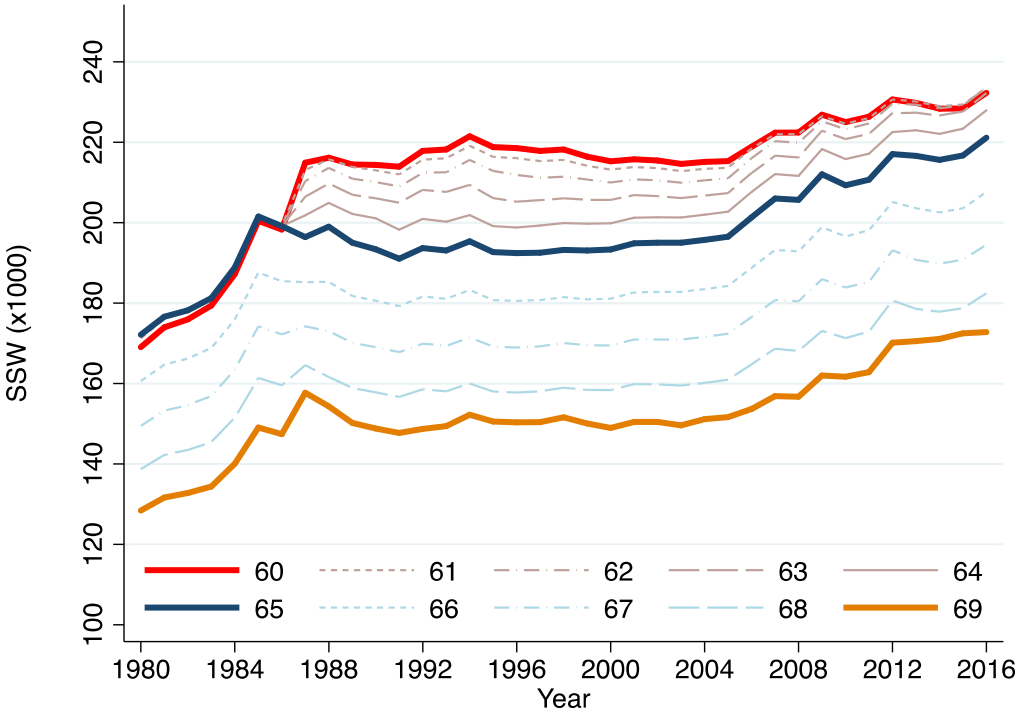
Note: Medium education and no private retirement income assumed.
Source: Authors' tabulations

Figure 14. SSW in the Canadian environment, single male

14.a. OECD taxes



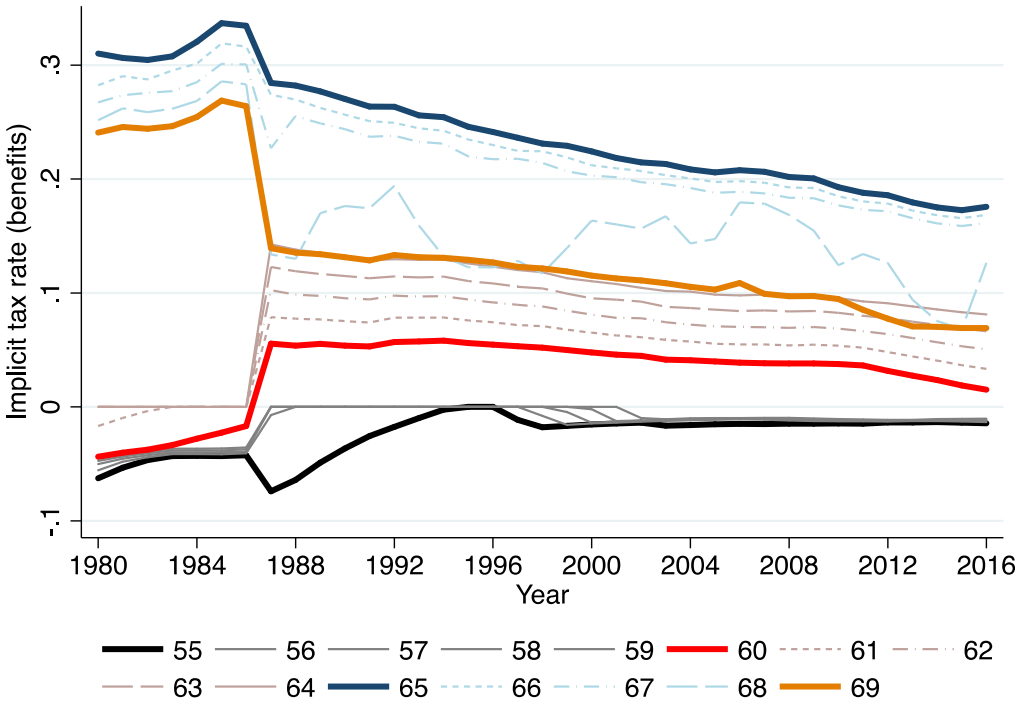
14.b. Canadian taxes



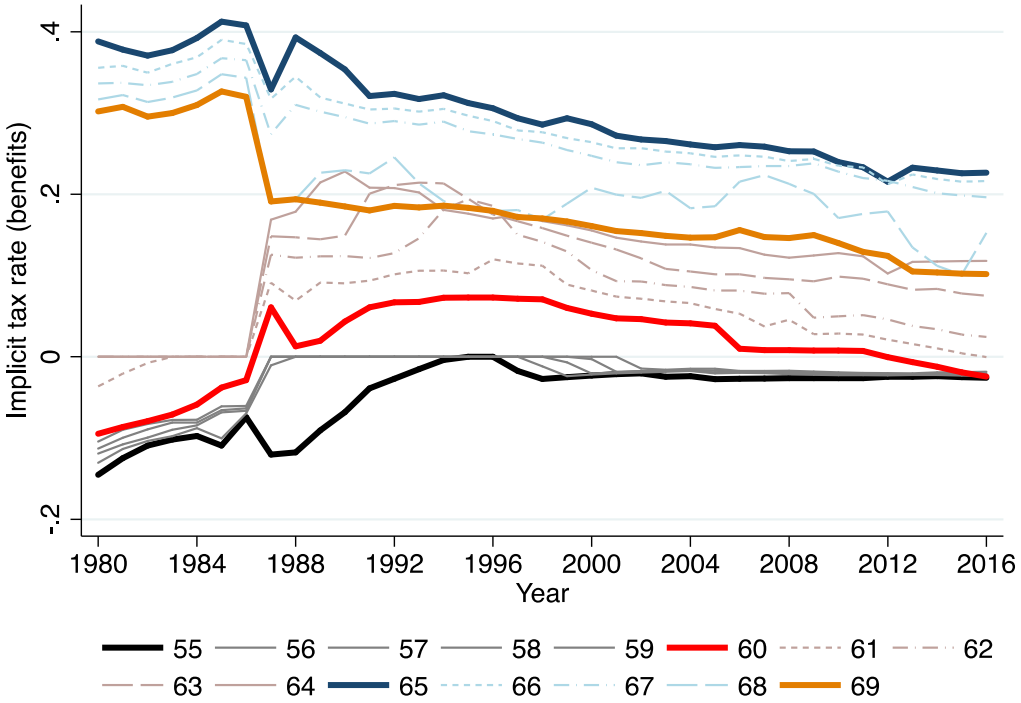
Source: Authors' tabulations

Figure 15. Implicit tax rates in the Canadian environment, single men (medium, no pension)

15.a. OECD taxes



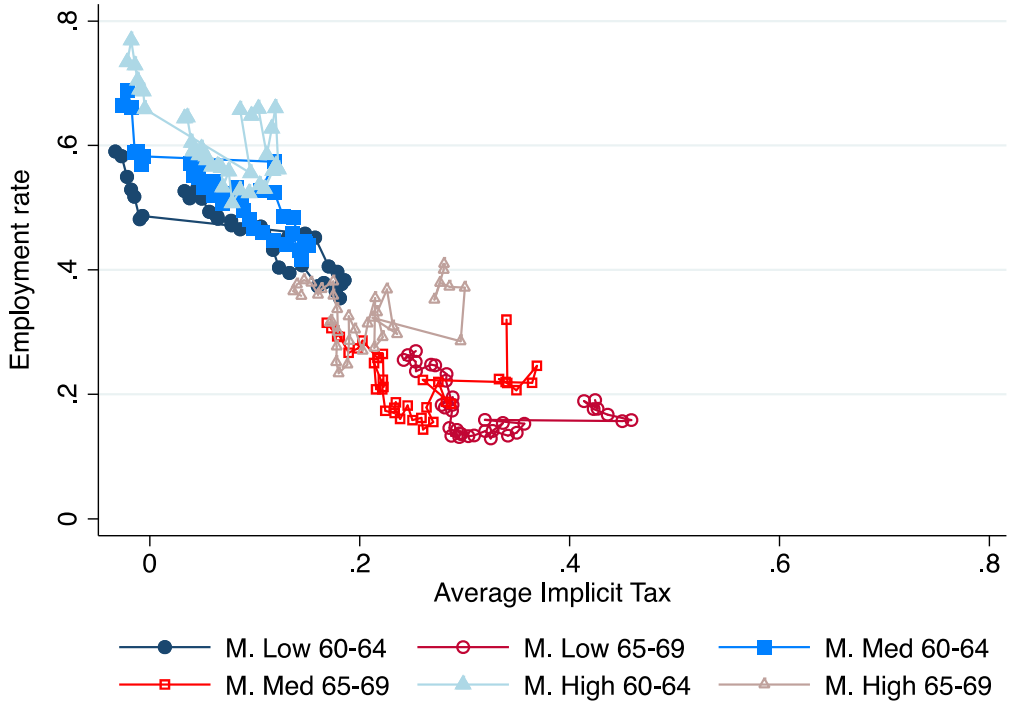
15.b. Canadian taxes



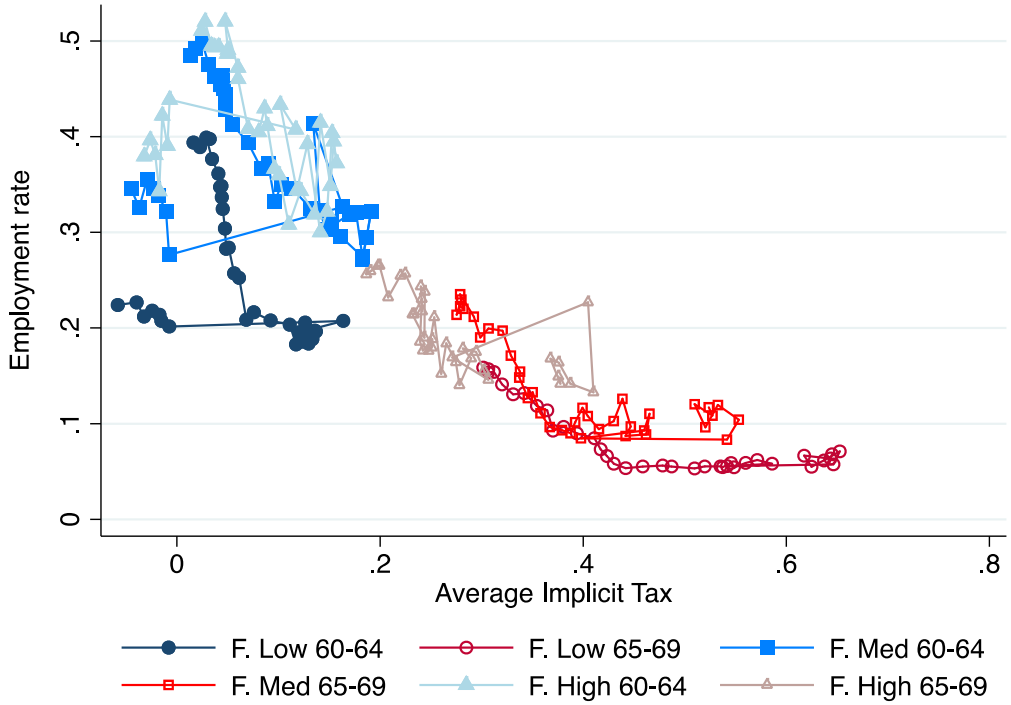
Source: Authors' tabulations

Figure 16. Implicit tax and employment rates in the Canadian environment with Canadian taxes

16.a. Single men



16.b. Single women



Source: Authors' tabulations