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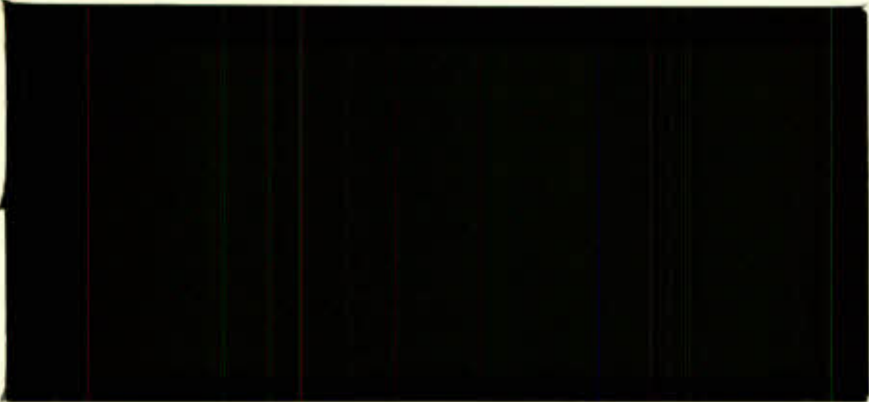
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DISCUSSION PAPER NO. 203

THE IMPACT OF CANADA'S OLD AGE SECURITY PROGRAM ON RETIREMENT SAVING, LABOUR SUPPLY AND RETIREMENT

by

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Résumé

Ces dernières années, on s'est de plus en plus questionné sur
les effets défavorables que pourrait avoir le système public de
rentes de retraite, au Canada, sur l'épargne globale et l'offre
de travail. Dans le présent document, les auteurs s'appliquent à
vérifier l'hypothèse voulant que le régime de sécurité de la
vieillesse (RSV) ait réduit en fait l'épargne en vue de la
retraite ainsi que les possibilités d'emploi. En outre, dans le
cadre du modèle théorique mis au point dans ce document, les
auteurs examinent un certain nombre d'autres hypothèses selon
lesquelles, entre autres:

(i)   Les régimes enregistrés d'épargne-retraite (REER)
        ne seraient pas un luxe, et que l'épargne qu'ils
        permettent varierait en proportion directe du taux de
        l'impôt sur le revenu des particuliers.

(ii)   L'inflation aurait une influence sur les décisions
        relatives à la retraite.

(iii)   Le RSV, qui ne se fonde pas sur les revenus, ne
        fausserait pas la part à faire entre le travail et
        les loisirs, de sorte qu'aucun effet induit du
        facteur retraite ne jouerait soit sur l'épargne en vue
        de la retraite, soit sur l'effort de travail fourni
        durant la pré-retraite.

Les résultats empiriques obtenus semblent confirmer que le régime universel de sécurité de la vieillesse a eu un effet défavorable, quoique peu important, non seulement sur l'épargne en vue de la retraite mais aussi sur l'offre de travail, réduisant, dans ce dernier cas, le volume de travail fourni avant la retraite, au lieu de pousser les gens à prendre une retraite anticipée. Les faits semblent montrer aussi que l'épargne des régimes de pension privés varie directement en fonction du taux de l'impôt sur le revenu personnel, limitant surtout la participation aux régimes enregistrés d'épargne-retraite aux contribuables des tranches supérieures de revenu. Enfin, le taux d'inflation semble avoir pour effet de reporter à plus tard le moment de la retraite.

Abstract

During recent years there has been growing concern over the possible adverse effects of Canada's public pension system on total savings and the supply of labour. The work in this paper tests the hypothesis that the universal Old Age Security (OAS) program reduces retirement saving and work. In addition, within the framework of the theoretical model developed in this paper, the authors examine a number of additional hypotheses. In particular:

    (i)   whether or not the Registered Retirement Savings Plan (RRSP) is a luxury good and whether such savings vary directly with the rate of personal income tax;

   (ii)   the effect of inflation on the retirement decision; and

 (iii)   the hypothesis that the OAS program (which is not earnings-tested) will not distort the work/leisure decision, and consequently that no induced retirement effect will affect either retirement savings or pre-retirement work effort.

The empirical results would seem to confirm that the universal OAS program has had an adverse, albeit minor effect, not only on retirement savings, but also on the labour supply, in the latter case, reducing the pre-retirement labour supplied by individuals rather than causing earlier retirement. The evidence also lends support to the proposition that private pension plan saving varies directly with the personal income tax rate, confining participation in RRSPs largely to taxpayers in the upper-income tax brackets. Finally, the inflation rate appears to result in the postponement of retirement.

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Introduction

During recent years there has been growing concern over the possible adverse effects of Canada's public pension system on total savings. The impact of public pension programs such as the Old Age Security (OAS) and the Canada and Quebec Pension Plans (CPP/QPP) is important insofar as they affect private retirement savings which now account for about 20 percent of gross savings in Canada. Rather less attention has been devoted to the possible disincentive effects of the public pension system on the supply of labour, although that also may be a cause for concern.

In this paper we will test the hypothesis that the universal Old Age Security program reduces retirement saving and work (H1). At the same time, within the framework of our theoretical model, we will examine a number of other hypotheses, namely,

(H2) The conventional wisdom that due to the income tax-deductibility of employer-sponsored pension and Registered Retirement Savings Plan (RRSP) contributions, such savings vary directly with the rate of personal income tax.

(H3) Private retirement savings and especially Registered Retirement Savings Plans are a luxury good, i.e., the elasticity of private retirement savings with respect to income is greater than unity.

(H4) An increase in the inflation rate tends to postpone retirement or encourage re-entry into the labour force, especially where private pension plans provide a significant proportion of an individual's retirement income. This may be explained by the fact that private pension plans, unlike the public programs, do not usually fully index pension benefits. As a result, the purchasing power of private pension wealth is reduced.

(H5) Since the OAS program, unlike OASDI in the United States, is not earnings tested, it does not distort the work/leisure decision. Consequently, there will be no induced retirement effect on either retirement saving or pre-retirement work effort. Of course, this does not mean that the retirement decision is unaffected by any wealth effect associated with the OAS (H1), or, for that matter, any other pension program. Programs, such as employer-sponsored pension plans, which provide benefits conditional upon retirement, usually at age 65, can distort the work/leisure decision, and therefore have an induced retirement effect on saving and work effort.

This paper is organized into five sections. In Section I we will briefly describe the institutional framework of Canada's existing retirement income system. We will then proceed with a cursory review of the relevant theoretical and empirical literature in Section II, followed by a description of our theoretical model in Section III. The empirical results are presented in Section IV with conclusions and policy implications discussed in Section V.

I. THE INSTITUTIONAL FRAMEWORK IN CANADA

Canada's present retirement income system has been designed with two primary goals in mind. The first is to guarantee a basic minimum level of income for all its elderly citizens, the second to ensure that individuals do not suffer a drastic reduction in their incomes upon retirement, in other words, some rate of earnings replacement.

In order to assure a guaranteed annual income for the elderly population, a number of programs are sponsored by the federal government. The most important of these is the Old Age Security (OAS) which is a demogrant type of program whereby all residents of Canada qualify for a flat-rate pension after a minimum period of residence. It is universal in that it does not discriminate by sex, marital status or income and covers almost everyone aged 65 and over.[1] Also adjusted for cost of living increases, the program provides average annual benefits of $2426 per person in 1981.

A second program is the Guaranteed Income Supplement (GIS) which was introduced in 1967 after the Old Age Security Act was amended in order to provide a "guaranteed monthly income supplement"

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[1] Before 1966, the age of eligibility for OAS benefits was 70 years.

for those born before 1910 and therefore ineligible for benefits under
the newly established Canada and Quebec Pension Plans. Unlike OAS,
GIS is an income-tested supplement designed to provide for the poorest
of the retired population who have little or no income other than
their OAS benefits. The GIS, in conjunction with the OAS, therefore
guarantees a minimum annual income to all of Canada's elderly
citizens[2]. In 1981, individuals were eligible for a maximum GIS
supplement amounting to $2435.

In connection with the second goal, which is to ensure some
rate of earnings replacement for retired workers, we have the public
Canada and Quebec Pension Plans (CPP/QPP) as well as the various
private schemes. The CPP/QPP, introduced in 1966, is not income-
tested. However, it is an earnings and employment-related pension
designed to ensure a minimum (twenty five percent) rate of earnings
replacement, up to some maximum earnings ceiling, to individuals upon
reaching the age of 65.

The private retirement income system is designed to
supplement the replacement level of earnings provided by public
plans. The main components of the private system are the
employer-sponsored

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[2]   In addition to these federal programs, a number of provinces have
implemented their own plans to supplement OAS/GIS.

pension plans, Registered Retirement Savings Plans (RRSP)[3] and various other forms of savings. By way of encouragement, Canada's Income Tax Act provides that contributions to employer- sponsored plans and RRSPs are, within certain prescribed limits, deductible from gross income in determining taxable income. The individual contributor therefore gains in two ways. First and foremost, by contributing to an RRSP, or indeed, an employer-sponsored plan, he defers his tax liability until retirement, at which time savings are received as income. In most cases, an individual's marginal rate of income tax will be lower during retirement than when contributions were paid in. This is largely due to the fact that employment earnings, if any, are much lower during retirement. Furthermore, as a result of the old age exemption of $1,810 (in 1980) together with the $1,000 pension income deduction for persons aged 65- and-over, any additional annuity income from RRSPs or other pension plans is also taxed at a rate much lower than income prior to retirement. Second, an individual earns the gross rate of interest on such retirement savings provided that interest earned is not received as income prior to retirement.

In what follows, we will concern ourselves mainly with the impact of the OAS program on private retirement savings (employer-sponsored plans and RRSPs) and individual work effort. The OAS program is of primary interest for a number of reasons. First, for

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3   The RRSP program in Canada was the model for the Individual
     Retirement Account (IRA) in the United States. See "Individual
     Retirement Account", John H. Hall, National Tax Journal, Vol. 27,
     No. 3, September 1974, pp. 459-65.

the period under consideration (1957-1975), it is by far the most important of all pension programs, with expenditures for the fiscal year 1977-78 amounting to $3.7 billion compared to $1.3 billion for the CPP/QPP program. Secondly, it provides a universal flat-rate pension. Thirdly, it is financed entirely out of general tax revenue on a pay-as-you-go basis and therefore involves an intergenerational transfer of income from the under-65 to the 65-and-over age group. Finally, it is an old-age (rather than a retirement) pension payable from the age of 65.

From a macro-economic perspective, due to the pay-as-you-go and hence redistributive nature of the OAS, one would expect it to have some impact on aggregate saving as well as on the labour market. Insofar as the propensity to save of the recipients of the OAS pension is likely to be less than that of the individuals whose taxes finance the program, the aggregate level of saving would tend to fall. Moreover, receipt of the OAS pension might be expected to reduce labour force participation by the over-65 age group.

In terms of micro-economic behaviour, to the extent that an individual takes into account the future benefits he expects to receive from the OAS pension, it will likely influence his current decisions regarding savings and work. We will assume that for an individual there is no perceived link between taxes paid and future OAS benefits since the OAS is financed out of Consolidated Revenue and not by an earmarked tax, as is the case in the U.S. with OASDI.

II. A REVIEW OF THE LITERATURE

Although there are a variety of other motives for saving, the life-cycle model of saving provides a particularly useful framework for discussing the effects of public pension plan programs on personal saving behaviour. According to this model, wealth is accumulated during one's working life to ensure an adequate income during retirement. Both private and public pension plans, by providing benefits during retirement, are likely to affect individual savings behaviour. Public pension plans may be viewed as an exchange of current taxes for an implicit promise of future benefits. The OAS program and the CPP/QPP may therefore be regarded as similar to owning an annuity with a claim on a future stream of annual payments starting at age 65. Such an annuity (net of taxes) may be considered an important part of each family's wealth and can be expected to play an important role in the aggregate savings function -- a higher level of wealth should increase current consumption and decrease current saving[4]. More broadly, public pension wealth to some extent,

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[4] In the case of OAS, this wealth is, of course, not real wealth, but only an implicit promise that the next generation will tax itself to pay off on these annuities. Nevertheless, even if no tangible assets correspond to this wealth, it is still perfectly rational for households to regard such future benefits as part of their personal wealth. In the aggregate, such wealth will be defined as the total value of anticipated future OAS benefits. It reflects the number of workers at each age, their mortality rates, the growth rate of income and an interest rate to discount benefits. A change in the age of eligibility for OAS benefits in 1966 from 70 years to 65 years has been incorporated in the wealth calculation for the OAS program and will therefore be reflected in the empirical work. Corresponding corrections have also been made in the pre- and post retirement labour variables. For more details, see Appendix A.

replaces ordinary or tangible wealth by causing a reduction of current personal (including private retirement) saving due to the anticipated future benefits from public pension plans.

Both Feldstein (1974) and Munnell (1975) have shown that such a wealth replacement effect would be offset by increased saving due to public pension plans inducing people to retire earlier. Since this means a shorter working life and a longer retirement period, any desired level of retirement income would require greater saving during a shorter working life. As the retirement age stabilizes, this "induced retirement" effect may be expected to disappear so that the wealth replacement effect dominates and personal (and private retirement) saving is reduced.

Cross-sectional and time-series studies by Munnell (1974) and Feldstein (1974) in the United States have found that expected Social Security benefits indeed reduce the personal savings rate. Both of the postulated effects of public plans appeared to be present and had, on balance, led to a lower rate of savings.

More recently, Barro (1977) has argued that, in the long run, the pension plan wealth effect would be offset by private intergenerational transfers, i.e. bequests. On the assumption

that Social Security in the United States is a pure pay-as-you-go,
government-imposed substitute for private intergenerational transfers,
no effect on savings behaviour should be observed. Any reduction in
savings for retirement would be exactly offset by an increase in
savings destined for bequests. However, the importance of the bequest
motive is necessarily an empirical question. Barro's own work, using
time series analysis of saving behaviour in the U.S. and an expanded
Feldstein model, did not in fact support the conclusions of Feldstein
who subsequently disputed both the theoretical and empirical findings
reached by Barro. According to Feldstein, the existance of a
significant bequest motive was not borne out by survey evidence.[5]

Hitherto, the relationship between saving and pre-retirement
work effort has been largely ignored. Our model will therefore
incorporate the wealth replacement effect of OAS on work effort.
Unlike Feldstein (1974), who argued that the work effort is reduced
over the life-cycle via an induced retirement effect resulting from
increased wealth, we consider an additional dimension of the
work/leisure choice. Individuals can increase their leisure either by
increasing the length of the retirement period, insofar as this is
institutionally possible, or they can retire as before, but reduce the
amount of work prior to retirement. In either case, the lifetime
labour supply of an individual is reduced. Empirically, we will
attempt to estimate the effect of OAS wealth on both the individual's
retirement decision and pre-retirement work effort.

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[5]   See M. Feldstein, "Social Security and Private Savings: Reply to
       Barrow" National Bureau of Economic Research (Mimeo, 1978).

III. A THEORETICAL MODEL

In order to examine saving, work and retirement behaviour,
we shall use a modified version of a model developed by Lucas and
Rapping [1969]. According to that model, the consumption-leisure
choice facing a representative individual involves four goods, C_1, C_2,
l_1 and l_2. It will be convenient to distinguish between two periods
in the life-cycle: period 1 denotes an individual's normal working
life, which we will assume to be from the age of 15 up to 65; period 2
commences on an individual's 65th birthday (when almost everybody
becomes a recipient of the OAS pension) and ends upon death. We
define C_1 and C_2 as consumption in those periods. Likewise, l_1 is the
amount of work done prior to the age of 65, while l_2 is the amount of
work done by the individual after he/she becomes eligible for the OAS
pension at age 65.

The representative individual is assumed to have a
well-defined utility function, U_1 such that

$$U = U(C_1, C_2, l_1, l_2) \quad U_1, U_2 > 0, \quad U_3, U_4 < 0.$$

The tax rate on personal income in period 1, t_1, is taken to be
greater than that during period 2. Without loss of generality, we

will assume that the tax rate on incomes of individuals aged
65-and-over is zero, which is in fact usually the case[6].

Retirement saving, s_1 only takes place during period 1 and
is deductible from taxable income $W_1 l_1$ (W_1 is the money wage rate) in
that period[7]. Given that the tax rate in period 1 is greater than
that in period 2, we will assume that tax-deductible saving dominates
all other forms of saving for retirement purposes, and that there is
no effective limit on the amount of such saving[8]. All retirement
saving is received as income in period 2 having earned a real rate of
interest of r percent.

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[6] For those with low retirement incomes this may not be true. The GIS
is reduced by $1 for every $2 of income over and above the OAS
pension, which in effect amounts to a marginal tax rate of 50%. In
addition, similar offsetting arrangements apply under provincial
programs. Hence, for some low-income pensioners, the effective
overall marginal tax rate on other pension income may be as much as
100%. In effect, we are more or less ignoring this group of
individuals in the analysis.

[7] While pension savings in the form of RRSPs is the result of an
individual's own decision, this is not generally the case with
employer-sponsored pension plan saving. The latter is jointly
determined by the employer and employee or his representatives via
collective bargaining. Nevertheless, we will assume that total
pension savings (employer-sponsored pension savings and RRSPs) is
determined by individual preferences and RRSPs serve as a vehicle
for personal retirement savings either exclusively or in conjunction
with the more institutionalized employer-sponsored plans.

[8] In fact there do exist limits on the tax-deductibility of retirement
savings. As of 1977, individuals who do not participate in an
employer-sponsored pension plan can contribute as much as 20 percent
of their annual earned income, up to $5,500 to a RRSP and deduct
these contributions from their taxable income. Individuals who are
participating in an employer-sponsored pension plan, but contribute
less than 20 percent to their annual earned income, up to $3,500,
may contribute the difference to a RRSP. Individual preferences
and/or capital market imperfections are such, however, that,
according to Revenue Canada, taxation data, the vast majority of
people do not put aside the full allowable amount and indeed their
payments are much below the maximum.

The individual is assumed to maximize utility, U_1 subject to the following lifetime budget constraint:

$$(1) \quad P_1C_1 + \frac{P_2C_2}{1 + r} = (1 - t_1) W_1l_1 + \frac{W_2l_2}{1 + r} + \frac{OAS}{1 + r} + t_1s$$

where $\frac{OAS}{1 + r}$ refers to the anticipated Old Age Security pension in money terms and t_1s is the tax saving associated with tax-deductible retirement saving.

Since desired retirement saving may be specified by defining

$$(2) \quad s = W_1l_1 - \frac{P_1C_1}{1 - t_1}$$

substituting for s into (1) we may rewrite the lifetime budget constraint as

$$(3) \quad \frac{P_1C_1}{1 - t_1} + \frac{P_2C_2}{1 + r} = W_1l_1 + \frac{W_2l_2}{1 + r} + \frac{OAS}{1 + r}$$

so that t_1 is equivalent to a tax on C_1 when saving is tax deductible.

We assume that for all positive values of the exogenous parameters P_1, P_2, W_1, W_2, r, t_1 and OAS, a unique maximum is attained at which C_1, C_2, l_1 and l_2 are positive. Then the solution to the maximum problem gives each of the choice variables as a function of these parameters. More precisely, C_1, C_2, l_1 and l_2 will depend on five arguments,

$$\frac{P_1}{1 - t_1} \ , \ \frac{P_2}{1 + r} \ , \ W_1, \ \frac{W_2}{1 + r} \ \text{ and } \frac{OAS}{1 + r} \ .$$

These functions are homogeneous of degree zero in all five arguments so that if P_1 is chosen as a deflator, the choice variables may be written as functions of the new parameters. The savings function (2) will also depend on the foregoing five arguments deflated by P_1. Hence,

(4) $\quad s = f(\frac{1}{1 - t_1} \ , \ \frac{P_2}{P_1(1 + r)} \ , \ \frac{W_1}{P_1} \ , \ \frac{W_2}{P_1(1 + r)} \ , \ \frac{OAS}{P_1(1 + r)})$

(5) $\quad l_1 = g(\frac{1}{1 - t_1} \ , \ \frac{P_2}{P_1(1 + r)} \ , \ \frac{W_1}{P_1} \ , \ \frac{W_2}{P_1(1 + r)} \ , \ \frac{OAS}{P_1(1 + r)})$

(6) $\quad l_2 = h(\frac{1}{1 - t_1} \ , \ \frac{P_2}{P_1(1 + r)} \ , \ \frac{W_1}{P_1} \ , \ \frac{W_2}{P_1(1 + r)} \ , \ \frac{OAS}{P_1(1 + r)})$

The theory's implications for the signs of the derivatives of f, g and h are, in general, ambiguous, but on the presumption that consumption and leisure in both periods are normal goods,

$$\frac{\partial s}{\partial X} \ , \ \frac{\partial l_1}{\partial X} \ , \ \frac{\partial l_2}{\partial X} \ < \ 0 \qquad (H1)$$

Where $X = \frac{OAS}{P_1(1+r)}$, the present value of expected OAS benefits in real terms.

This simple theory of individual behaviour implies the existence of aggregate retirement savings, labour supply and retirement functions which may be derived from (4), (5) and (6) respectively.

Given our retirement savings function f, we postulate the
following linear relationships for aggregate per capita employer-
sponsored plan savings (ES) and RRSP savings (RS) in real terms at
time t:

(7) $ES_{1t} = a_o + a_1 M_{1t} + a_2 \overline{\Pi}_{1t}^* + a_3 W_{1t} + a_4 W_{2t}^* + a_5 X_t + a_6 r_{1t}^*$

(8) $RS_{1t} = b_0 + b_1 M_{1t} + b_2 \overline{\Pi}_{1t}^* + b_3 W_{1t} + b_4 W_{2t}^* + b_5 X_t + b_6 r_{1t}^*$

where $M_1 = \dfrac{1}{1-t_1}$, $\Pi_1^* = \dfrac{P_2^*}{P_1}$, $W_1 = \dfrac{W_1}{P_1}$, $W_2 = \dfrac{W_2^*}{P_1} = \dfrac{W_2^*}{P_2^*} \cdot \Pi_1^*$,

$r_1 = r_1 \overline{\Pi}_1^*$ and the asterisk denotes an (unobservable) expected value.

While one would not expect RRSP contributions to affect
employer-sponsored pension plan savings ES, because individuals may
not have much choice about the latter, retirement saving through RRSPs
could be affected by employer-sponsored pension plan savings for those
individuals who participate in both types of plans. But, the majority
of contributors to RRSPs do not contribute to employer- sponsored
plans[12]. Furthermore, since in our theoretical model RS and ES are
determined by the same set of variables, inclusion of the ES variable
in the equation determining RS in order to capture any effects of dual
contributions would result in serious problems of multicollinearity.
Hence, given the institutional reality and the trade-off between
capturing the effects of dual contributors and the resulting
multicollinearity, the equations were estimated independently of each
other.

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[12] See <u>Pension Plans in Canada, 1978</u>. Statistics Canada,
Catalogue 74-401.

Given our function g, we postulate a linear aggregate labour supply function L_{1t}, which relates total man-hours supplied annually by individuals under the age of 65, deflated by the size of the labour force under 65, to the empirical counterparts of the arguments of g.

$$(9) \quad L_{1t} = c_0 + c_1 M_{1t} + c_2 \overline{W}_{1t} + c_3 W_{1t} + c_4 W_{2t}^* + c_5 X_t + c_6 r_{1t}$$

To correct for the potential bias of the coefficients resulting from demographic trends, two additional variables were incorporated into the aggregate labour supply equation; a median age variable of the male working age population, $MAGE_t$, and a dispersion parameter of the median age, $VAGE_t$. Both variables reflect the changing age composition of the labour force.

One further modification of the aggregate labour supply equation, L_{1t}, is necessary. Existing data only provides information on the total man-hours worked by employed members of the labour force. However, the total labour supply consists of individuals who are employed plus those that are unemployed, but would accept employment at what they regard as their 'normal' wage rate. This total labour supply is jointly determined with labour market demand. Consequently, at any point in time, the employed labour force L^e_{1t}, equals the demand for labour L^d_{1t}, and is also equal to the total labour supply less unemployment i.e.

$$\text{(10a)} \quad L^e_{1t} = L^d_{1t}$$

$$\text{and} \quad \text{(10b)} \quad L^e_{1t} = L_{1t} - U_{1t} = L^d_{1t}$$

For this reason, an unemployment rate in included in the labour supply equation with L_{1t} meaning employed man hours per member of the total labour force. The unemployment rate U_{1t}, differs from the measured unemployment rate, $\overline{U}_{1t}$, for two reasons. First, many individuals may not report themselves as actively seeking work during surveys. Second, there is a frictional unemployment component which varies positively with the non-frictional component. Summarizing these two aspects of measured unemployment, and assuming U_{1t} to be linearly related to $\overline{U}_{1t}$, we define:

$$\text{(11)} \quad U_t = g_0 + g_1\overline{U}_{1t}$$

Using equations (9), modified to include the demographic variables, (10a), (10b) and (11), and rearranging terms, we have

$$\text{(12)} \quad L_{1t} = c_0^1 + c_1 M_{1t} + c_2 \overline{\overline{1}}_{1t} + c_3 W_{1t} + c_4 W_{2t}^* + c_5 X_t + c_6 r_{1t}$$
$$+ c_7 MAGE_t + c_8 VAGE_t - c'_9 \overline{U}_{1t}$$

where $c'_0 = c_0 - g_0$.

The retirement age is not included explicitly in our theoretical model. To do so would make it rather more complicated, especially if the retirement age appears in the utility function as a

choice variable. Nevertheless, we can derive an aggregate proxy for a
retirement variable from our post-65 reduced form labour supply
equation (6).

According to Statistics Canada, an individual is classified
as a full-time participant in the labour force provided he/she works
32 hours per week or more. Consequently for each individual i, if l^i_2
$\geq$ 32 then l^i_2 will be ascribed a value of unity. If $l^i_2 <$ 32, l^i_2
will take on the value of zero. Let N_2 denote the population age 65-
and-over. Then the number of individuals age 65-and-over who are
classified as full-time labour force participants may be denoted by
Q_2 where $Q_2 = \sum\limits_{i=1}^{N} l^i_2$. Hence, the number of individuals in the 65 and
over age group classified as part-time participants or "retired" is
R_2, where $R_2 = N_2 - Q_2$. Our retirement variable RET is then defined as
$\frac{R}{N}$, that is, one minus the participation rate of the over 65 age
group[1]. It follows that,

$$(13) \quad RET = H \left(\frac{1}{1-t_1}, \frac{P_1}{P_2(1+r)}, \frac{W_1}{P_1}, \frac{W_2}{P_1(1+r)}, X \right)$$

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[1] Statistics Canada does not provide data on part-time participants in
the labour force. We have therefore assumed that individuals 65
years and older that do not fully participate in the labour force
are retired.

Given the aggregate nature and labour supply characteristics of RET, it seems appropriate to include the unemployment rate as a variable. Firstly, because it ensures that RET reflects the labour supply decision and secondly, because it is often suggested that a higher measured unemployment rate, u_{1t} results in elderly people being forced into earlier retirement. We have also included other forms of non-human wealth, Y_{1t}, as a variable determining RET. At the same time, because the retirement variable RET is defined over individuals 65 years and older, the relevant wage rate for such individuals is the then current wage rate. Consequently, we excluded the variable w_{2t} from the estimating equation.

The following equation (14) attempts to capture the effect of OAS, as well as other variables, on the retirement decision.

(14) $RET_t = d_0 + d_1M_{1t} + d_2W_{1t} + d_4X_t + d_5r_t + d_6U_t + d_7Y_{1t}$

We argued earlier that the universal OAS would not distort the work/leisure choice since no earnings test is involved. Only to the extent that there is a wealth effect resulting from the OAS, and leisure is a normal good, would individuals reduce their work by retiring earlier. Hence, as OAS induced retirement effect has no place in our reduced form equations (4) and (5). If it did, l_2 would appear as an argument in f and g.

By contrast, in the case of employer-sponsored pension plans, which pay benefits conditional upon retirement and therefore distort the work/leisure choice, individuals may be induced or forced into retiring earlier than they would like. As a result, greater savings effort is required during a shorter working life to provide adequate income during an extended retirement period. Consequently, the retirement variable, RET_t should perhaps be included in our aggregate retirement savings equations (7) and (8) as an endogenous variable, even though our theoretical model implies that no such induced retirement effect is present.

Unlike RRSP saving, employer-sponsored pension plan saving is not the result of an individual's own decision, but is largely determined by the employer. Consequently, there is not a great deal of flexibility open to the individual employee in his decision to save through these more institutionalized employer-sponsored plans. The retirement variable is therefore likely to have little effect on such savings. Indeed, preliminary estimates indicated that the endogeneous retirement variable had no significant impact on employer-sponsored savings, ES, so that RET_t was included only in the RRSP equation (8).

(15) $RS_{1t} = b_0 + b_1 M_{1t} + b_2 \Pi_{1t}{}^* + b_3 W_{2t} + b_4 W_{2t}{}^* + b_5 X_t + b_6 r_{1t}{}^*$
$+ b_7 RET_t$

The retirement variable may also affect pre-retirement labour supply L_{1t} which measures the number of man-hours worked per members of the labour force under the age of 65. The fact that

individuals decide or are forced to retire earlier, for whatever reason, may also cause them to increase their pre-retirement labour supply. Thus, the induced retirement effect of pension wealth on savings has a similar counterpart in the labour supply equation. In order to ensure a desired level of income over a longer retirement period, individuals may not only increase their savings out of a given disposable income, as Feldstein suggested, but also increase their income (and therefore their savings) by increasing their labour supply[15]. The aggregate labour supply equation (12) was therefore also modified to incorporate the endogeneous retirement variable, RET_t. (Strictly speaking, the presence of RET_t in (12) violates the assumption of our theroetical model. Nevertheless, it was included in order to test its empirical significance as a determinant pre-65 labour supply).

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[15] Note that if the induced retirement effect of an increase in pensions increases both pension saving and income (via the increase in pre-retirement labour supply), then Feldstein's conclusion that the savings ratio of non-retired individuals rises is no longer obvious.

IV. EMPIRICAL RESULTS

Our empirical results indicate that both private pension savings and work effort are reduced as a result of the wealth effect of the OAS program (H1). The evidence also supports the hypotheses that an increase in the marginal tax rate will increase private pension savings because of the tax-deductibility of contributions (H2), and that private pension saving is a luxury good (H3). In addition, it appears that the inflation rate plays an important role in the retirement decision; people will tend to postpone retirement because inflation makes the prospect of living on a fixed income less attractive (H4)[17].

We now turn to a more detailed examination of the empirical results. Table 1 provides both the simultaneous estimation (2SLS) and ordinary least squares (OLS) estimations of the private pension savings equations (7) and (15) as well as the retirement equation (14). Table 2 presents the 2SLS estimations of the pre-retirement labour supply equation (11) and alternative retirement equations. Equations (14) and (11), presented in Table 2, were estimated with either the OAS or employer-sponsored pension wealth variable[18]. All

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[17] For corroborating evidence, see the Louis Harris Survey on Attitude Towards Pensions and Retirement, World of Work Report, Volume 4, April 1979.

[18] Such wealth measures the perceived increase in permanent income. It is an estimate of the present value of the expected future benefits taking into consideration coverage, life expectancy, age, benefit rates and the real per capita growth of income. The estimates of these wealth variables were provided by P.P. Boyle and J. Murray from their paper entitled "Social Security Wealth and Private Savings in Canada", University of British Columbia, Working Paper #574, Mimeo, April, 1978. The authors will provide detailed calculations on request.

OLS estimations were corrected for autocorrelation using the Hildreth-Lu technique.

As mentioned earlier, preliminary estimates indicated that retirement, RET_t had no significant effect on the more institutionalized employer-sponsored plan savings. We were therefore able to estimate the corresponding equation by OLS. All other equations included the retirement variable RET_{2t} endogenously via 2SLS.[19] In addition, although the savings and retirement equations were initially estimated with w_{1t}/w_{1-t} as a proxy for w_{1t} and w^*_{2t}, results indicated that an alternative specification using w_{1t} only, yielded considerably improved results. Both the tax variable M and the OAS wealth variable X were lagged by one period for the RRSP savings and labour supply equations. This is based on the assumption that given the flexibility of choice inherent in these decisions (unlike private pension savings), individuals will make decisions on the basis of the previous period's tax rate and expected OAS wealth. Finally, all equations were estimated with a constant on the assumption that the equations are not homogeneous with respect to income.[20]

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[19] The unemployment rate was initially included in the savings equations in order to replicate the experiment made with U.S. data. In the United States no significant effect was observed when the unemployment rate was included in equations estimating the effect of Social Security wealth on the personal savings rate. Similar equations estimated with Canadian data did not show any significant impact of the unemployment rate on the relationship between savings and pension wealth. Indeed, the unemployment rate was insignificant and therefore excluded.

[20] If higher income is associated with a lengthening of the relative amount of time spent in retirement, an increase in real per capita income would raise the desired ratio of wealth to income, thereby increasing real per capita savings.

The data for the empirical estimations comes from a variety of sources reporting on annual time series from 1946 to 1975. By and large the non-financial data series have been taken from the <u>National Income and Expenditure Accounts</u>. Financial data on interest rates, the stocks and flows of various assets and liabilities used to construct an approximate balance sheet for individuals (to calculate non-human wealth) are largely based on <u>Bank of Canada</u> statistics. Data on RRSP savings, employer-sponsored pension savings, and taxes payable were derived from <u>Revenue Canada, Taxation Statistics</u>. The construction of an OAS wealth variable is discussed in Appendix A. Any income data was deflated by the Consumer Price Index and population unless otherwise specified. For a definition and an explanation of the construction of the variables used in the estimating equations, see "Definition and Sources of Variables".

Our results show that the OAS variable has had an adverse, albeit small, effect on both employer-sponsored pension savings and RRSPs. The coefficients are significant at the 5 per cent level with a point elasticity of about 0.20 in both cases.[21] In 1975, a one percent increase in real future benefits from the OAS would have reduced employer-sponsored pension savings by $56.8 million and gross RRSP contributions by $2.3 million. There were $28.4 billion of assets in employer-sponsored pension plans and $6.9 billion in accumulated gross RRSP contributions in 1975.

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[21] Elasticities were calculated at the mean value of the variables in all cases.

Table 1

Private Pension Savings and Retirement Equations: Regression Results, 1957-1975

VARIABLE EQUATION	ES(OLS) (7)	RS(OLS) (15)	RS(2SLS) (15)	RÊT(2S (14)
Nominal Interest Rate, r_t	-52.539* (3.65)**	-12.745 (2.12)	-12.285 (1.46)	0.349 (0.62)
Real, Per Capita Wage, w_t	0.276 (3.56)	0.195 (4.40)	0.195 (4.38)	0.013 (3.02)
Marginal Tax Rate, M_t	2207.637 (3.62)			-39.795 (1.78)
M_{t-1}		1250.219 (2.81)	1218.347 (2.02)	
Inflation Rate, P_t/P_{t-1}	-1564.184 (2.26)	187.482 (0.45)	165.521 (0.33)	-81.773 (3.50)
Old Age Security Wealth, x_t	-0.051 (1.65)			0.000 (0.31)
x_{t-1}		-0.019 (2.71)	-0.018 (2.44)	
Induced Retirement, RÊT		-10.006 (2.99)	-9.661 (1.75)	
Unemployment Rate, $\hat{u}_t$				0.021 (0.09)
Other Wealth, y_{t-1}				0.002 (1.89)
Constant	3628.170 (3.22)	-909.717 (1.32)	-879.536 (1.12)	160.473 (3.89)
$\bar{R}^2$	0.95	0.99	0.99	0.96
N	(19)	(19)	(19)	(19)
D.W.	2.06	2.50		
rho	.12	.28	-	-

* The coefficient estimate is with respect to the 5-year Trust Certificate Rate.

** The numbers in brackets are t-statistics.

*** The Durbin-Watson Statistic is not applicable to 2SLS estimation.

As hypothesized, an increase in the average (and, hence, marginal) tax rate significantly increases private retirement savings (H_2). With elasticities of 1.9 and 3.6 for employer-sponsored pension saving and RRSPs respectively.

Evidence from both the 2SLS and OLS estimates also supports our contention that the wage rate has a significant effect on private retirement savings. A wage elasticity of 1.6, confirms our hypothesis that the RRSPs are a luxury good (H3).

The retirement decision also has a significant and negative effect on gross RRSP contributions. A 1.0 percent decline in the labour force participation rate of the 65-and-over age group reduced gross RRSP contributions by 2.8% or $32.8 million in 1975. At first sight, this appears to contradict Feldstein's so-called "induced retirement" effect which is supposed to increase private retirement saving. In fact, there is no such contradiction, merely an aggregation problem. The "induced retirement" effect may indeed increase private retirement saving by those individuals remaining in the labour force (i.e., retirement saving per worker). However, at any point in time, some elderly individuals will retire earlier and no longer contribute to a pension plan. Hence, although individuals who continue to be in the labour force save proportionately more of their

income for retirement, the number of people in the labour force is reduced and this tends to reduce such saving on a <u>per capita</u> basis thus counteracting the conventional "induced retirement" effect.

The labour supply equation (12) was initially estimated with the nominal interest rate, r_{1t}, and the average tax rate, M_{1t}, as explanatory variables. However, their coefficients were not significant so that these variables were dropped and equation (12) was re-estimated. Our empirical results show that a doubling of OAS benefits reduces man-hours worked per member of the labour force by approximately 2 per cent or 38 man-hours per annum. By contrast, only a 10 per cent increase in per capita real non-pension wealth is required to have the same effect on the per worker labour supply[22]. Furthermore, we also found that private pension wealth has no such direct effect on the pre-retirement labour supply[23].

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[22] Bowen and Finegan (1965) also reported that a non-employment income variable which included income from assets and transfer payments had a significant negative effect on participation rates.

[23] We also estimated the effects of CPP/QPP wealth independently and found that, unlike the U.S. Social Security, CPP/QPP wealth has no significant effects on savings (see Wrage, 1980). But CPP/QPP has tended to reduce pre-retirement labour supply. However, while the OAS caused earlier retirement, the CPP/ QPP appears to have induced people to postpone retirement. This was no doubt due to the fact that the CPP/QPP is earnings related, and that during the period 1966-75, "blanketing-in" resulted in considerable intergenerational transfers of income to those persons becoming eligible for CPP/QPP benefits. The benefit formula was such that it was possible that some individuals, although entitled to it, postponed drawing the pension and continued to work past the age of 65 because the benefits forgone were more than offset by increased future entitlements.

In addition, according to our results, earlier retirement increases the per worker pre- retirement labour supply. This effect is more substantial than the direct OAS wealth effect. A 10 percent reduction in the average labour force participation rate of individuals age 65 years and older induces an increase in the pre-retirement labour supply per worker by between 2 and 3 percent. On balance, this retirement effect dominates the OAS wealth effect which is consistent with the positive "induced retirement" effect on personal savings postulated by Feldstein.

Equations (14), (14a) and (14b) are the retirement equations. OAS wealth had no significant effect on the retirement decision. This appears to support our contention that individuals do not retire any earlier in response to a program which is not earnings-tested (H5). Nevertheless, the OAS program does reduce their labour supply prior to the age of 65 because of its wealth effect. On the other hand, the effect of employer-sponsored pensions, as embodied in the private pension wealth variable, causes individuals to retire earlier rather than reduce their pre-retirement labour supply. Since employer-sponsored pension plan benefits are usually conditional upon retirement, this is to be expected. However, the effect is quite small. A 10 per cent increase in such wealth reduces the participation rate of individuals aged 65 and over by only 0.5 per cent.

Table 2

Labour Supply and Alternative Retirement Equations: Regression Results (2SLS), 1953-1975

VARIABLE EQUATION	L (12a)	L (12b)	RÊT (14a)	RÊT (14b)
Nominal Interest Rate, r_t			0.636 (0.87)	-0.564 (0.81)
Real, Per Capita Wage, w_t			0.010 (2.40)	0.008 (3.06)
Growth of the Wage Rate, w_t/w_{t-1}	-317.245 (1.71)*	-377.264 (2.55)		
Marginal Tax Rate, M_t			-13.203 (0.54)	2.696 (0.13)
Inflation Rate, P_t/P_{t-1}	-212.727 (0.83)	-589.330 (2.54)	-36.079 (3.14)	-31.575 (3.26)
Unemployment Rate, $\hat{u}_t$	-40.241 (5.42)	-44.527 (8.08)		
Old Age Security Wealth, x_{t-1}	-0.017 (2.12)		-0.001 (0.04)	
Private Pension Wealth, b_{t-1}		-0.046 (1.11)		0.008 (3.05)
Other Wealth y_{t-1}	-0.041 (4.88)	-0.033 (3.85)	0.001 (2.97)	0.001 (3.73)
Induced Retirement, $\hat{RET}_t$	7.739 (1.68)	5.399 (2.54)		
Median Age, $MAGE_t$	-1.872 (0.31)	-3.629 (0.50)		
Age Dispersion, $VAGE_t$	-11.606 (4.15)	-13.465 (7.66)		
Constant	4755.423 (9.25)	5687.416 (7.13)	94.236 (3.27)	83.268 (3.41)
$\overline{R}^2$	0.98	0.98	0.96	0.97
N	(23)	(23)	(23)	(23)

* The numbers in brackets are t-statistics.
** The Durbin-Watson Statistic is not applicable to 2SLS estimations.
Note: Equations were estimated for the period 1953-75 since most pension variables did not extend back any further.

Finally, the inflation rate also has a significant and negative effect on the retirement decision. A 10 per cent increase in the inflation rate causes individuals to postpone their retirement and results in a 1.5 percentage point increase in participation rate of individuals aged 65 and over.

V. CONCLUSIONS

In brief, our research confirms that the universal OAS program has had an adverse, albeit minor, effect not only on retirement savings but also on labour supply. In the latter case, it has decreased work effort i.e. reduced the number of hours worked per individual prior to the normal retirement age of 65 rather than caused earlier retirement. This, and the fact that the overall adverse effect of the universal OAS program appears to have been rather small, should not be too surprising since the OAS is not income-tested. As a result, there is less of a disincentive to save for retirement through employer-sponsored pension plans and RRSPs than would be the case if the retirement income derived from such savings reduced OAS entitlements as is the case with the income-tested GIS program. For a similar reason, the universal OAS is also less likely to discourage labour force participation by the 65-and-over age group. Hence, universal programs seem less likely to distort retirement saving and work/leisure decisions than income-tested programs.

Our empirical evidence also lends support to the
conventional wisdom that, as a result of the tax-deductibility of
contributions to employer-sponsored pension plans and RRSPs, such
savings vary directly with average and hence the marginal rate of
personal income tax. Thus, one would expect participation in
employer-sponsored pension plans, and especially RRSPs, to be largely
confined to taxpayers in the upper-income brackets, not just because
of their income, but also by virtue of the fact that they have more to
gain in terms of tax saving due to their higher marginal tax rates.
Indeed, according to Statistics Canada, of the almost 1.3 million
taxpayers who reported RRSP contributions in 1976, nearly 86 per cent
had earnings of $10,000 or more. While the average contribution was
$1,638, taxpayers in the higher earning bracket contributed average
amounts ranging from $1,053 for those in the $10,000-$14,000 range and
$2,978 for those who earned $25,000 or more.

What this suggests is that lower income groups may fail to
save for their retirement, not simply because they have insufficient
income, but, because there is little incentive to do so. Since their
marginal tax rates are low, the tax saving on employer-sponsored
pension plans and RRSP contributions will be small. It follows, that
if the lower income groups were offered tax savings on such
contributions similar to those accorded to higher income groups, they
might be tempted to save more for their retirement.

This might be done by introducing a new kind of RRSP, whereby the government would pay low-income contributors a bonus on their of RRSP contributions.[24] While this type of RRSP would be quite innovative, it should be pointed out that a system of government bonuses for saving by lower income groups has been operating successfully in West Germany for a number of years, and has been justified on vertical equity grounds.

Finally, it would appear that the inflation rate causes individuals to delay their retirement. To the extent that postponement of retirement reduces the employment opportunities open to younger workers and thereby results in higher unemployment, this will tend to reduce the trade-off between unemployment and inflation.

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[24] See [Daly, 1980].

APPENDIX A

Estimation of Old Age Security Wealth (OAS)[1]

We define the mortality experience, l_x as the number of survivors at age s. If i is the rate of interest used to value benefits, we can define $v = 1/1+i$. We can then define the value of a life annuity of one dollar per year, payable continuously during the lifetime of x as,

1) $\bar{a}_x = .5 + \sum_{t=1} v^t \left(\frac{l_{x+t}}{l_x}\right)$ applicable to both males and females.

Suppose the retirement age is R and we assume that the number of males in the population eligible for OAS benefits are grouped according to the nearest age x and defined as $M(x)$. Total annual payments to cohort $M(x)$ for $x = R$ is then $TOAS(x)$. Then the value of benefits payable to the retired male population in a specific year is,

2) $\sum_{t=0} TOAS(R+t) \ast \bar{a}_{R+t}$

We also need to calculate the expected benefits payable to those still in the labour force. Assume that annual benefits of the program to an individual are OASB. If E is first age of entry into the labour force, then the value of benfits payable to cohort $M(x)$ where $E < X < R$, is given by,

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[1] Based on "Social Security Wealth and Private Saving in Canada" by P.P. Boyle and John Murray. University of British Columbia Working Paper No. 574 (1978).

3) $M(x)*OASB*\dfrac{1_R}{1_x}*v^{R-x}*\bar{a}_R$

and the total value for the male labour force is,

4) $\displaystyle\sum_{t=0}^{R-E} M(E+t)*OASB*\dfrac{1_R}{1_{E+t}}*v^{R-E-t}*\bar{a}_R$

For any given year, the total value of OAS wealth is the sum of (2) and (4) plus the corresponding expressions for the female population.

The calculations take into account:

i) The change in the retirement age in 1965. It was reduced from 70 to 65 over the next five years.

ii) The linking of OAS to the Consumer Price Index in 1973 by adjusting i down from 4% to 3%.

iii) Changes in mortality experience by using different mortality tables for different periods.

Both (i) and (ii) are reflected by changes in OAS wealth in 1966 and 1973 respectively.

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Both (i) and (ii) are reflected by changes in OAS wealth in 1966 and 1973 respectively.

Table 1

Old Age Security Wealth 1955-1975

(Current Dollars, millions of dollars)

Year	OAS Wealth	Year	OAS Wealth
1955	11623	1966	45091
1956	11859	1967	46479
1957	13882	1968	53769
1958	17070	1969	55593
1959	17451	1970	57649
1960	17810	1971	63057
1961	18071	1972	72783
1962	21705	1973	93190
1963	24465	1974	124882
1964	27459	1975	139679
1965	28244		

DEFINITION AND SOURCES OF VARIABLES

Symbol	Definition
ES_{1t}	Real per capita employer-sponsored pension plan annual savings defined as the change in the book value of assets held in trust by trustees, trust companies and insurance companies.
RS_{1t}	Real per capita gross annual contributions made to RRSP's by individuals.
x_{t-1}	Real per capita expected benefits from the OAS program.
b_{t-1}	Real per capita employer-sponsored pension plan wealth defined as the book value of the stock of assets held in trust by trustees, trust companies and insurance companies.
y_{1t-1}	Real per capita non-human wealth defined as the net sum of real and financial assets and liabilities, i.e., Money (MI) + Savings Deposits (SDEP) + Equity (RCAP) + Canada Savings Bonds (CSB) + RRSP's + Consumer Durables (CD) + Net Stock of Residential Housing + Private Pension Assets - Residential Mortgages - Consumer Credit.
w_{1t}	Real per capita annual wages, salaries and other non-wage related income.
w_{1t}/w_{1t-1}	The growth in the annual wage bill.
P_{1t}/P_{1t-1}	A proxy for the expected inflation rate, defined as the growth of the Consumer Price Index (C.P.I.).
r_{1t}	For the employer-sponsored pension savings, ES, and the labour supply equations, the interest rate was the yield on Canada Savings Bonds. For RRSP's, the interest rate was the yield on 5-year or more Trust Certificates.
M_{1t}, M_{1t-1}	A proxy for the marginal tax rate defined as $1/(1-t_1)$ where t_1 is the ratio of all personal direct taxes over taxable income. With a proportional tax system the average tax rate is equal to the marginal tax rate.
u_t, u_{t-1}	The unemployment rate as defined by Statistics Canada, i.e., the number of individuals looking for work in the labour force.

Symbol	Definition
RET_t	A proxy for retirement behaviour defined as the number of individuals aged 65 and older, who have left the labour force each year, as a percentage of the 65 years and older population, i.e. one minus the labour force participation rate of individuals 65 years and older.
$MAGE_t$	The median age of the male population aged 15 to 65. From 5 year cohort groups this median age was calculated using the standard statistical formula.
$VAGE_t$	The variance around the mean age of the male population aged 15 to 64 was calculated in a similar fashion.
L_{1t}	The number of man-hours of employed members of the labour force divided by the total number of workers in the labour force.

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