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The Effect of Income Tax Incentives on Retirement Savings: Some Canadian Evidence

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I. Introduction

In Canada, social policy aimed at providing adequate retirement incomes is a mixture of public programs, such as Old Age Security, the Guaranteed Income Supplement and the Canada and Quebec Pension Plans, and private schemes that are encouraged by substantial tax concessions. It is therefore important to understand how government retirement income programs together with the various tax incentives affect private retirement savings. Private saving for retirement purposes now constitutes a major component of total savings, and in the 1972–76 period was equivalent to 18 percent of gross saving. Hence, any changes in private retirement savings resulting from public pension programs and tax concessions may have important implications for economic growth and stability.

In 1977, over four million employees or 40 percent of the Canadian labour force were covered by approximately 15,000 employer-sponsored pension plans with total contributions (employer and employee) amounting to $6.2 billion. Related to, but separate from these institutionalized schemes are the Registered Retirement Savings Plans (RRSPs) which serve as a vehicle for personal retirement saving either exclusively or in conjunction with employer-sponsored schemes.[1] RRSPs have experienced a phenomenal rate of growth in recent years as an increasing number of individuals have taken advantage of the tax saving associated with such plans. In 1977, approximately 1.3 million persons contributed a record $2,369 million (compared to $320 million by 348,000 persons in 1971), thus exceeding the total of employee contributions paid into all employer-sponsored plans.

The attractiveness of employer-sponsored plans and especially RRSPs is in large part due to the fact that Canada's Income Tax Act provides that contributions to such schemes are, within certain prescribed limits, deductible from gross income in determining taxable income.[2] According to what may be described

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[1]The Individual Retirement Account (I.R.A.) in the United States is based on the RRSP program in Canada. Similar programs also exist in many of the European countries. See "Individual Retirement Account," John H. Hall, *National Tax Journal*, Vol. 27, No. 3 September 1974, pp. 459–65.

[2]As of 1977, an employee is allowed to deduct from his taxable income any amount up to $3,500 in any year withheld from his wages or salary and paid to an

as the "conventional wisdom", the foregoing tax treatment of contributions and earnings of employer-sponsored pension plans and RRSPs "provide a strong incentive of individuals to increase their overall level of saving" (Johnson, 1977).[3] Furthermore, it has been suggested by Turner (1977) that the preferential tax treatment of the elderly through the old age exemption, by lowering the marginal tax rate paid by older taxpayers, would also have a positive effect on retirement saving. In what follows, we will re-examine the theoretical foundations for this "conventional wisdom" and demonstrate that neither conclusion is justifiable on theoretical grounds. Indeed, from our theoretical model alone, it becomes clear that the effect on retirement saving of both the tax deductibility of contributions to employer-sponsored pension plans and RRSPs and the old age exemption is necessarily ambiguous. Moreover, under certain assumptions we will show that the old age exemption has an adverse effect on retirement saving, a conclusion which is supported by our empirical results.

By contrast, although the effect of the tax rate is theoretically ambiguous, our empirical findings show that an increase in the tax rate encourages retirement saving. Because of the tax-deductibility of contributions to employer-sponsored pension plans and RRSPs, the higher the tax rate on pre- as opposed to post-retirement income, the more attractive it is for a person to contribute to tax-deductible retirement savings schemes in order to defer his or her tax liability until retirement. This increases the tax saving associated with such contributions.

employer-sponsored pension plan in respect of his services in that year. Individuals who do not participate in an employer-sponsored pension plan can contribute as much as 20 per cent of their annual earned income, up to $5,500, to an RRSP and deduct these contributions from their gross income in determining taxable income. Participants in an employer-sponsored pension plan who contribute less than 20 percent of their annual earned income, up to $3,500, may contribute the difference to an RRSP.

[3]It should also be mentioned that interest on money borrowed to pay RRSP premiums is deductible from gross income in determining taxable income.

A Theoretical Model

The life-cycle model provides a particularly useful framework for analysing the effects of tax incentives on individual saving behaviour. According to this model, an individual saves during his working life in order to provide an adequate level of consumption during retirement. As a simplifying assumption, the bequest motive for saving is ignored.

It will be convenient to distinguish two periods in the life-cycle; period 1, corresponding to an individual's normal working life which we will assume to be from the age of 15 up to the age of 65, and period 2, commencing on an individual's 65th birthday. Upon the attainment of that age, not only does the old age exemption become effective, but almost everybody becomes a recipient of the Old Age Security pension. The earnings-related CPP/QPP also becomes payable at age 65. We define C_1, as the annual current consumption of some composite commodity during an individual's working life and C_2 as the annual consumption of the same composite commodity during retirement.

The following behavioural assumptions are made:

(A1) The typical individual has a well-defined utility function U, such that

$$U = U(C_1, C_2).$$

The utility function is everywhere twice differentiable so that,

$$U_{ij} = U_{ji}$$
$$U_i = \partial U/\partial C_i > 0$$
$$U_{ii} = \partial^2 U/\partial C_i^2 < 0$$
where $i \neq j$ and $i, j = 1, 2$
where $i = 1, 2$

(A2) Retirement saving R, only takes place in period 1 and is deductible from taxable income Y_1, in the same period.[4] It is assumed that there is no effective limit on the tax-deductibility of such retirement saving except that $Y_1 - R \geqq 0.5$

(A3) All such retirement saving, R, is received as personal income in period 2 having earned a real rate of interest, r.

(A4) The marginal tax rate on personal income in period 1, t_1, is greater than that in period 2, t_2. Initially, it is assumed that t_1 and t_2 are determined exogenously which implies that, for any small change in the dependent variable R, the individual does not change tax bracket. (In fact, as our empirical results show, this turns out to be a reasonable assumption.)

(A5) In period 2 the individual becomes eligible for public pension benefits, B.

(A6) E denotes age-specific exemptions which are effective in period 2.
By definition $E \leq R(1 + r) + Y_2 + B$,
where Y_2 denotes other income in the form of earnings received during the second period.

The consumer is assumed to choose C_1 and C_2 so as to maximize his utility, $U = U(C_1, C_2)$ subject to the following constraints:

(i) $C_1 = (1 - t_1)(Y_1 - R)$.

(ii) $C_2 = (1 - t_2)(Y_2 + R(1 + r) + B - E) + E$.

Substituting for C_1 and C_2 into U is equivalent to choosing R so as to maximize U.

$$U = U[(1 - t_1)(Y_1 - R); (1 - t_2)(Y_2 + R(1 + r) + B - E) + E].$$

Without loss of generality, for the theoretical analysis it is assumed that r, Y_2 and B take on the value zero.

$$U = U[(1 - t_1)(Y_1 - R); (1 - t_2)(R - E) + E]. \quad (1)$$

The first-order condition for U to be a maximum is

$$\partial U/\partial R = -(1 - t_1)U_1 + (1 - t_2)U_2 = 0. \quad (2)$$

The second-order condition is[6]

$$\partial^2 U/\partial R^2 = (1 - t_1)^2 U_{11} + (1 - t_2)^2 U_{22} - 2U_{12}(1 - t_1)(1 - t_2) < 0. \quad (3)$$

Differentiating the *first-order* condition with respect to t_1, t_2, Y_1, and E, the following comparative static results are derived.

$$\frac{\partial R}{\partial t_1} = \frac{-U_1 + (1 - t_2)(Y_1 - R)U_{21} - (1 - t_1)(Y_1 - R)U_{11}}{D} \quad (4)$$

$$\frac{\partial R}{\partial t_2} = \frac{U_2 - (1 - t_1)(R - E)U_{12} + (1 - t_2)(R - E)U_{22}}{D} \quad (5)$$

[4]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, so that from the individual's point of view, it may be regarded as a form of forced saving. Nevertheless, we will assume that total retirement savings (of employer-sponsored pension savings and RRSPs) is determined by individual preferences.

[5]Individual preferences and/or capital market imperfections are such that according to Revenue Canada Taxation data, the vast majority of contributors to employer-sponsored pension plans and RRSPs do not put aside the full allowable amount. Indeed contributions are well below the maximum.

[6]For convenience, we will define $\partial^2 U/\partial R^2 \equiv D < 0$

$$\frac{\partial R}{\partial Y_1} = \frac{-(1-t_1)(1-t_2)U_{21} + (1-t_1)^2 U_{11}}{D} \quad (6)$$

$$\frac{\partial R}{\partial E} = \frac{(1-t_1)t_2 U_{12} - (1-t_2)t_2 U_{22}}{D} \quad (7)$$

Substituting for $\partial R/\partial Y_1$ and $\partial R/\partial E$ into Equations (4) and (5), respectively, the following Slutsky-type equations are derived

$$\frac{\partial R}{\partial t_1} = \frac{-U_1}{D} - \frac{Y_1 - R}{1-t_1} \cdot \frac{\partial R}{\partial Y_1}, \qquad D < 0 \quad (8)$$

where $-U_1/D$ may be termed the *pure tax*[1] effect of t_1 and $-Y - R/1 - t_1 \cdot \partial R/\partial Y_1$ the *income* effect. For an increase in t_1, the *pure tax* effect increases R while the *income* effect is indeterminate.

$$\frac{\partial R}{\partial t_2} = \frac{U_2}{D} - \frac{(R-E)\partial R}{t_2 \quad \partial E} \quad (9)$$

where U_2/D may be termed the *pure tax* effect[7] of t_2 and

$$-\left(\frac{R-E}{t_2}\right) \cdot \frac{\partial R}{\partial E}$$

the *exemption* effect. For an increase in t_2, the *pure tax* effect decreases R while the *exemption* effect is indeterminate.

Due to the indeterminacy of the *income* and *exemption* effects, further assumptions are needed to assess how retirement saving is affected by t_1, t_2, Y_1 and E. It does not seem unreasonable to assume that both C_1 and C_2 are *normal goods* with respect to an individual's lifetime income. Hence, $\partial R/\partial Y_1 > 0$ and $\partial R/\partial E < 0$.[8] This implies that Y_1 has a positive effect on retirement saving while the exemption has a negative effect. However, without further restrictions on the individual's utility function, one cannot determine the effects of t_1 and t_2 on such savings.

An Additional Complication

Before attempting to estimate empirically the effects of changes in t_1, t_2, Y_1 and E on retirement saving, an additional complication needs to be introduced, namely, the fact that the income tax system is progressive rather than proportional. This is of particular importance with regard to changes in Y_1 and E. In the case of the latter, it is usually argued that an increase in old age exemptions will encourage retirement saving since such exemptions lower the marginal tax rate of retired individuals. This would appear to contradict our earlier conclusion that, if C_1 and C_2 are normal goods, then $\partial R/\partial E < 0$. In what follows, we will show that there is, in fact, no contradiction but rather a failure to distinguish two closely connected effects.

In practice, under a progressive income tax system, the marginal tax rate is not altogether independent of taxable income as assumed in our model (A4). It may be the case that for small change in E and R the majority of taxpayers do not change tax bracket. However, in general, as an individual's taxable income increases he tends to face higher marginal tax rates. The marginal tax rate is thus to some extent endogenously determined. Indeed, we may define our tax function as follows:

$$t_1 = t_1(Y_1 - R) \text{ and } t_2 = t_2(R - E) \quad (13)$$

where

$$\frac{\partial t_1}{\partial Y_1}, \frac{\partial t_2}{\partial R} \geq 0 \text{ and } \frac{\partial t_1}{\partial R}, \frac{\partial t_2}{\partial E} \leq 0$$

Consequently, when we estimate the effect of a change in old age exemptions on retirement saving, we are in effect estimating the following:

[7]The pure tax effects are analogous to the pure substitution effects.

[8]An increase in exemptions E is equivalent to an increase in after tax income of t_2E for an individual with taxable income in period 2. If both C_1 and C_2 are normal goods, then some of this increase in after tax income will be spent on C_1 and hence result in a fall in R.

$$\frac{dR}{dE} = \frac{\partial R}{\partial E} + \frac{\partial R}{\partial t_2} \cdot \frac{\partial t_2}{\partial E}$$

that is, we are differentiating R with respect to E when t_2 is allowed to change.[9] From our assumption that C_1 and C_2 are normal goods, and our progressive income tax function, we know that

$$\frac{\partial R}{\partial E} < 0, \frac{\partial t_2}{\partial E} \leq 0. \text{ If } \frac{\partial R}{\partial t_2} > 0$$

then it follows that $\frac{dR}{dE} < 0.$

However, if $\partial R/\partial t_2 < 0$ then the sign of dR/dE becomes ambiguous.

Similar problems exist with respect to changes in Y_1. Specifically, dR/dY_1 is estimated as follows:

$$\frac{dR}{dY_1} = \frac{\partial R}{\partial Y_1} + \frac{\partial R}{\partial t_1} \cdot \frac{\partial t_1}{\partial Y_1}$$

By assumption

$$\frac{\partial R}{\partial Y_1} > 0 \text{ and } \frac{\partial t_1}{\partial Y_1} \geq 0.$$

Since

$\frac{\partial R}{\partial t_1}$ may be positive or negative,

the sign of $\frac{dR}{dY_1}$ is ambiguous.

As is often the case, theoretical analysis can illuminate the ways in which public policy affects individual behaviour, but it cannot yield an estimate of the magnitude of the effect nor even an unambiguous conclusion about the signs. For this, we must turn to an empirical investigation.

[9]We are ignoring any second round effects whereby an induced change in R will in turn have a further impact on t_2.

[10]Again we are ignoring any second round effects whereby an induced change in R will have a further impact on t_1.

IV. Empirical Estimation

To determine the effect of tax incentives on retirement savings empirically it is necessary to specify the retirement savings function. Given a typical individuals' utility, function U, where

$$U = U[(1-t_1)(Y_1 - R);$$
$$(1-t_2)(Y_2 + R(1+r) + B - E) + E]$$

It is assumed that, for all positive values of the exogenous parameters r, t_1, t_2, Y_1, Y_2, B and E, a unique maximum is attained at which $R > 0$. Then the solution to the maximization problem gives the choice variable R as a function of these parameters. Hence, a general retirement savings function is given by,

$$R = R(Y_1, \frac{1}{1-t_1}; \frac{1}{(1-t_2)(1+r)}, \frac{t_2 E}{(1-t_2)(1+r)}, \frac{Y_2}{1+r}, \frac{B}{(1+r)}. \quad (14)$$

Since retirement savings has two main components, RRSPs and employer-sponsored plans (denoted by R_1 and R_2 respectively), one of which may be a partial substitute for the other, two corresponding retirement equations were estimated. While one would not expect RRSP contributions to have much, if any, effect on employer-sponsored plan contributions because individuals have little discretion with regard to the latter, the converse is unlikely to be the case. RRSP saving (R_1) is likely to be affected by R_2 especially for those individuals who contribute under both plans. Consequently, employer-sponsored pension savings (R_2) was included in the RRSP (R_1) equation in order to estimate the degree of substitutability between these two forms of retirement saving.

Retirement savings decisions in period 1 may be influenced not only by tax incentives but also by expected future benefits in period

2 from public pension programs. Following Feldstein (1974) and Munnell (1974), one can define such a variable as a measure of the perceived increase in permanent income, i.e. public pension plan wealth.[11] It is relevant to distinguish between OAS wealth a, and CPP/QPP wealth s, both of which are included as a proxies for B. (It should be pointed out that the third argument of equation (14) is omitted as a variable in the following empirical specifications on the grounds that it would be collinear with the fourth argument since both involve the term $1/1 - t_2$.)

To eliminate the effects of population and price level changes, all monetary variables in the retirement savings equation were estimated in real per capita terms. the equations were estimated with all variables in the log form, that is,

$$\log R_1 = b_0 + b_1 \log y_1 + b_2 \log y_2 + b_3 \log \hat{m}_1 + b_4 \log \hat{m}_2 + b_5 \log e + b_6 \log r + b_7 \log a + b_8 \log s + b_9 \log p \quad (16)$$

and

$$\log R_2 = c_0 + c_1 \log y_1 + c_2 \log y_2 + c_3 \log \hat{m}_1 + c_4 \log m_2 + c_5 \log e + c_6 \log r + c_7 \log a + c_8 \log s \quad (17)$$

where p refers to employer-sponsored pension plan wealth, e exemptions, and r is the yield on trust certificates of five years or more.

While the theoretical model assumed that changes in E and R were not large enough to affect the tax rates t_1 and t_2, in reality, these tax rates may be partially affected by E and R via changes in taxable income. Consequently the following tax rate equations were estimated, providing $\hat{m}_1$ and $\hat{m}_2$ as instrumental variables in the retirement savings equations.

$$m_1 = f(Z_1) \quad (15a)$$

$$m_2 = g(Z_2) \quad (15b)$$

where m is the average tax rate, $f^1, g^1 > 0$ and $Z_1 = Y_1 - R$, $Z_2 = Y_2 + R(1 + r) + B - E$, i.e. both Z_1 and Z_2 denote taxable income in periods 1 and 2 respectively, while Y_2 denotes other income in the form of earnings and/or income from other assets.

The corresponding personal income tax rate equations are estimated linearly with all variables in nominal, per capita terms.

$$m_1 = f_0 + f_1 Y_1 + f_2 X_1 + f_3 K_1 + f_4 D_1 + f_5 T \quad (18)$$

and

$$m_2 = g_0 + g_1 Y_2 + g_2 X_2 + g_3 D_2 + g_4 E + g_5 T \quad (19)$$

where Y, X and D are assessed personal income, personal exemptions and personal deductions in periods 1 and 2 respectively.[12] To examine the direct effect of R on the tax rate, total pension plan contributions K_1, were included separately in equation (18). Similarly, to examine the direct effect of old age exemptions E on the tax rate, it was included separately in equation (19). T is a time trend reflecting changing personal income taxation rates.

All equations are estimated, using taxation data provided by *Revenue Canada,* for the period 1964 to 1976. The data were disaggregated by sex and a sex dummy variable included in all equations because income patterns differ between males and females. The equations were estimated by the instrumental variable technique with the log transformation of the estimated tax rates m_1 and m_2 as the instrumental variables. Estimates of the direct effects of tax incentives on retirement saving are presented in Table 1. Estimates of the effects of the incentives on the tax rates are presented in Table 2.

As expected, changes in the pre- and post-retirement tax rates, induced by existing tax incentives, have a significant effect on retirement saving ($\partial R/\partial \hat{m}_1 > 0$, $\partial R/\partial \hat{m}_2 < 0$). An increase in $\hat{m}_1$ relative to $\hat{m}_2$ increases retirement saving. If the partially offsetting effect of $\hat{m}_2$ is taken into consideration, R_1 and R_2 increase by about 4 percent for a 1 percent change in the average tax rates (Table 1).[13] It suggests that incentives affecting the relative tax rates are major potential policy levers for changing retirement saving behaviour.

The tax rate effect on retirement saving is, to some extent, offset by the effect of the old age exemption which has a significant *negative* impact on retirement saving ($\partial R/\partial e < 0$). While this result contradicts Turner's conclusion for the United States and the widely held

[11]This wealth measure 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. Of course, this wealth is not tangible wealth, but only an implicit promise to pay. Nevertheless, even if no tangible assets correspond to this wealth, it is still perfectly rational for households to regard such expected future benefits as part of their personal wealth. 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.

[12]For a definition of all variables used in all the estimations and their source, see Appendix A

TABLE 1. Retirement Savings Equations; Regression Estimates (ILS), 1964–1976

Variable[1] *Equation*	*Log R (1)*	*Log R (2)*
Assessed Personal Income (<65); log y_1	5.869	1.011
	(2.34)	(2.16)
Assessed Personal Income (≥65); log y_2	−4.643	−0.137
	(1.95)	(0.38)
Personal Income Tax Rate (<65); log$_{m_1}$	12.851	4.486
	(1.97)	(1.56)
Personal Income Tax Rate (≥65); log$_{m_2}$	−8.135	−0.762
	(1.48)	(1.38)
Old Age Exemptions (≥65); log e	−0.919	−0.341
	(1.71)	(1.41)
Yield on 5-Year or More Trust Certificates; log r	2.881	0.417
	(1.38)	(1.14)
Old Age Security Wealth; log a_1	−0.241	−0.027
	(0.39)	(0.28)
CPP/QPP Wealth, log s_1	−0.050	−0.039
	(0.52)	(5.51)
Employer-Sponsored Pension Plan Wealth; log p_1	−0.497	
	(0.29)	
Sex Dummy, S	−0.968	−0.078
	(0.77)	(0.41)
Constant	−2.054	−1.384
	(0.22)	(1.02)
R^2	0.94	0.98
D.W.	1.62	1.75

*t-statistics in parenthesis.
[1]Unless otherwise specified, all variables are in real per capita terms.

[13]Individuals make retirement saving decisions based on both pre-retirement and their expected post-retirement tax rates and real incomes i.e. m_1, y_1, m_2 and y_2. The latter are assumed to equal the current, observed post-retirement tax rate and income of individuals 65 years and over. Similarly, the old age exemption effect in real terms is based on an individual's expected exemption assumed to equal the observed exemption applicable to individuals aged 65 years and over.

TABLE 2. Personal Income Tax Rate Equations for Taxpayers Aged Less Than 65 Years and More Than 65 Years 1964–1976

Variable Equation	*m (1)*	*m (2)*
Assessed Personal Income (<65); log Y_1	0.592×10^{-4} (2.02)*	
Assessed Personal Income (≥65); log Y_2		0.253×10^{-4} (1.73)
Personal Exemptions (<65); X_1	-0.102×10^{-3} (2.25)	
Personal Exemptions[1] (≥65); X_2		-0.529×10^{-4} (1.17)
Pension Plan Contributions (<65); K_1	-0.392×10^{-3} (0.87)	
Personal Deductions[2] (<65); D_1	-0.535×10^{-3} (3.69)	
Personal Deductions (≥65); D_2		-0.894×10^{-4} (2.16)
Old Age Exemptions (≥65); E		-0.865×10^{-4} (1.75)
Sex Dummy; S	0.321 (0.33)	−0.105 (2.67)
Time Trend; T	0.577 (1.85)	0.003 (0.92)
Constant	0.896 (7.06)	0.239 (2.17)
R^2	0.83	0.90
D.W.	2.28	1.54

*t-statistics in parenthesis
[1]Excludes old age exemptions
[2]Excludes Pension Plan Contributions

view that such exemptions encourage retirement saving, our theory showed that $\partial R/\partial E < 0$ if consumption in both periods is a normal good. Furthermore, any increase in exemptions appears to reduce retirement saving by less than a proportional amount. Since one would expect the rise in income t_2E resulting from an increase in E to increase consumption in both period, retirement saving would be reduced in period 1. Our results in Table 2 also support the hypothesis that the direct effect of the old age exemption on retirement saving $\partial R/\partial E$ dominates the tax effect induced by a change in this exemption i.e. $(\partial R/\partial t_2 \cdot \partial t_2/\partial E)$.[14] Nevertheless, Turner's results are not necessarily incorrect if the positive tax-induced effect dominates the direct exemption effect in the United States.

The level of real, per capita before-tax income also has a significant effect on retirement saving behaviour ($\partial R/\partial Y_1 > 0$). In the case of RRSPs, the elasticity is greater than unity (5.9) implying that saving via RRSPs increases as a proportion of pre-retirement income, y_1, as the latter increases. In other words, RRSPs are a luxury good. This confirms Schoeplein's [8] findings that it is primarily middle and especially upper income groups who save for retirement and supports Holland's [6] assertion that the "demand for pensions . . . is elastic with respect to income". On the other hand, this is not the case for employer-sponsored pension saving (R_2). An aggregate income elasticity of approximate unity over time is hardly surprising given the institutional fact that pension contributions are usually proportional to income.

Although the coefficients of the social security wealth variables have a negative sign, only CPP/QPP has any significant effect on R_2. This may be explained by the fact that most employer-sponsored pension plan members belong to plans which are integrated with the CPP/QPP.[15]

The results from the tax rate equations in Table 2 are consistent with the expected signs on the coefficients. Total pension plan contributions, while having the correct sign, have no significant effects on the tax rate in period 1. It suggests that taxpayers do not change tax brackets as a result of such contribution (A4). However, changes in income and the old age exemptions do affect the tax rates, justifying the assumption that tax rates are partially endogenously determined. Consequently, an instrumental variable approach was appropriate under the circumstances.

Finally, it is not altogether surprising that our empirical findings indicate that tax incentives and other variables have an overall stronger effect on RRSPs than on employer-sponsored plans i.e. for all those variables which are statistically significant in both regressions, the magnitudes of their coefficients in the RRSP equation (R_1) exceed those of the employer-sponsored pension saving equation (R_2). Since RRSPs are more "personalized" than pension savings through employer-sponsored plans i.e. provide greater freedom for individual choice, one would expect RRSPs to be more sensitive to changes in these variables.

[14]$\partial R/\partial E = 0.919$ and $\partial R/\partial t_2 \cdot \partial t_2/\partial E = (8.135) \times (0.865 \times 10^{-4}) = .0007$.

[15]"Integrated Plans" are defined as those that provide a lower level of contributions and/or benefits on all or part of the year's Maximum Pensionable Earnings under the CPP/QPP or that provide for pensions to be reduced by all or part of the C/QPP benefit.

Conclusions and Policy Implications

(1) *The Case for Abolition of the Old Age Exemption*

Our theoretical and empirical findings cast doubt upon the efficacy of the old age exemption in encouraging retirement saving. Evidence from time series data indicates that, contrary to the conventional wisdom, this exemption has had an adverse, albeit minor, effect on retirement saving. Thus, if is it an objective of public policy to provide private retirement saving, one should reconsider the use of the old age exemption for this purpose. Insofar as the elderly face special living expenses, an additional exemption might be appropriate. While this may have been true in 1948 when the old age exemption was introduced, there is little evidence to suggest that it is the case at present. Even as early as 1966, the Carter Commission on Taxation concluded that no special exemption for the elderly was warranted. Since that time, universal medical care has been introduced to provide basic security against health-induced financial problems for all Canadians.

When one also considers that, in many provinces, senior citizens are either exempt from health insurance premiums (or else entitled to rebates depending upon income) and also receive other ancillary benefits at little or no cost to themselves, it becomes increasingly doubtful whether the elderly require more income for subsistence than do the young. On the contrary, since the elderly incur less, if any, work-related expenses and have less need to save, it would appear that preferential treatment should be granted to the young rather than the old, implying that the old age exemption should be abolished on *horizontal* equity grounds. Further, at the other extreme, an individual whose exemptions already exempt the whole of his income will gain nothing from an additional exemption. Hence, one might want to reject the old age

exemption on *vertical* equity grounds since the greatest beneficiaries are those who are least in need. In short, one should abolish the old age exemption on equity (horizontal and vertical) as well as efficiency grounds. Indeed, anything (e.g., indexing) which leads to an increase in such an exemption is therefore undesirable.

Similar arguments apply to the $1,000 pension income deduction which was introduced in 1975, supposedly to compensate individuals in some way for the deleterious impact of inflation on the purchasing power of retirement savings. Like the old age exemption, this deduction is inequitable and there is no empirical evidence to suggest that it encourages retirement saving. The tax expenditures (i.e., revenue loss) associated with the old age exemption could instead be used to finance an expanded Guaranteed Income Supplement as well as more generous provincial supplements to the elderly, while those tax expenditures on the pension income deduction could be channelled into a more equitable programme to encourage saving for retirement.[16]

(2) *A More Equitable Incentive to Retirement Saving*

On the other hand, empirical evidence does support the conventional wisdom that, as a result of the tax-deductibility of contributions to employer-sponsored pension plans and especially 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 income but 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 percent 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 incomes are low, implying a low marginal tax rate, the tax saving on employer-sponsored pension plans and especially RRSP contributions will be small. It follows, therefore, 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 through a new kind of RRSP, whereby the government would pay low-income contributors a bonus in order to compensate them for their low tax saving resulting from the tax deductibility of RRSP contributions.[17] 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.

[16]In this regard, it is useful to indicate the tax expenditures or revenue loss associated with both the old age exemption and pension income deduction. Estimates by the Economic Council of Canada show that if the old age exemption had been abolished for the 1977 tax year, federal and provincial government tax revenues would have increased by $142 million and $68 million respectively, while removal of the pension income deduction in the same year would have increased federal and provincial government revenues by $90 million and $42 million respectively. If the old age exemption as well as the pension income deduction had been abolished together, they would have increased federal government revenue by $248 million and provincial governments' revenue by $117 million, a total of $365 million in 1977.

[17]See (Daly, 1980).

APPENDIX "A"
Definitions and Sources of Variables

Symbol	*Definition*
R_1	Real, per capita gross annual contributions to Registered Retirement Savings Plans (RRSP) by individuals less than 65 years of age.
R_2	Real, per capita employer-sponsored pension plan savings defined as annual employee contributions to Registered Pension Plan.
a	Real, per capita expected benefits from the Old Age Security program, corrected for a change in the age of eligibility in 1972.
p	Real, per capita employer-sponsored pension plan wealth defined as the book value of the stock of assets held by trustees, trust and insurance companies.
s	Real, per capita expected net benefits from the Canada and Quebec Pension Plans excluding future tax liabilities.
r	The yield on Trust Certificates of 5 years or more.
m_1	A proxy for the marginal tax rate defined as $1/(1 - t_1)$ where t_1 is the ratio of Total Tax Payable over Taxable Income in Period 1.
m_2	A proxy for the marginal tax rate defined as $t_2/(1 - t_2)$ where t_2 is defined as above for period 2. The average tax rate equals the marginal tax rate in a proportional tax system.
e	Real, per capita Old Age Exemptions applicable to taxable income of individuals 65 years and older.
E	Nominal, per capita Old Age Exemptions as defined above.
y_1, y_2	Real, per capita assessed personal income from all sources as defined by the Income Tax Act for individuals less than age 65 (y_1) and aged 65 years and older (y_2).
Y_1, Y_2	Nominal, per capita assessed personal income as defind above.
X_1, X_2	Nominal, per capita Personal Exemptions as defined by the Income Tax Act for individuals less than age 65 (X_1) and aged 65 years and older (X_2). The latter excludes Old Age Exemptions.
D_1, D_2	Nominal, per capita deductions as defined by the Income Tax Act excluding all pension plans contributions (RRSP, CPP/QPP and Registered Pension Plans) for individuals less than age 65 (D1) and all deductions for individuals aged 65 and over (D2).
K_1	Nominal, per capita pension plan contributions by individuals less than age 65 as defined above.
T	A time trend for the period 1964 to 1976.
S	Since the data are time series disaggregated by sex, dummy, 0 for observations on males and 1 for observations on females is required.

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