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Progressive income taxes and the substitution effect of RRSPs

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Abstract. Within a progressive income-tax system, Registered Retirement Saving Plans (RRSPs) generate a substitution effect that decreases saving. The key point made here is that when an RRSP is introduced to a system that taxes capital income, the rate of return on marginal saving within the RRSP is driven to equality with the rate of return on non-RRSP saving. Since RRSP contributions redistribute taxable income across periods, they also have the effect of increasing future marginal income-tax rates, which lowers the after-tax return to saving. This result stands in contrast to the conventional view from the public finance literature.

Impôts progressifs sur le revenu et effet de substitution des REER. A l'intérieur d'un régime d'impôts progressifs sur le revenu, les régimes enregistrés d'épargne retraite (REER) engendrent un effet de substitution qui réduit l'épargne. Le point central sur lequel l'auteur insiste est à l'effet que quand on met en place un REER dans un système qui impose les revenus en provenance du capital, le taux de rendement sur l'épargne marginale dans le cadre du REER tend à évaluer le taux de rendement sur l'épargne qui n'est pas canalisée vers le REER. Puisque les contributions au REER tendent à redistribuer le revenu imposable entre périodes, elles ont pour effet d'accroître les taux marginaux d'imposition dans l'avenir. Voilà qui réduit le taux de rendement après impôt sur l'épargne. Ce résultat contraste avec les points de vue conventionnels qu'on trouve dans la littérature spécialisée en finances publiques.

I. INTRODUCTION

This paper examines the proposition that tax-deferred saving plans, such as Individual Retirement Accounts (IRAs) in the United States or Registered Retirement Saving Plans (RRSPs) in Canada, can be used to increase national saving. RRSPs were introduced in Canada in 1957 so individuals could more easily provide for their retirement. Though contributions to RRSPs in Canada are significant and growing –

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contributions in 1987 exceeded \$9 billion (see Frenken 1990) – it is not obvious that these contributions reflect an increase in total private saving, since individuals may be simply substituting RRSP saving for non-RRSP saving. Despite this concern, RRSPs appear to be viewed by many as an effective means for increasing total private saving. They also appear to be viewed, at least by some, as an effective instrument for promoting national saving.

The conventional view from the public finance literature (e.g., Beach et al. 1988) is that such tax-deferred saving plans generate a substitution effect that unambiguously increases private saving. The source of this view is that the tax advantages inherent to RRSPs increase the rate of return to saving (at the margin) and thus reduce current consumption. The total effect on private saving, however, is compounded by the wealth effect of the RRSP; such tax-deferred saving plans permit individuals within a progressive income-tax system to redistribute taxable income across years and thus reduce their lifetime income-tax obligations. This positive wealth effect would normally be expected to lead to an increase in consumption throughout an individual's life. Since the substitution and wealth effects are expected to have opposing influences on saving, the conventional view does not generate a clear prediction concerning the effect of RRSPs on total private saving.

The wealth effect of the RRSP also complicates the analysis of the relationship between RRSPs and national saving. The increase in wealth experienced by an individual who contributes to an RRSP is seen by the government as a reduction in tax revenue and thus, for unchanged government expenditure, a decrease in government saving. RRSPs can therefore increase national saving only if the combined substitution and wealth effects lead to an increase in total private saving which more than offsets the certain reduction in government saving.

The conventional view therefore does not predict that RRSPs will necessarily increase national saving. It predicts only that the substitution effect of the RRSP leads to more saving. It follows that in an experiment where the government introduces an RRSP and simultaneously levies non-distortionary taxes on individuals which leaves government saving unchanged, the conventional view predicts an unambiguous increase in national saving. Gravelle (1991, 137) explicitly endorses this conventional view in her discussion of IRAS and saving in the United States.

This paper challenges the view that RRSPs generate a substitution effect that leads individuals to increase their saving. In a very simple two-period model with flat-rate income taxes, I show that RRSPs have no substitution effect whatsoever. In the same model with progressive income taxes, I show that the substitution effect of the RRSP actually works to *reduce* the level of saving.

The basic point emphasized in this paper is that when an RRSP is introduced to an income-tax system which taxes ordinary capital income, the rate of return to marginal saving (either inside or outside the RRSP) is determined by the return on non-RRSP saving. With constant marginal income-tax rates, the after-tax rate of return on non-RRSP saving is constant (for a given pre-tax rate), and so there can be no substitution effect. But if marginal income-tax rates rise with income, as they do in a progressive income-tax system, then contributions to the RRSP that defer

taxable income to later years have the effect of increasing future marginal tax rates and thus lowering the after-tax return to saving. This result explains the perverse substitution effect of RRSPs when they are introduced to a progressive income-tax system.

The paper is organized as follows. Section II outlines the assumptions of the basic model used in the paper. I discuss why the assumption of an unchanged government deficit helps to focus the analysis on the substitution effect. The particular definition of saving is also addressed. Section III presents the central result of the paper, discussing both flat-rate and progressive income-tax systems. I show in section IV why relaxing the simplifying assumptions of the model does not alter the basic result. Section V offers some final remarks and specifically addresses the question of how one might think of the effects of RRSPs on national saving in a world where governments do not have access to non-distortionary taxation. I argue that the absence of lump-sum taxes increases the strength of the argument against RRSPs as an effective means to increasing national saving.

II. THEORETICAL BACKGROUND

I examine an individual's intertemporal consumption pattern in a standard two-period model with no uncertainty: I compare the consumption pattern in the absence of RRSPs to that when the individual has access to an RRSP as an additional avenue of saving. The individual has convex lifetime preferences represented by the utility function $u(c_1, c_2)$ and pays taxes on total income in each period. Income taxes in period i are given by $\tau(y_i)$, where y_i is taxable income and it is assumed that $\tau'(y_i) > 0$ and $\tau''(y_i) \geq 0$. I consider two income-tax systems: flat-rate income taxes, with $\tau''(y) = 0$, and progressive income taxes, with $\tau''(y) > 0$.¹

I also make the following assumptions, which greatly clarify the presentation; I defer until section IV a discussion of why relaxing these assumptions leaves the central result unchanged.

ASSUMPTION 1. *Individuals face a constant real interest rate, $r > 0$.*

ASSUMPTION 2. *There is no issue of labour supply or production. Individuals have endowments of income given by $e_1, e_2 > 0$.*

ASSUMPTION 3. *Contributions to RRSPs earn the real interest rate, r .*

ASSUMPTION 4. *There are no upper limits to the size of the RRSP contribution.*

ASSUMPTION 5. *In addition to making a contribution to the RRSP, individuals can borrow or lend any amount at the real interest rate, r .*

¹ A progressive income-tax system with tax brackets, where $\tau''(y)$ is always non-negative but zero over some intervals, is simply a combination of these two cases.

ASSUMPTION 6. *Interest income is taxed and interest payments are tax deductible.*

1. *Lump-sum taxes*

I assume throughout the analysis that the government, when introducing RRSPs, also imposes lump-sum taxes (or transfers) to keep the individual's income-tax obligations unchanged in each period. This assumption is convenient for two reasons. First, by eliminating any changes in an individual's wealth generated by the RRSP, I am able to focus on the pure substitution effect of the RRSP. With such taxes in place, the effect of the RRSP on private saving is given by the substitution effect alone. The second reason why the lump-sum taxes are convenient relates to the issue of the impact of the RRSP on government saving. The lump-sum taxes are constructed to eliminate the reduction in tax-revenue caused by the RRSP and therefore leave the level of government saving unchanged. This means that the effect of the RRSP on national saving is given by the effect on private saving alone. In the absence of such taxes the relationship between RRSPs and national saving would be complicated by the effects of government deficits on private saving. This issue has already received much attention in the literature on Ricardian Equivalence (e.g., Barro 1974), and I prefer to avoid it entirely.

This is not meant to suggest that the absence of such lump-sum taxes would leave the analysis unchanged. On the contrary, I argue in the concluding section of the paper that in a world where the government is either unwilling or unable to balance its budget through such lump-sum taxes, there is even a stronger reason to believe that RRSPs decrease national saving; the argument there is based on individuals' departures from pure Ricardian behaviour.

2. *The definition of saving*

RRSPs will be said to increase private saving if, as a result of making a contribution to the RRSP, the individual reduces his first-period consumption. Given that the lump-sum taxes are imposed in such a way as to keep the present value of lifetime consumption (i.e., wealth) unchanged, this is equivalent to a rise in second-period consumption.

Since the focus here is on the pattern of consumption directly, rather than on the behaviour of the gap between disposable income and consumption, the timing of taxes over the individual's life does not affect the measure of saving. Thus, while I assume that the government imposes lump-sum taxes to keep the individual's total tax bill unchanged in each period, this assumption is not at all necessary. Given the assumed access to perfect capital markets, the lump-sum taxes could take any pattern over the individual's life and have no effect on the pattern of consumption.

III. THE SUBSTITUTION EFFECT OF RRSPS

In the absence of RRSPs the individual chooses c_1 and c_2 to maximize $u(c_1, c_2)$ subject to

$$c_2 = e_2 + (e_1 - \tau(e_1) - c_1)(1 + r) - \tau\{e_2 + (e_1 - \tau(e_1) - c_1)r\},$$

where the third term on the right-hand side shows that the individual must pay tax on interest earned from the first-period saving. The first-order condition is

$$u_1/u_2 = 1 + r(1 - \tau'(y_2)), \quad (1)$$

where I denote second-period taxable income by $y_2 = e_2 + (e_1 - \tau(e_1) - c_1)r$. The subscripts on u denote the partial derivative of u with respect to either first- or second-period consumption.

Now suppose that the government introduces an RRSP. Any contributions made to the plan in the first period are deducted from taxable income in that period, but the contribution and accumulated interest are added to taxable income when they are withdrawn in the second period. I assume that individuals leave no bequests, and so they withdraw the full amount in the second period. Using an R superscript for variables when the individual has access to an RRSP, the individual chooses c_1^R , c_2^R and the RRSP contribution (x) to maximize $u(c_1^R, c_2^R)$ subject to

$$c_2^R = e_2 + (e_1 - \tau(e_1 - x) - c_1^R - x - z_1)(1 + r) + x(1 + r) - \tau\{e_2 + (e_1 - \tau(e_1 - x) - c_1^R - x - z_1)r + x(1 + r)\} - z_2.$$

The term in large brackets is second-period taxable income; the individual pays tax in the second period on the interest earned from non-RRSP saving as well as on the interest and principle from the RRSP contribution. z_1 and z_2 are the lump-sum taxes that the individual must pay in the first and second period, respectively. For each period, the lump-sum tax is equal to the difference between the income tax paid in the world without RRSPs and that paid in the world with RRSPs. The taxes are given by

$$z_1 = \tau(e_1) - \tau(e_1 - x)$$

$$z_2 = \tau(e_2 + sr) - \tau(e_2 + s^R r + x(1 + r)),$$

where s and s^R represent non-RRSP saving in the absence and presence of RRSPs, respectively.

The first-order conditions for c_1 and x are

$$u_1/u_2 = 1 + r(1 - \tau'(y_2^R)) \quad (2a)$$

$$\tau'(y_1^R) = \tau'(y_2^R)(1 + \tau'(y_1^R)r)/(1 + r). \quad (2b)$$

The condition for c_1 takes the same form as it does in the model without an RRSP; the pattern of consumption is chosen so that the marginal rate of substitution is equal to the after-tax interest rate.

The condition for x reflects the individual's desire to minimize lifetime income-taxes. The intuition behind equation (2b) is as follows. An increase in x by one unit (holding c_1 constant) comes directly out of non-RRSP saving, but the RRSP

contribution reduces first-period taxes by $\tau'(y_1^R)$ which adds to non-RRSP saving. So, as a result of the marginal contribution to the RRSP, non-RRSP saving falls by $(1 - \tau'(y_1^R))$. The increase in second-period pre-tax resources made possible by the marginal RRSP contribution is therefore

$$(1 + r) - (1 - \tau'(y_1^R))(1 + r). \quad (3a)$$

Since all RRSP funds (principle plus interest) are taxed upon withdrawal in the second period, whereas only the interest on non-RRSP saving is taxed, the increase in second-period income taxes as a result of the marginal RRSP contribution is

$$\tau'(y_2^R)\{(1 + r) - r(1 - \tau'(y_2^R))\}. \quad (3b)$$

The optimal value of x is that equating the marginal gain in consumption in equation (3a) to the marginal loss in consumption in equation (3b). Equating (3a) and (3b) simplifies to equation (2b).

It is worth emphasizing that the optimal RRSP contribution purely reflects the desire of the individual to minimize lifetime income-taxes. As such, the optimal value of x depends on the individual's pattern of pre-tax income and the structure of the income-tax system but not at all on the nature of preferences. Non-RRSP saving, in contrast, allows individuals with convex preferences to smooth their consumption over time; the optimal level of non-RRSP saving therefore depends on the structure of preferences. The individual thus chooses x to maximize wealth and then chooses the appropriate level of non-RRSP saving to maximize utility, given the maximized level of wealth. Individuals therefore typically have both RRSP and non-RRSP saving simultaneously. This point has also been made by Daly (1981).

1. Flat-rate income taxes

With flat-rate income taxes $\tau'(y_i) = \tau$, and so the first-order conditions for x and c_1 are

$$u_1/u_2 = 1 + r(1 - \tau) \quad (4a)$$

$$1 + r = 1 + r\tau. \quad (4b)$$

It is clear that with positive marginal tax rates (less than 1) equation (4b) cannot hold. An individual who makes a contribution to the RRSP effectively receives a low-interest loan from the government and so has every incentive to make the maximum allowable RRSP contribution in the first period. At the same time, he will borrow or lend as necessary in the capital market to finance the level of first-period consumption consistent with equation (4a).

The RRSP generates no substitution effect whatsoever if there are flat-rate income taxes, a result seen in equation (4a), which shows that the after-tax interest rate that guides the intertemporal allocation of consumption is unchanged and equal to $1 + r(1 - \tau)$. This does not mean that the individual does not gain by contributing

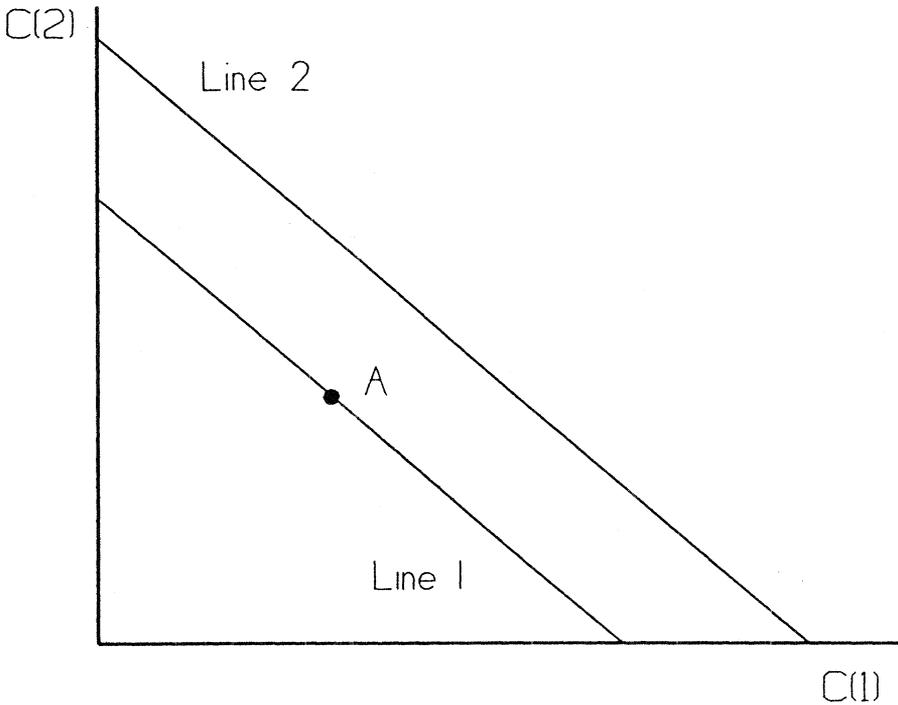


FIGURE 1 The effect of RRSPs with flat-rate income taxes

to the RRSP; for there clearly are gains associated with the low-interest loan. But the gains represent purely an increase in the individual's wealth, with no change in the relative price that guides the intertemporal allocation of consumption.

The case of RRSPs and flat-rate income taxes is illustrated in figure 1. Line 1 is the individual's budget line with flat-rate income taxes at the rate τ when there is no RRSP and has a slope equal to $-(1 + r(1 - \tau))$. In the absence of RRSPs, the individual chooses to consume at some point like A. With access to an RRSP, the individual makes the maximum possible contribution (say, \bar{x}), which increases his wealth and thus shifts his budget line out to line 2, which has the same slope as line 1.² So with flat-rate income taxes the RRSP generates no substitution effect. When confronted with the lump-sum taxes, constructed to eliminate any wealth effects of the RRSP, the budget line then shifts back to line 1. The effect of the RRSP on private saving is therefore zero, as is the effect of the RRSP on national saving.

2. Progressive income taxes

Comparison of the first-order condition for c_1 in equation (2a) reveals that the RRSP changes the intertemporal relative prices faced by the individual if and only if it

2 From equation (4b), the increase in c_2 for a given value of c_1 is equal to $\bar{x}r(1 - \tau)$.

leads to a change in taxable income in the second period. Lemma 1 below proves that $y_2^R > y_2$ and therefore that the substitution effect of the RRSP is to decrease the level of saving. The theorem then proves that when the lump-sum taxes are imposed on the individual, there is a decline in national saving. For what follows, it is helpful to provide a summary of the relevant variables:

$$s = e_1 - \tau(e_1) - c_1 \quad (5a)$$

$$s^R = e_1 - \tau(e_1 - x) - x - c_1^R - z_1 \quad (5b)$$

$$y_2 = e_2 + sr \quad (5c)$$

$$y_2^R = e_2 + x(1+r) + s^R r \quad (5d)$$

$$z_1 = \tau(e_1) - \tau(e_1 - x). \quad (5e)$$

LEMMA 1. $y_2^R > y_2$.

Proof. Use (5e) in (5b) and then subtract from (5a) to get an expression for the difference in total private saving:

$$s - (s^R + x) = (c_1^R - c_1). \quad (6)$$

Now, subtract (5c) from (5d) and use (6) to get

$$y_2^R - y_2 = x(1+r) - r(x + c_1^R - c_1) = x - r(c_1^R - c_1). \quad (7)$$

Now consider the following proof by contradiction: suppose $y_2 \geq y_2^R$. By the strict convexity of the income-tax function, $y_2 \geq y_2^R$ implies that the marginal tax rate in the second period is lower in the presence of the RRSP. From the first-order condition in (2a), it follows that $c_1^R < c_1$. But this result violates equation (7) for positive values of x . Thus, $y_2^R > y_2$. This further implies that $\tau'(y_2^R) > \tau'(y_2)$, which means that the after-tax rate of return is lower in the world with RRSPs than in the world without RRSPs. The substitution effect of the RRSP therefore decreases private saving. ■

THEOREM 1. *Private (and national) saving falls when individuals contribute to an RRSP ($x > 0$).*

Proof. By the convexity of the income-tax function, lemma 1 implies an increase in the second-period marginal tax rate as a result of the RRSP. From (2a) this means that $c_1^R > c_1$. From equation (6) it follows that total private saving falls. Since the government deficit is unchanged, national saving must also fall. ■

IV. DISCUSSION

I have argued that introducing an RRSP to a system that taxes capital income does not change intertemporal relative prices in a way that favours saving. In other words,

either there is no substitution effect whatsoever generated by the RRSP (with flat-rate income taxes) or else that substitution effect leads to less saving (with progressive income taxes). The key to understanding the basic result is that individuals who have access to two saving instruments – one that offers a tax shelter and one that does not – will optimally contribute funds into the tax-sheltered account until the rate of return on tax-sheltered saving at the margin is driven to equality with the return on unsheltered saving.

In the case of flat-rate income taxes, the after-tax return on unsheltered saving is unaffected by any intertemporal redistributions of taxable income, and so the individual is led to contribute the maximum allowable amount into the RRSP. In this case, the rate of return on infra-marginal contributions to the RRSP exceeds the return on non-RRSP saving. Since the individual is pushed in a corner, however, the comparison of returns at the margin is irrelevant: any marginal saving must be done outside the RRSP and thus earns the (unchanged) after-tax return on unsheltered saving. The RRSP therefore generates no substitution effect.

In the case of progressive income taxes, each extra dollar contributed to the RRSP changes the pattern of taxable income and thus also changes the patterns of marginal tax rates, implying that there is an interior optimal level of RRSP contributions that reflects the smoothing across time of marginal tax rates. At the optimal level of RRSP contributions, the rate of return on tax-sheltered saving at the margin is driven to equality with the return at the margin on unsheltered saving. But since the act of contributing to the RRSP increases second-period marginal tax rates and thus lowers the after-tax return on unsheltered saving, the rate of return on saving at the margin is lower than it would be in the world without RRSPs. The RRSP therefore generates a perverse substitution effect, leading to a decline in saving.

The conclusion is that RRSPs introduced with the intention of increasing private or national saving may well have the opposite effect. Recall that the conventional view of RRSPs is that the substitution effect leads to more private saving, while the wealth effect probably leads to less. The results from this analysis suggest that the substitution effect (with progressive income taxes) leads to less private saving, thus making it very unlikely indeed that the total effect on private saving can be positive. In the concluding section of this paper I address further the issue of the effect of RRSPs on private, government, and national saving when the government does not impose the lump-sum taxes discussed in the model above.

The model I use to generate these strong results is constructed with some extreme assumptions. In what follows I discuss why these assumptions can be relaxed without changing the basic result of the paper.

1. Fixed interest rate, no production (assumptions 1 and 2)

The same results can be obtained in a model in which production and capital accumulation take place and the interest rate is determined endogeneously (e.g., Diamond 1965). The only interesting way in which the production economy is different from the endowment economy is that the introduction of the RRSP may now have an effect on the pre-tax real interest rate. As individuals reduce their

saving with the introduction of the RRSP, the capital stock falls. With diminishing returns to capital, this decline increases the real interest rate. If individual wealth is held constant by imposing lump-sum taxes, such an increase in the real interest rate may dampen, but will not overturn, the initial reduction in total saving.

2. Contributions to RRSPs earn the interest rate r (assumption 3)

The model ignores an important characteristic of RRSPs – namely, that contributions to RRSPs are permitted to accumulate tax free before withdrawal, thus increasing their pre-tax rate of return above that available on non-RRSP saving. With a higher pre-tax interest rate available within the RRSP, is there not an additional substitution effect at work that can offset the one discussed above?

To address this issue, I modify the basic model by assuming that RRSP contributions earn the interest rate $r^R > r$. The individual's second-period taxable income is then $y_2^R = e_2 + x(1 + r^R) + (e_1 - \tau(e_1 - x) - c_1^R - x - z)r$. To show that the RRSP still generates a substitution effect that decreases saving, I need show only that second-period taxable income increases when the RRSP is introduced. When $r^R > r$, equation (7) is modified to be

$$y_2^R - y_2 = x(1 + r^R - r) - r(c_1^R - c_1). \quad (7')$$

Using the same argument as in lemma 1, it is clear that if RRSP contributions earn $r^R > r$, then second-period taxable income must rise when the individual contributes to the RRSP, thus lowering the after-tax rate of return to saving and producing a substitution effect that decreases the level of saving.

It is interesting to note the effect of changes in r^R on the individual's optimal RRSP contribution. When r^R differs from r , the first-order condition for x is given by

$$(1 + r^R) - [1 - \tau'(y_1^R)](1 + r) = \tau'(y_2^R)\{1 + r^R - [1 - \tau'(y_1^R)]r\}. \quad (8)$$

Differentiating equation (8), it is easy to show that

$$\text{sign} \left\{ \frac{\partial x}{\partial r^R} \right\} = -\text{sign} \left\{ \tau''(y_2^R)x[1 + r^R - r(1 - \tau'(y_1^R))] - [1 - \tau'(y_2^R)] \right\}.$$

As r^R rises, the optimal RRSP contribution may actually fall; $\partial x / \partial r^R$ will be negative if $\tau''(y_2^R)$ and x are sufficiently large. This counter-intuitive result is explained by the fact that for a given value of x , an increase in r^R raises second-period taxable income (by $x \cdot \Delta r^R$) and thus also increases the second-period marginal tax rate, since $\tau''(y_2^R)$ is positive. The increase in second-period income taxes must be weighed against the increase in second-period consumption that is made available to the individual by saving at the rate r^R in the RRSP rather than at the rate r outside the RRSP.

3. No upper limit to RRSP contributions (assumption 4)

Suppose that the individual's contribution to the RRSP is restricted to be less than or equal to \bar{x} and that this constraint is binding. Although the existence of an upper

limit on RRSP contributions restricts the extent to which second-period marginal tax rates will increase when the RRSP is introduced, it is clear from the theorem above that for any $\bar{x} > 0$ it is still true that the RRSP leads to an increase in second-period taxable income and an increase in second-period marginal tax rates. The substitution effect of the RRSP is still to decrease the level of saving.

Moreover, as the binding upper limit is reduced, the second-period marginal tax rate falls, thus increasing the after-tax return to saving. Another counter-intuitive result is thereby revealed: a reduction in the upper limit on RRSP contributions leads to a fall in RRSP contributions (obviously) and an *increase* in private and national saving (if the wealth effects of the RRSP are eliminated with the lump-sum taxes).

4. Access to perfect capital markets (assumption 5)

Suppose that individuals are able to lend at the interest rate r but are unable to borrow at any positive interest rate. If the individual's rate of time preference is sufficiently high and the optimal RRSP contribution is sufficiently large, the unconstrained level of non-RRSP saving is negative – that is, the individual wishes to borrow in the first period. With liquidity constraints in place, however, the individual is prevented from such borrowing and is forced to save more as a consequence of making his optimal RRSP contribution. Thus, under some conditions in the two-period model, the introduction of an RRSP can lead to an increase in saving.

Notice, however, that the ability of the RRSP to increase saving in the presence of liquidity constraints is based largely on the absence of an upper limit to RRSP contributions. If contributions have a binding upper limit, then the individual's level of non-RRSP saving will be higher than the level chosen when x is unconstrained (see previous section), and the more binding this constraint, the higher is the individual's non-RRSP saving. As long as non-RRSP saving is positive, then any liquidity constraints are irrelevant and total saving will fall when the RRSP is introduced. Thus, while the existence of liquidity constraints allows the possibility that RRSPs may lead to an increase in saving, a reasonable presumption of real-world conditions may be that e_1 is sufficiently larger than e_2 and \bar{x} is sufficiently small³ that the (constrained) level of non-RRSP saving is positive, and thus any restrictions on borrowing are unimportant.

5. Interest payments are tax-deductible (assumption 6)

The model treats interest earnings and interest payments symmetrically by assuming that interest payments are tax deductible. Typically, however, this symmetry does not exist in actual tax systems, and such an asymmetry can change the result concerning the direction of the substitution effect of the RRSP (see Burman et al. 1990). This asymmetry is a special case of the liquidity constraints discussed in the previous section.

The basic point can be made in the two-period model with flat-rate income taxes. Figure 2 shows the individual's budget line with a kink at the after-tax endowment

3 The RRSP contribution limit in 1991 was the lesser of 18 per cent of income or \$11,500.

point (point Z). If the individual borrows in the first period, then he faces the interest rate r . But if he lends in the first period, the relevant intertemporal relative price is the after-tax interest rate, $r(1 - \tau)$. With unlimited access to an RRSP, the budget line above Z rotates up, with the slope now equal to r . If the individual was consuming at a point like A , then the RRSP is irrelevant. But if the individual was consuming at a point like B , then with access to the RRSP he moves to a point like C ; the substitution effect of the RRSP clearly increases saving.

But suppose now that the RRSP has a maximum contribution. The budget line now becomes kinked at point Z' ; above that point the intertemporal relative price is $(1 + r(1 - \tau))$. For an individual originally consuming at point A , the RRSP is again irrelevant. But for the individual consuming at point B there are two possible outcomes. The individual may contribute less than the maximum and thus end up at point C ; in this case there is a clear substitution effect of the RRSP, since the marginal dollar is saved at the rate r .⁴ Or the individual at point B may contribute the maximum amount to the RRSP and thus end up at point D ; in this case there is no substitution effect, since any marginal saving earns only the after-tax interest rate.

Across all individuals in the economy, the aggregate substitution effect of RRSPs therefore depends on the fraction of 'type C ' people relative to 'type D ' people. To the extent that most contributors to RRSPs make the maximum contribution and, in addition, have positive levels of non-RRSP saving, the aggregate substitution effect will be close to zero.

With progressive income taxes, however, any substitution effects from figure 2 must be offset by the substitution effects resulting from the change in marginal tax rates brought about by the intertemporal redistribution of taxable income. For 'type D ' people the overall substitution effect will definitely decrease saving. Only for 'type C ' people is there the *possibility* that the overall substitution effect will positively affect saving; the more marginal tax rates rise with income, the more the overall substitution effect for these people will lead them to reduce their saving.

V. FINAL REMARKS

I have argued that tax-deferred saving plans, such as RRSPs in Canada or IRAs in the United States, do not generate a substitution effect that increases saving when such plans are introduced into a system that taxes capital (and other) income. This result is in contrast to the conventional view from the public finance literature, which views RRSPs as a means of transforming an income-tax system into a consumption-tax system. Since a consumption tax does not distort intertemporal relative prices, while an income tax clearly does so, a successful move to a consumption-tax system would indeed produce a substitution effect that increases saving. Thus, the result in this paper can be viewed also as an argument for why RRSPs cannot be used to transform an income-tax system into a consumption-tax system.

⁴ Another possibility is that the individual makes the maximum RRSP contribution but then borrows outside of the RRSP to consume at point C .

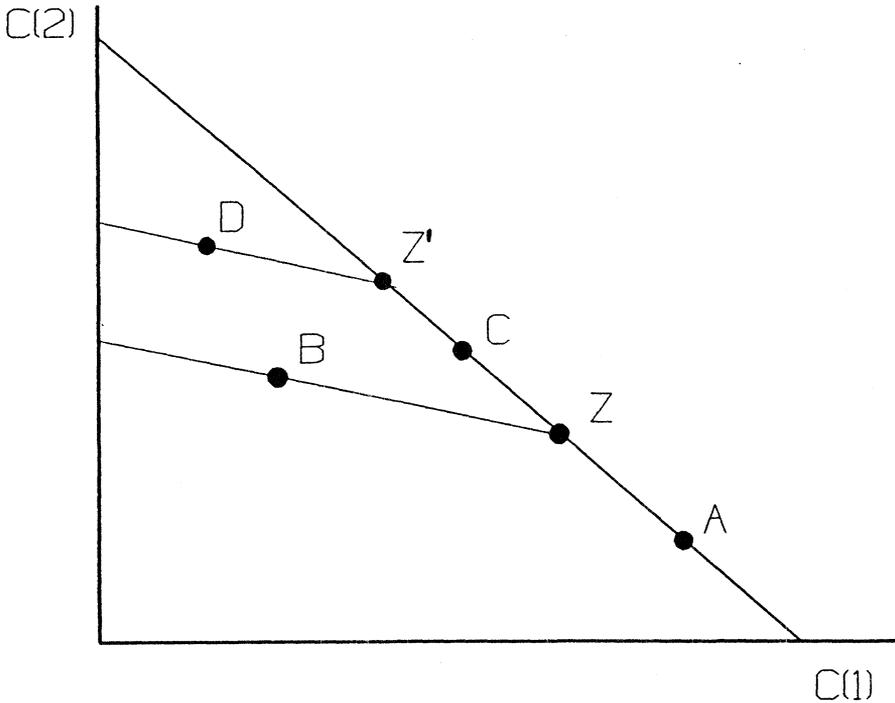


FIGURE 2 The effect of RRSPs when interest payments are not tax deductible

The standard argument that RRSPs can convert income taxes into consumption taxes (e.g., Stiglitz 1988) is based on the assumption that the RRSP is the *only* mechanism for saving. In such a world every dollar saved in the first period gets deducted from taxable income in that period, and so the individual faces only the undistorted intertemporal relative price. It follows immediately that RRSPs transform an income-tax system into a consumption-tax system.

The simultaneous existence of both RRSP saving and non-RRSP saving is essential to understanding why a system of income taxes with RRSPs will generally *not* be equivalent to a system of consumption taxes. If individuals choose to do some saving outside of the RRSP, as they will in general, then they still face income taxes on the interest earned from that saving. And the rate of return on marginal saving within the RRSP will be driven to equality with the return at the margin on non-RRSP saving. Thus, the interest rate that individuals use to allocate their consumption across periods will be the after-tax interest rate (as in the income-tax world) rather than the pre-tax interest rate (as in the consumption-tax world). In other words, as long as individuals have some non-RRSP saving, the conventional view about the substitution effect of the RRSP is incorrect.

With flat-rate income taxes, the RRSP generates no substitution effect. With progressive income taxes, however, the RRSP generates a substitution effect that de-

creases saving. In this case, not only does the RRSP not remove the distortion to intertemporal relative prices caused by the taxation of interest income, but because of the change in marginal income tax rates brought about by the RRSP contribution, the RRSP actually *increases* the distortion. In this sense, introducing an RRSP to a progressive income-tax system actually moves the system *further away* from a consumption-tax system.

It is worth mentioning how this analysis can be used to examine the effect that RRSPs have on national saving. While this paper has focused entirely on the substitution effect of RRSPs, the private wealth effects, as well as the effects on government saving, are also clearly important. In the absence of the special lump-sum taxes assumed above, the effect of RRSPs on national saving can be obtained by summing the wealth and substitution effects on private saving and the tax-revenue effect on government saving. Individuals' behaviour in response to changes in the timing of government taxation plays a central role in this analysis.

If individuals are Ricardian (e.g., Barro 1974) and the path of government expenditures is unchanged, then individuals will save all of the reduction in income taxes generated by the RRSP contributions. In this case the wealth effect and the tax-revenue effect of the RRSP will exactly offset each other. Only the substitution effect is left, and so national saving will fall if the income-tax system is progressive. But if individuals are not Ricardian⁵ and they therefore consume some part of their increase in wealth brought about by their RRSP contributions, then the wealth and tax-revenue effects must combine to decrease national saving. In this case national saving will certainly fall when RRSPs are introduced.

Finally, note that I have ignored mention of any 'psychological' or 'non-rational' reasons why RRSPs may lead to an increase in private or national saving. I have heard the argument that RRSPs almost certainly increase total private saving because without such well-advertised saving instruments people would simply 'forget' to save. However, as Gravelle (1991) argues, it seems just as reasonable to think that individuals will fail to recognize the future tax liabilities of their RRSP saving and, in so doing, perceive themselves to be wealthier than they actually are. This mistake may well lead them to reduce their total saving. Given the virtual infinity of such 'non-rational' arguments that could be invoked, it seems unlikely that this avenue of research will resolve the issue.

Given the substitution effect of the RRSP, which at best is absent and at worst reduces the level of saving, combined with the wealth/tax-revenue effect, which is certainly negative if individuals are non-Ricardian, I conclude that it is all too easy to justify a healthy scepticism of the view that RRSPs can be used to increase private or national saving.

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⁵ See Poterba and Summers (1987) for some evidence suggesting that individuals are non-Ricardian.

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