Inheritance and Taxation

by

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An essay submitted to the Department of Economics

in partial fulfillment of the requirements for

the degree of Master of Arts

Queen's University

Kingston, Ontario, Canada

August 2011

> This shall be their inheritance: I am their inheritance. And you shall give them no possession [...] I am their possession.
> Ezekiel 44:28

1 Introduction

Who is the basic economic unit: the individual or the household? For economists this is usually a practical concern, but when assessing the validity of taxation on inheritance it must also be philosophical. If we regard the rights of the individual as paramount, then assuming that the welfare of each is given equal weight, we should seek to provide equality of opportunity to all citizens. A policymaker pursuing this objective may favour a high rate of taxation on inheritance, since variation in inherited wealth implies inequality of opportunity among heirs. On the other hand, if the household is the fundamentally important unit we should avoid inhibiting the intertemporal continuity of its assets, which calls for a rate of inheritance taxation close to or equal to zero. The latter policy may also be advocated by an individualist who focuses on the rights of the testator (who should be allowed to leave his estate to whomever he wishes) rather than those of potential heirs. Should we then hold the wishes of a dead man in higher esteem than the welfare of the living?

Let us retreat from such metaphysical arguments and frame the problem in tangible terms. Measurable negative consequences of large inheritances include reduced labour effort among heirs (Holtz-Eakin, Joulfaian and Rosen 1993), increased wealth concentration (Kopczuk and Saez 2004)[1], and if we allow them to go unchecked, the forfeiture of a significant tax base. We must weigh these concerns against the ills of estate taxation, which include the disenfranchisement of heirs and the distortion of earning and saving incentives for testators (Kopczuk and Slemrod 2001). The former is unlikely to be of concern under a standard welfarist approach since those adversely affected tend to be the most wealthy and least in need of preferential tax treatment (Kopczuk 2010), while the latter may have significant and far-reaching negative consequences. On aggregate, a disincentive to saving may erode the capital stock (Gale and Slemrod 2001) and inhibit long-run growth, while a disincentive to earning will reduce labour effort. However, the severity of these effects is highly sensitive to the bequest motive, which remains an enigma (Kopczuk 2010). If wealth accumulation is motivated by the desire to pass it on to one's heirs, the resulting disincentives will be significant. However, if bequests arise accidentally from precautionary saving the tax will be non-distortionary (and thus the ideal tax).

Since bequest motives are poorly understood, purely theoretical models cannot tell us

[1] Which we oppose on equity grounds, if not others; Stiglitz has suggested that extreme concentration of wealth may have destabilizing effects on aggregate. Kopczuk and Saez (2004) and Saez (2008) show that in recent years wealth has become increasingly concentrated in Canada and the United States, and to a lesser extent in Britain, Australia and New Zealand.

anything useful about the inheritance tax-elasticity of wealth accumulation or the deadweight loss resulting from incentive distortion. This paper measures the response of wealth accumulation to inheritance taxation empirically, using the 2005 cycle of Statistics Canada's Survey of Financial Security (SFS). To the best of our knowledge no similar study has been done using Canadian data. We use our estimates to calculate excess burden to savers of the tax compared to a revenue-neutral switch to a capital income tax, following Holtz-Eakin and Marples (2001) (hereafter HEM). This approach allows us to remain agnostic regarding bequest motives, obviating the complications entailed therein.

Several studies have estimated the inheritance-tax elasticity of saving using American data. Chapman, Hariharan and Southwick (1996) regress a measure of the marginal estate tax on aggregate revenues collected. However, their study suffers from lack of controls (only the logarithm of GDP is used).

Kopczuk and Slemrod (2001) (hereafter KS) begin with an aggregate time-series approach, but realizing its limitations opt to conduct a separate analysis of individual tax returns. This allows them to use individual-specific controls. Of course, the progressive nature of the tax system means that net worth and the marginal estate tax rate are simultaneously determined. To isolate the (negative) behavioural response to the tax KS use a two-stage least squares (2SLS) regression, instrumenting the marginal rate with rates calculated at fixed, exogenous wealth levels. Finding inconclusive results using the actual tax rate faced at death as the explanatory variable, KS resort to two alternative measures: the tax rates in effect when an individual was age 45, and ten years before death. These should correspond more closely to the expected tax rates that influence household decisions over the course of the life cycle. In particular, KS expect the rate at age 45 to influence earning and savings decisions, and the rate ten years prior to death to determine avoidance behaviour. They find the rate at age 45 to be the largest and most significant, with an elasticity of -.16.

Another individual level approach is taken by Holtz-Eakin and Marples (2001), who exploit variations in state level inheritance and estate taxes. HEM also regress the marginal estate tax on net worth (in logarithmic forms), but include the marginal capital income tax rate as a control (in addition to individual-specific demographic controls). Since the two tax rates likely have some degree of collinearity, excluding one from the specification could lead to an overestimate of the other's partial effect. HEM use similar instruments to KS – marginal estate tax rates faced at fixed, exogenous wealth levels – but augment this set with dummies detailing state of origin. This second set exploits cross-state variation in marginal rates for individuals of the same net worth (which result from differences in exemption rates and state-specific taxes), but is less likely to be endogenous than state of residence, since households might relocate to states with preferential tax laws.[2]

[2]Because of relocation costs the state of origin should be correlated strongly enough with the state of residence to be a useful instrument.

Because they transform the marginal tax rates into ad valorem rates (for reasons explained below) the elasticities estimated by HEM are not directly comparable to those of KS. In conventional form their estimates roughly correspond to elasticities of -1.4 for the estate tax and -.04 for the capital income tax.[3] Note how much greater in magnitude is HEM's estimate than that of KS, and how much greater it is than their own estimate of the capital income tax-elasticity. This result is especially puzzling given that their sample excludes very wealthy individuals. The highest taxable estate category they report is $21,040 and over (corresponding to estates of $621,040 and over). These estates face a marginal tax rate of .55, compared to .37 for taxable estates between $600 and $700. Taxable estates of less than $600 (i.e. total estates of less than $600,600) are not taxed after accounting for federal credits. This means for estates facing non-zero marginal rates of taxation the total range or rates is only .018 (although since these are time-discounted the total variation will be relatively greater).

HEM use their estimates to calculate the change in excess burden to consumers of a revenue-neutral marginal decrease in the bequest tax (implying an increase in the capital income tax). They find this move to increase welfare by a small amount.

This paper follows the methodology of HEM to a large degree. The remainder is organized as follows: Section 2 explains the theoretical model; Section 3 details the peculiarities of Canadian tax law and their impact on our analysis; Sections 4 and 5 present our main empirical analysis and a series of extensions respectively; Section 6 shows the implications of our estimates in the theoretical context, and Section 7 concludes.

2 The Model

We use the simple two-period lifecycle model of Holtz-Eakin and Marples (2001), with the first period corresponding to working life and the second to retirement. In the first period households allocate exogenous wealth W_0 and labour income between consumption and saving according to the budget constraint

$$W_0 + v(L - l) = C_0 + S, \tag{1}$$

where labour supply is fixed at the difference between total potential labour supply L and fixed leisure time l; v is the wage rate, C_0 is consumption in period zero, and S is saving. Saving earns interest r which is taxed at rate θ, which determines second period wealth W_1 according to

$$W_1 \equiv S(1 + r(1 - \theta)) \tag{2}$$

[3]Transformation to conventional elasticities involves calculations using individual-specific variables; therefore HEM's ad valorem estimates correspond to a range of conventional elasticities, the above figures being calculated with parameter values equal to those assumed in HEM's analytic framework.

which is used to finance second period consumption. Any wealth not consumed in the second period becomes the estate.

$$S(1 + r(1 - \theta)) = C_1 + E. \tag{3}$$

The estate is divided into bequests to descendants B which are taxed at rate τ, and charitable bequests CB and tax-avoiding assets A,[4] neither of which are taxed directly.[5] Thus the estate tax increases the price of bequests relative to other uses of the estate according to

$$\begin{aligned} E &= CB + A + B - \tau[E - CB - A] \\ &= CB + A + \frac{1}{1-\tau}B. \end{aligned} \tag{4}$$

Combining (2), (3) and (4) yields the retirement-age budget constraint

$$W_1 = C_1 + CB + A + \frac{1}{1-\tau}B \tag{5}$$

which can be combined with (1) to form the lifetime budget constraint

$$\begin{aligned} W_0 + vL &= C_0 + vl + \frac{1}{1 + r(1-\theta)}[C_1 + CB + A + \frac{1}{1-\tau}B] \\ &= C_0 + q_l l + q_1 C_1 + q_{CB} CB + q_A A + q_0 B \end{aligned} \tag{6}$$

where the variables q represent post-tax prices, with first period consumption being the numeraire. Let p represent pre-tax prices. Then

$$\begin{aligned} p_l &= q_l = v \\ p_1 &= p_{CB} = p_A = p_B = \frac{1}{1+r}. \end{aligned} \tag{7}$$

Neither first period consumption nor leisure is taxed, so their post-tax prices are unchanged. The components of second period spending are all taxed at the capital income tax rate θ, with bequests being doubly taxed at rate θ and again at rate τ. This yields post-tax prices

[4] In theory there is some cost to such avoidance, but we concern ourselves only with the division of the estate. We can think of the recipient receiving some function of A such that $f_{(A)} < A$.

[5] Although second period wealth has already been taxed according to θ.

$$q_1 = q_{CB} = q_A = \frac{1}{1 + r(1-\theta)}$$
$$q_B = \frac{1}{1 + r(1-\theta)} \frac{1}{1-\tau}. \tag{8}$$

Let us transform these prices into the *ad valorem* tax rates denoted by μ. We find

$$\mu_1 = \mu_{CB} = \mu_A \equiv \frac{q_1 - p_1}{p_1}$$
$$= \frac{r\theta}{1 + r(1-\theta)} \tag{9}$$
$$\mu_0 \equiv \frac{q_0 - p_0}{p_0}$$
$$\mu_B \equiv \frac{q_B - p_B(1+\mu_1)}{p_B(1+\mu_1)} \tag{10}$$
$$= \frac{\tau}{1-\tau}. \tag{11}$$

Note that μ_B reflects the tax mark-up of the bequest tax alone, while μ_0 describes the total tax mark-up on bequests. This definition allows us to examine the effects of either tax separately.

As mentioned above, the welfare effects of estate taxation are sensitive to the bequest motive. For this reason we define the utility function as broadly as possible; we will use empirically measured elasticities to calculate excess burden of taxation rather than resort to simulation. Letting $V(.,.)$ be the indirect utility function and R be government revenues, the equivalent variation measure of excess burden[6] χ is defined by

$$V(q_l, q_1, q_{CB}, q_A, q_B, (vL + W_0)) \equiv V(p_l, p_1, p_{CB}, p_A, p_B, (vL + W_0) - R - \chi). \tag{12}$$

So $R+\chi$ is the lump-sum amount we take from a household facing no taxes to bring them to the utility level of a taxpaying household. For the sake of interpretation, assume that government revenue goes to some useful end.

Now we want to find the change in excess burden to households resulting from a revenue-neutral change in taxation policy, an increase in the estate tax and a corresponding

[6]HEM note that in general deadweight loss involves more than just excess burden. Restricting our attention to this circumscribed measure allows us to move forward in a partial equilibrium setting free from paralyzing information demands or restrictive assumptions of bequest, savings, and labour supply motives.

decrease in the capital income tax. Differentiating (12) with respect to the *ad valorem* estate tax yields

$$\left[\frac{\partial V}{\partial q_1}\frac{\partial q_1}{\partial \mu_1}+\frac{\partial V}{\partial q_{CB}}\frac{\partial q_{CB}}{\partial \mu_1}+\frac{\partial V}{\partial q_A}\frac{\partial q_A}{\partial \mu_1}+\frac{\partial V}{\partial q_B}\frac{\partial q_B}{\partial \mu_1}\right]\frac{d\mu_1}{d\mu_B}+\frac{\partial V}{\partial q_B}\frac{\partial q_B}{\partial \mu_B}=-\frac{\partial V}{\partial I}\left[\frac{\partial R}{\partial \mu_B}+\frac{\partial \chi}{\partial \mu_B}\right] \tag{13}$$

where I is income net of tax revenue and excess burden. Using Roy's Identity gives us

$$\frac{-\partial V}{\partial q_1}/\frac{\partial V}{\partial I}=C_1,\ \frac{-\partial V}{\partial q_{CB}}/\frac{\partial V}{\partial I}=CB,\ \frac{-\partial V}{\partial q_A}/\frac{\partial V}{\partial I}=A,\ \frac{-\partial V}{\partial q_B}/\frac{\partial V}{\partial I}=B. \tag{14}$$

Next we impose revenue neutrality:

$$\left.\frac{\partial \chi}{\partial \mu_B}\right|_{dR=0}=p_1[C_1+CB+A+(1+\mu_B)B]\frac{d\mu_1}{d\mu_B}+p_1(1+\mu_1)B. \tag{15}$$

Noting that

$$R=\mu_1 W_1+\mu_B B \tag{16}$$

determines revenue, we differentiate(16) and set the left-hand side equal to zero, yielding

$$dR=0\implies\frac{d\mu_1}{d\mu_B}=-\frac{B\left[1+\frac{\mu_B}{1+\mu_B}\varepsilon_{BB}\right]+W_1\left[\frac{\mu_1}{1+\mu_B}\right]\varepsilon_{WB}}{W_1\left[1+\frac{\mu_1}{1+\mu_1}\varepsilon_{W1}\right]+B\left[\frac{\mu_B}{1+\mu_1}\right]\varepsilon_{B1}} \tag{17}$$

where ϵ_{XY} represents the elasticity of X with respect to the tax on Y. The above elasticities are defined as

$$\varepsilon_{WB}\equiv\frac{\partial W_1}{\partial(1+\mu_B)}\frac{(1+\mu_B)}{W_1},\ \varepsilon_{W1}\equiv\frac{\partial W_1}{\partial(1+\mu_1)}\frac{(1+\mu_1)}{W_1} \tag{18}$$

$$\varepsilon_{BB}\equiv\frac{\partial B}{\partial(1+\mu_B)}\frac{(1+\mu_B)}{B}=\frac{\partial B}{\partial(1+\mu_1)}\frac{(1+\mu_1)}{B}\equiv\varepsilon_{B1}. \tag{19}$$

Because both taxes increase the price of bequests proportionally the elasticity of bequests is the same for either tax.

Combining (5), (11), (15) and (17) yields

$$\left.\frac{d\chi}{d\mu_B}\right|_{dR=0} = p_1 W_1 \left[\frac{B}{W_1}(1+\mu_1) - \frac{\frac{B}{W_1}\left[1+\frac{\mu_B}{1+\mu_B}\varepsilon_{BB}\right] + \left[\frac{\mu_1}{1+\mu_B}\right]\varepsilon_{WB}}{\left[1+\frac{\mu_1}{1+\mu_1}\varepsilon_{W1}\right] + \frac{B}{W_1}\left[\frac{\mu_B}{1+\mu_1}\right]\varepsilon_{BB}}\right] \tag{20}$$

which gives the excess burden of a revenue-neutral increase in estate taxation. After estimating the relevant elasticities we can calculate household-specific excess burden of the tax reform (since magnitudes of second period wealth and bequests differ across households). Note that excess burden is proportional to the present value of second period wealth $p_1 W_1$. Alternatively we can meausure excess burden per dollar of wealth

$$\left.\frac{d\chi}{d\mu_B}\frac{1}{p_1 W_1}\right|_{dR=0} = \frac{B}{W_1}(1+\mu_1) - \frac{\frac{B}{W_1}\left[1+\frac{\mu_B}{1+\mu_B}\varepsilon_{BB}\right] + \left[\frac{\mu_1}{1+\mu_B}\right]\varepsilon_{WB}}{\left[1+\frac{\mu_1}{1+\mu_1}\varepsilon_{W1}\right] + \frac{B}{W_1}\left[\frac{\mu_B}{1+\mu_1}\right]\varepsilon_{BB}}. \tag{21}$$

The latter measure provides us with a different perspective on excess burden: whereas counting the total burden will place greater weight on wealthier households, counting the excess burden per dollar of wealth places equal weight on each.

In either case the tax reform trades off the distortion to savings incentives caused by the capital income tax with the distortion between bequests and other uses of the estate. The latter will be weighed more heavily the larger is the bequest share $\frac{B}{W_1}$.

Note that the elasticities contained in these measures of excess burden are with respect to the post-tax price relative to the pre-tax price $\frac{q}{p}$, or one plus the *ad valorem* rate. Their relationship to conventional elasticities[7] follows

$$\varepsilon_{WB} \equiv \frac{\partial W_1}{\partial(1+\mu_B)}\frac{(1+\mu_B)}{W_1} = \left[\frac{\partial W_1}{\partial \tau}\frac{\tau}{W_1}\right]\frac{\partial \tau}{\partial(1+\mu_B)}\frac{(1+\mu_B)}{\tau} = \left[\frac{\partial W_1}{\partial \tau}\frac{\tau}{W_1}\right]\frac{1-\tau}{\tau} \tag{22}$$

$$\varepsilon_{W1} \equiv \frac{\partial W_1}{\partial(1+\mu_1)}\frac{(1+\mu_1)}{W_1} = \left[\frac{\partial W_1}{\partial \theta}\frac{\theta}{W_1}\right]\frac{\partial \theta}{\partial(1+\mu_B)}\frac{(1+\mu_B)}{\theta} = \left[\frac{\partial W_1}{\partial \theta}\frac{\theta}{W_1}\right]\frac{1+r(1-\theta)}{r\theta}. \tag{23}$$

After estimating the *ad valorem* elasticities we can transform them into conventional elasticities using the equations above, which will allow us to gauge the plausibility of our estimates. Since the transformation involves household-specific variables the conventional elasticity measurements will differ between households. In contrast, our estimation procedure assumes uniform *ad valorem* elasticities across households.

[7] That is, elasticities of saving with respect to the marginal tax rates.

3 Estate Taxation in Canada

Strictly speaking there has been no estate tax in Canada since 1972. Instead, the estate of the decedent is subject to capital gains tax. Upon death a "deemed disposition" of assets takes place, legally equivalent to a sale. Capital gains (losses) are measured as the increase (decrease) in sale price of an asset above (below) its original purchase price. Since in this case there is no actual sale, the government appraises the "fair market price" of the assets. The tax liability falls upon the estate before any inheritance is transferred.[8]

Therefore under Canadian law both capital income and the estate are taxed according to the same schedule (i.e. they are both taxed as capital gains). However, this does not mean the taxes are equivalent. Capital gains are treated as income in the year of sale, with one half of total gains being taxable. This means the marginal rate of capital gains tax depends on current labour (and other) income in addition to the level of capital gains. Since the income profile varies across years and will generally be higher during working-age than during retirement, the marginal tax rate faced in a given year will differ from that faced in the year of death (even if the current tax schedule is still in effect). Furthermore, we expect interest to accrue over this period, introducing another source of variation between rates. Although the statutory rates are the same, households expect to face different marginal rates of taxation under "deemed disposition" than under actual sales. Furthermore, antemortem sales of assets can be easily postponed while "deemed disposition" cannot; the inability to defer bequest tax liability introduces a distinction between the taxes, making the effective tax rate on bequests higher than that on other forms of saving.

Note that even if households time-discount future tax liabilities at the same rate that interest accrues, the interest will compound inside of the tax rate function and the time discounting outside. Let $T(.)$ determine the marginal tax rate faced for a given level of taxable capital gains Y_K. If the assets are sold today then the marginal rate is $T(Y_K)$, whereas the present value of the rate payable at death will be

$$\frac{T(Y_K(1+r)^m)}{(1+r)^m}$$

where m is the remaining lifespan. Because $T(.)$ is a convex function – the progressive nature of Canadian income tax implies convexity – accumulation of interest will not cancel out time discounting in general.

This assumes zero labour income in either period. Relaxing this assumption, let Y_{L0} be working-age labour income and Y_{L1} retirement-age income (i.e. pension collections), where $Y_{L0} > Y_{L1}$. Then the marginal rate of taxation on capital gains sold today is $T(Y_{L0} + Y_K)$ and the present value of the marginal rate on capital gains payable at

[8] Note that upon sale or "deemed disposition" of assets, the cost base is set to the sale price or "fair market price" of the assets. Therefore capital gains are not double-taxed.

death is

$$\frac{T(Y_{L1} + Y_K(1+r)^m)}{(1+r)^m}.$$

This introduces a further source of variation between current capital gains taxes and those faced at death. Note that charitable bequests and savings that avoid estate taxation will not be taxed. Accounting for this, the marginal tax rate payable at death is

$$\frac{T(Y_{L1} + Y_K(1+r)^m - CB - A)}{(1+r)^m}.$$

In addition, tax liability on antemortem capital gains can be deferred to whatever time a household prefers, while tax liability on "deemed disposition" requires prolonging the lifespan of the testator.

The examples above illustrate that despite using the same tax schedule, the capital income and estate taxes in Canada are conceptually different and in general do not imply the same marginal rate. In the context of the model introduced in Section 2, this means $\tau \neq 0$.[9] The type of tax reform characterized in equations (20) and (21) is open to many interpretations, including a change in tax treatment of different income sources, the promise of lower income tax rates today in exchange for higher rates in the future, or even the introduction of an explicitly differential estate tax. Only the last would require significant tax reform.

Some other aspects of the tax system merit attention. First, not all assets are taxable. Primary residences are tax exempt. Investing more heavily in these asset types may be one form of avoidance. Second, there is currently a lifetime exemption of $500,000 in capital gains ($250,000 of taxable capital income) on farming or fishing property or small business corporation shares. If this level is not exceeded during the lifetime then it factors into post-mortem estate taxation. Third, there is no "deemed disposition" of assets if they transfer to a legal or common-law spouse.[10] This is equivalent to the 100% spousal exemption introduced in the United States in 1981.

Finally and perhaps most importantly, since capital gains are taxed as income the tax schedule varies by province. This means different bracket cutoffs, different numbers of brackets, and different marginal rates within brackets. We exploit this province-level variation in our empirical analysis.

4 Estimating the Tax-Elasticity of Wealth Accumulation

In this section we estimate the response of wealth accumulation to both the estate and capital income tax. We use the resulting parameter estimates to calculate the change in excess burden faced by households under the tax reform described in equation (20).

[9] Taking into account the lost ability to defer bequests, $\tau > 0$.

[10] Note that this defers tax liability to the year of death of the last surviving spouse.

4.1 The Dataset

We use the 2005 cycle of the Survey of Financial Security (SFS) collected by Statistics Canada. This includes detailed information on the composition of the asset portfolio, income data, total income taxes paid (including tax on capital gains income), and detailed demographic characteristics. However, because our data come from a single year, we have no way of knowing the actual or intended bequest share. We do have data on inheritance received (which we use as a control), but without information on the marginal tax rate faced by decedents we cannot estimate the tax-elasticity of bequests. We therefore employ baseline levels and levels estimated by previous literature.

The SFS is divided into two surveys: the family file of roughly 5,000 households and the person file of roughly 11,000 individuals. Since neither dataset contains all of our required variables we merge the two, assigning household-level variables to each individual within the household. For the regression analysis and the following deadweight loss estimation we limit our attention to primary earners (of which there is one per household by definition) so as to avoid double-counting the effect of one variable on another. For example, detailed asset composition is omitted from the individual-level survey; so to measure each family member's income and demographic information against the common asset portfolio would cause us to overestimate the significance of our partial effects.

4.2 Tax Calculators

Note that marginal tax rates are not explicitly reported in the SFS. The tax schedule for 2005 is publicly available on the Canada Revenue Agency's website. Using these rates in conjunction with reported total income and total tax liability, we calculate the marginal rate faced on the next dollar of capital gains for each individual.[11] To check the accuracy of our estimates, we then calculate the implied level of tax exemption and use these same techniques in reverse to calculate an estimate of tax liability. This estimate is precisely equal to reported tax liability in just over 40% of the sample, and differs by an average of $1,000 among the remaining observations.

The estate tax (i.e. the capital gains tax payable at death) is more complicated to compute, and we use two alternate approaches in order to check the robustness of the results. In either case we assume that current taxable assets generate returns at some average interest rate, and that households expect the current (2005) tax system to be in effect in their year of death. In addition, detailed pension information allows us to form a good estimate of non-capital income for any year in the future; both methods count capital gains income on top of expected pension income.

The first approach is to estimate the year of death based on Statistics Canada's CANSIM

[11] This method is explained in Appendix A.

Table 102-0218, which details life expectancy by age, sex, and province of residence.[12] Calculating the expected value of income and taxable asset wealth in this year, we estimate the estate tax as the present value of the marginal tax rate faced on the next dollar of capital gains income. Transforming this into the *ad valorem* rate we represent it by μ_B^I.

The second approach follows HEM and requires the calculation of each individual's death in every year up to 2155 or until the probability of death becomes negligible by virtue of the individual almost certainly having died already – in practice the latter always comes first. This approach makes use of Statistics Canada's CANSIM Table 102-0504, which details mortality rates by age, sex, and province of residence. We calculate each primary earner's probability of dying in each five year interval conditional on the probability of living to the necessary age. On the first iteration the latter probability is equal to one, and it will decrease with each iteration, eventually approaching zero. The unconditional probability of death in any five year interval tends to increase with age. We estimate tax liability in every year up to 2155 and take a weighted average of the present value of the marginal rate, weighted by the probability of death in that year. The *ad valorem* rate resulting from this approach is represented by μ_B^{II}.

The second approach is significantly more complicated than the first; its advantage is that it takes uncertainty into account explicitly, whereas the first approach treats the year of death as given. However, as the behavioural response we estimate is essentially the response to an expected tax rate, we might speculate on how households are likely to form their expectations. Do households earn, save and spend with the thought of imminent death on their minds? Do they take the minute possibility of their primary earner living to the age of 150 seriously? For working age households either scenario is unlikely, but a tendency to underestimate the probability of unlikely scenarios coming to fruition may narrow the window of expected time of death. Taken to the extreme such thinking will lead us to the first approach, which places 100% probability on dying in a single year.

[12] Clearly life expectancy varies by region and gender. Its variation based on age takes as given the fact that an individual lives to his or her current age, which involves more than just subtraction of the current age from life expectancy at infancy. The age of death for younger individuals is weighted downwards by the possibility that they die soon. For example, the expected remaining lifespan for a 15 year old male in Newfoundland and Labrador is 60.9 years, implying a total lifespan of 75.9 years. The expected remaining lifespan for a 50 year old male residing in the same province is 27.7 years, for a total lifespan of 77.7 years. The 50 year old is expected to live to an older age by virtue of having passed the last 35 years without fatal incident (a task the 15 year old has yet to face). Note that demographic change over time may also cause this sort of variation, but its effect is likely to work in the opposite direction.

4.3 Model Specification

In order to facilitate the use of equations (20) and (21) we transform the marginal tax rates into their *ad valorem* forms[13] and regress log values of one plus these rates on the logarithm of net worth (which includes real estate, bank deposits, stock and bond portfolios, pension wealth, mutual funds, RRSP and RRIF wealth, nonfinancial assets, and business equity), including a host of demographic controls. We include both the marginal estate tax and the marginal capital income tax in the same specification, following HEM. This measure is particularly important for estimating the partial effects using Canadian data since the two tax rates use the same schedule.

Because of the progressive nature of the tax system, wealth and the marginal tax rates are simultaneously determined, so Ordinary Least Squares (OLS) estimation is inappropriate for estimating the behavioural elasticities. We therefore employ two-stage least-squares (2SLS), using two alternate sets of instruments.[14]

The first is a set of dummy variables for province of residence. Assuming that households are stationary, the province of residence will affect wealth accumulation only to the extent that it determines the marginal tax rate. In reality wealthy households are likely to relocate in search of preferential tax treatment. To remove this potential source of endogeneity HEM use dummies for state of origin rather than state of residence (as explained in Section 1). The SFS does not report province of origin, so we proceed with this instrument set treating its results as suggestive rather than conclusive. This is model (2).

The second set of instruments consists of marginal tax rates evaluated at fixed, exogenous wealth levels, a technique employed by both HEM and KS. We exploit province-level variation, but abstract from household-level demographic information which affects the estimated lifespan so as to avoid endogeneity.[15] These instruments are correlated with the general level of taxes in each province, but by virtue of being evaluated for counterfactual wealth levels and fixed age and sex characteristics they do not directly affect relocation incentives. Following HEM we evaluate this set of instruments at the 10^{th}, 25^{th}, median, 75^{th} and 90^{th} percentiles of the wealth distribution, but drop the first two measures because they imply zero tax liability. This set of instruments corresponds to model (3).

The set of demographic controls consists of age and its square, and dummy variables for sex (equal to one if the primary earner is male), the presence of children in the household (we do not have information on whether descendants exist outside the household), health (equal to one if the primary earner is healthy), completion of high-school, completion of a

[13] The *ad valorem* rate of estate tax being $\frac{\tau}{1-\tau}$ and that of the capital income tax being $\frac{r\theta}{1+r(1-\theta)}$ for marginal rates of τ and θ respectively, where r is the real interest rate. See equations (9) and (10).

[14] For comparison's sake we report OLS results under model (1).

[15] That is, we evaluate the present value of the tax rate for each household as if they were males of a fixed age.

postsecondary degree or certificate, whether the primary earner has ever been divorced, whether the household has received an inheritance, whether the primary earner has a spouse (legal or common-law), and whether the primary earner is an immigrant. These are consistent with the specification of HEM insofar as data availability allows.

4.4 Results

A brief inspection of the control variables shows their coefficients all point in the expected direction (though some are insignificant in the 2SLS specifications). Being older, male, healthy, married, more educated, and receiving inheritance are significantly associated with higher wealth levels. The presence of children in the household predicts higher wealth and having experienced a divorce or having immigrated to Canada lower, though these effects are insignificant.

OLS results using the "expected year of death" marginal estate tax rate mu_B^I are displayed in Table 1 next to 2SLS results using the same definition of the regressor and either instrument set. Immediately we notice the spurious positive relationship between wealth and marginal tax rates caused by the progressive nature of the tax system. After instrumenting the tax rates we find significant negative partial effects on net worth, with the exception of the marginal estate tax under model (2) (which uses province dummies as instruments), for which the coefficient is negative but insignificant. Note that in either case the effect of the capital income tax is larger in magnitude and more significant.

As explained in Section 2, the parameter estimates of interest correspond to a range of marginal tax rate elasticities. Model (3) yields estimates comparable to a marginal estate tax-elasticity of wealth accumulation of -1.29 and a marginal capital income tax-elasticity of wealth accumulation of -1.64; model (2) estimates more modest partial effects corresponding to marginal tax elasticities of -.62 and -1.07 respectively.

The estimates of the marginal estate tax-elasticity of wealth are consistent with HEM (their estimate of -1.4 is close to ours of -1.29), but our elasticities with respect to the capital income tax are much higher. We perform a series of robustness checks to verify our results. Following HEM, we include demographic controls for age groups, sex, and immigrant status. We also employ a marginal tax rate specification (in which we measure the conventional elasticity directly) and a tax price specification (where the dependent variable is the natural logarithm of one minus the marginal tax rate). Finally we run twin sets of regressions omitting one or the other of the tax variables.[16] The results are shown in Table 2.

[16] HEM employ a specification including state-level dummy variables. We do not follow this procedure as it eliminates nearly all the exogenous variation in our explanatory variables; whereas HEM were able to exploit changes in tax rates over time, our dataset contains only a single year. They also test a specification including an interaction term between the estate tax and the existence of offspring; lacking information on the latter variable we regrettably must omit this specification.

Our original results are robust to this series of tests. The coefficients on the capital income tax variables are significant in every specification; those on the estate tax are significant for the most part, and point in the expected direction even when not.[17] This is consistent with its weakly significant partial effects from the first set of regressions. With the exception of the specification where we omit capital income tax and instrument using exogenous tax levels, the magnitude of all coefficients are in line with our main results.[18]

5 Empirical Extensions

In this section we present some variations on the empirical specifications of the previous section.

First we employ HEM's definition of the expected inheritance tax rate, μ_B^{II}. The results are shown in Table 3. OLS yields the same spurious positive correlation as does our method, though the magnitude of the partial effect on the estate tax is smaller. 2SLS yields less consistent results. Instrumenting using province dummies we find a significant negative coefficient on the estate tax of roughly the same magnitude and significance as our main result, but a small and insignificant – and even positive – partial effect of the capital income tax. Using exogenous tax rate instruments we find negative coefficients on both tax rate variables, though neither are significant.[19]

These results are closer to those of HEM: the effect of the capital income tax is insignificant, and those of the estate tax are larger in magnitude than our estimates using comparable instrument sets (though not as large as theirs). It is likely that with a dataset as large as theirs we would find significant results using this specification. Coefficients of the controls all point in the expected directions except those on age (though these effects are insignificant). Most interestingly, when using the exogenous tax rate instrument set the implied marginal capital income tax rate elasticity of saving is -.68, much smaller than our estimate using the same instruments. However, the marginal estate tax elasticity implied by their estimate is implausibly high at -2.77.[20] One explanation of this surprisingly high magnitude is that expected estate tax liabilities are biased upwards because of the nonzero expectation of imminent death implied by HEM's definition of the tax rate. If primary earners systematically underestimate (or dismiss) the probability of death in proximate years – at least when young – then the true behavioural elasticity will be significantly smaller.

[17] The tax price specification is inversely related to the tax rate, so the positive coefficients represent negative behavioural relationships.

[18] Note that the marginal tax rate and tax price specifications estimate the conventional elasticity directly – these elasticities are even higher than our previous estimates!

[19] Note that the coefficient on the estate tax is significant at the 10.2% level, just above our threshold.

[20] Although the coefficient using HEM's definition is only slightly higher than ours, the marginal estate tax rate differs, meaning a different transformation function (a different value of $\frac{1-\tau}{tau}$ in equation (22)).

Next we perform a more novel exercise. Chapman, Hariharan and Southwick (1996) find more liquid assets to be more responsive to the marginal tax rate. We respecify our regressions so as to use taxable net worth rather than total as the dependent variable. This should capture the additional effect of a crude form of avoidance, the reallocation of taxable assets to non-taxable ones.[21] Thus we expect the difference between the estimated partial effects from these regressions and those of our main results to represent this circumscribed form of avoidance. Table 4 reports the results.

The magnitude of the partial effects is not as expected: for each tax variable it is markedly smaller – not larger – than comparable estimates on total net worth. However, since none of these effects are significant we cannot draw conclusions from these results. One indirect inference we can make is that our primary estimates measure something close to the actual effect on saving rather than a mix of wealth accumulation and avoidance. This is consistent with the argument of Kopczuk (2010) that the source of reported wealth is important to the interpretation of the behavioural response: regressions using wealth reported by survey should yield a coefficient close to the true effect on wealth, while those using wealth reported by tax returns will pick up the additional effect of avoidance.

6 Deadweight Loss of Tax Reform

6.1 Estimating Excess Burden

Now that we have estimated the response of wealth accumulation to the *ad valorem* rates of estate and capital income tax, we use equations (20) and (21) to calculate the change in excess burden resulting from a marginal revenue-neutral increase in the estate tax (and corresponding decrease in the capital income tax). Recall that equation (20) describes the total excess burden while equation (21) describes the excess burden per dollar of retirement-age wealth. From a policymaker's point of view it is not straightforward which measure should take precedence, so we begin by analyzing the proportions of winners and losers. The latter values are the same whether equation (20) or (21) is used, and may shed light on the popularity of the potential reform.

Table 5 shows the percentage of households who stand to gain or lose from tax reform, and those who face no net change in utility. According to our preferred specification[22] 81% of households experience a decrease in excess burden when the estate tax is increased and the capital income tax correspondingly decreased. This result is robust to a variety of tax-elasticities of bequests[23] and bequest shares.[24] The more modest estimates of model

[21] To the extent that it distorts households' asset portfolios this effect may be welfare decreasing; we estimate the behavioural effects only and leave welfare implications to future study.

[22] That is, using the coefficients estimated by model (3).

[23] We use a tax-elasticity of bequests of zero as a baseline; the other two values come from HEM.

[24] Except the impossibly high bequest share of 1, which we display for comparison's sake. Note that a

(2) predict welfare gains for 64 to 68% of households. Note that when the bequest share is equal to zero the tax-elasticity of bequests does not enter equations (20) and (21) and therefore does not affect welfare estimates.

Naturally, the lower is the bequest share the smaller is the proportion of households who stand to lose from the proposed tax reform as opposed to gaining or remaining neutral. We see this effect in Table 5 when the tax-elasticity of bequests takes nonzero values. However, the effect of the latter is not so simple: model (3) predicts more losers as opposed to neutrals as the elasticity increases, while using model (2) we find that the percentage of losers first increases and then decreases as the elasticity rises. Given the form of equations (20) and (21) we do not expect a monotonic relationship.

Following HEM, we present the gainers and losers across the same parameters for elasticities of one half the rates estimated by our regressions. Table 6 shows the results. Reducing the tax-elasticity of wealth accumulation reduces the proportion of predicted gainers substantially; we find only 46 to 50% of households to be net gainers and 35 – 54% to be net losers from tax reform using halved estimates from model (3). Model (2) predicts even fewer gainers, with the vast majority of households experiencing net welfare losses. Given the lack of significance of the coefficients in the latter model and noting that its estimates were small even when taken at face value, the implied *ad valorem* estate tax-elasticity of saving of -4.46[25] may be implausibly low.[26] Nevertheless we find deadweight loss implications of tax reform to be sensitive to our elasticity estimates at extreme levels, though relatively robust even at half the value of the preferred estimates.

Next we examine excess burden per dollar of wealth. The mean and median values are presented in Table 7. These results agree with those previous; for plausible levels of the bequest share and tax-elasticities we find a decrease in excess burden resulting from tax reform. These results are not robust to extremely high levels of the bequest share or extremely low tax-elasticities. In the latter scenarios the gain or loss per dollar of wealth can exceed unity; this reflects the extreme nature of the parameter values and suggests their implausibility.

Table 8 shows the mean excess burden per household and the total excess burden summed across the entire population. The former denote the decline in working-age wealth needed to bring a household facing pre-reform tax prices to the utility level it would face under post-reform tax prices, and the latter those values summed across the population.[27] These results confirm the previous, and are sensitive around the same margins. Most interesting are the aggregate figures, which show a net increase in welfare for Canadians resulting from a revenue-neutral increase in the estate tax and corresponding decrease in the capital income tax.

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bequest share of 1 implies zero retirement-age consumption for the decedent.

[25] Corresponding to a marginal estate tax-elasticity of -.31.

[26] Our preferred estimate is -18.6; that of HEM is -37.8.

[27] With the weight-adjusted population containing approximately twelve million households.

6.2 Excess Burden and Net Worth

The results above favour a revenue-neutral increase in the estate tax whether our objective is to minimize total excess burden or excess burden per dollar of wealth. The former measure places a higher weight on wealthy households while the latter places equal weight on all households. Next we analyze the relationship between estimates of change in excess burden and net worth.

Table 9 shows correlation coefficients between retirement-age net worth and various measures of change in excess burden, evaluated for different coefficient estimates and parameter values. The first measure of change in excess burden is that per dollar of wealth; the second indicates the direction of the change and the third the total level. Naturally the total excess burden is more strongly correlated with net worth than the per-dollar measure. The correlation of net worth with the directional measure should indicate whether the tendency to lose or gain from tax reform varies across the wealth distribution.

We find no significant correlation between retirement-age wealth and per-dollar change in excess burden.[28] For plausible levels of the bequest share we find a significant negative correlation between total change in excess burden and net worth, with coefficients in the area of .25 when using elasticity estimates at face value.[29] Remembering that the majority of households gain from tax reform according to these estimates, the results reflect the fact that wealthier households stand to gain more by virtue of having more wealth upon which to gain. However, the significant negative correlation between the direction of change in excess burden and net worth shows that wealthier individuals are more likely to gain from tax reform. This measure is untainted by the size of the estate, reflecting that there is some tendency for the wealthy to gain more from tax reform beyond that resulting from simply having more wealth to gain from. Note that higher wealth levels can affect the tendency to gain or lose indirectly through the effect of wealth on the asset portfolio; wealthier individuals with more investments are more likely to be net gainers because they stand to benefit more from the decreased capital income tax.

7 Conclusion

We find a strong case for tax reform in Canada. Our results indicate that the majority of Canadians would benefit from a revenue-neutral increase in the estate tax and decrease in the capital income tax, and further that this reform would cause a net decrease in excess burden on aggregate.[30] These results are robust to all but the most extreme

[28] Except using the extremely low elasticity values yielded by halving the estimates of model (2).

[29] This result is robust to halving the elasticity estimates, although the magnitude of the correlation decreases.

[30] That is, it is not the case that many gainers gain a little at great expense to the few losers.

parameter values.

Our findings stem from empirical estimates of the estate and capital income tax-elasticities of wealth accumulation: both are negative and significant, with the latter being considerably greater in magnitude. The difference in relative magnitude may reflect ignorance of future tax liability or an indifference to post-mortem taxation.

A more likely explanation is that a large portion of bequests are unintentional. If precautionary saving leads to larger-than-intended bequests then we expect the estate tax-elasticity of saving to be significantly lower than that of the capital income tax. Although we do not estimate an intended bequest share our results indicate that it is smaller than the share of bequests actually realized. Since households expect to consume a larger portion of their savings than they end up doing, the estate tax is relatively less distortionary and we find a lower tax-elasticity of wealth accumulation of its *ad valorem* rate.

Within the context of the Canadian tax system we explain the difference in magnitudes as follows: since the estate tax is a tax on capital gains realized at death evaluated in excess of the most recent purchase price of taxable assets, any antemortem sale of assets will push forward the date of tax liability, lowering the realized marginal estate tax rate.[31] This could correspond to the liquidation of assets to finance consumption or a reshuffling of the asset portfolio; if some portion of bequests is accidental, then households may overestimate the extent to which they can decrease tax liability at the time of death. Therefore a high present value of the Canadian estate tax will not deter household wealth accumulation to the extent that the present value of a conventional estate tax would.

This complicates the implementation of a differential estate tax in Canada. If the marginal rate of taxation faced upon "deemed disposition" of assets at death were raised above the rate faced on an antemortem sale of assets, the testator's incentive would be to reshuffle the asset portfolio prior to death. This distortion to incentives could be avoided through the introduction of a conventional estate tax, though such a reform in the tax system would likely affect the relative magnitude of the tax-elasticities.

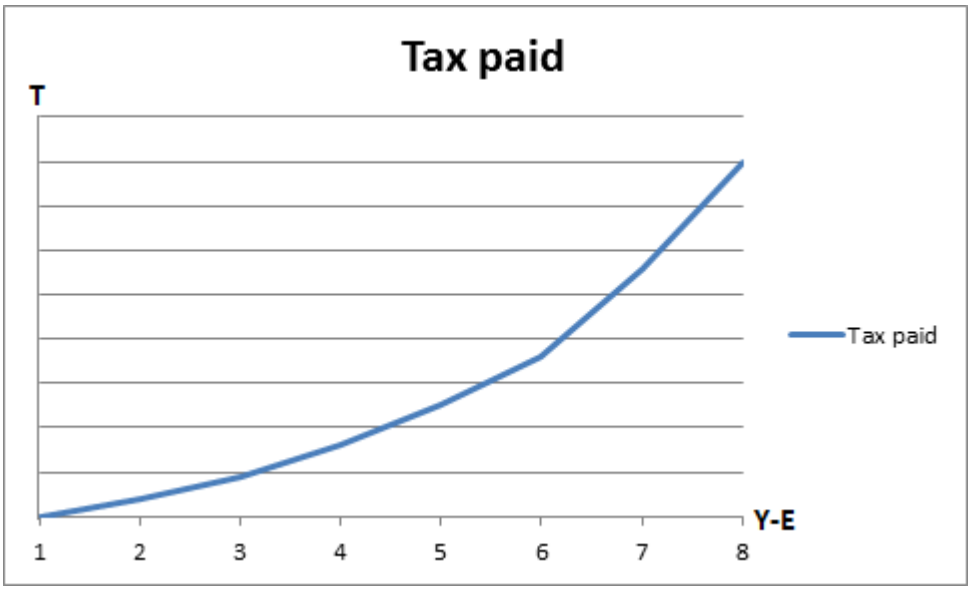
Note that our findings are do not agree with those of Holtz-Eakin and Marples (2001): we find the response of wealth accumulation to the capital income tax to be greater than the response to the estate tax while they find just the opposite. This yields a reversed prescription for tax reform: we find a revenue-neutral increase in the estate tax to increase welfare while they recommend a decrease. This discrepancy may result from differences between Canadian and American tax law.

There are several limitations to our study that merit future extensions. Given a more comprehensive dataset we could estimate the tax-elasticity of bequests and bequest shares empirically rather than relying on estimates from Holtz-Eakin and Marples (2001) and baseline values. In addition, the model could be extended to allow for variable labour

[31] See Section 3 for an explanation of the Canadian estate tax.

effort; the SFS contains enough information to estimate the tax-elasticity of labour supply.

Appendix A: Calculation of Exemption Rates



On the vertical axis we measure tax liability T, while on the horizontal is taxable income Y-E (total income minus expemtion). The numbering on the horizontal represents different tax brackets, separated by the tick marks. T and Y are reported, while E is not. To calcuate E, and thus find our variables of interest Y-E, we use the following formula:

$$
\begin{aligned}
T=&a(Y-E)+b(Y-E-B1)+c(Y-E-B2)+d(Y-E-B3)+e(Y-E-B4)+f(Y-E-B5)+g(Y-E-B6)+h(Y-E-B7) && if Y-E>=B7\\
&a(Y-E)+b(Y-E-B1)+c(Y-E-B2)+d(Y-E-B3)+e(Y-E-B4)+f(Y-E-B5)+g(Y-E-B6) && if B7>=Y-E>B6\\
&a(Y-E)+b(Y-E-B1)+c(Y-E-B2)+d(Y-E-B3)+e(Y-E-B4)+f(Y-E-B5) && if B6>=Y-E>B5\\
&a(Y-E)+b(Y-E-B1)+c(Y-E-B2)+d(Y-E-B3)+e(Y-E-B4) && if B5>=Y-E>B4\\
&a(Y-E)+b(Y-E-B1)+c(Y-E-B2)+d(Y-E-B3) && if B4>=Y-E>B3\\
&a(Y-E)+b(Y-E-B1)+c(Y-E-B2) && if B3>=Y-E>B2\\
&a(Y-E)+b(Y-E-B1) && if B2>=Y-E>B1\\
&a(Y-E) && if B1>=Y-E
\end{aligned}
$$

Where a to h are the marginal tax rates and B1 to B7 the cut-offs for brackets 1 to 8 respectively. Solving for E for each equation, and rearranging the "if" conditions as functions of T, a to h, and B1 to B8, we get the following schedule for tax exemptions

that we can calculate using reported data:

$$E=Y-B7+aB1/h+b(B2-B1)/h+c(B3-B2)/h+d(B4-B3)/h+e(B5-B4)/h+f(B6-B5)/h+g(B7-B6)/h-T/h$$

$$if T>=aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)+f(B6-B5)+g(B7-B6)$$

$$Y-B6+aB1/g+b(B2-B1)/g+c(B3-B2)/g+d(B4-B3)/g+e(B5-B4)/g+f(B6-B5)/g-T/g$$

$$if T>=aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)+f(B6-B5)$$

$$\&T<aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)+f(B6-B5)+g(B7-B6)$$

$$Y-B5+aB1/f+b(B2-B1)/f+c(B3-B2)/f+d(B4-B3)/f+e(B5-B4)/f-T/f$$

$$if T>=aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)\&T<aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)+f(B6-B5)$$

$$Y-B4+aB1/e+b(B2-B1)/e+c(B3-B2)/e+d(B4-B3)/e-T/e$$

$$if T>=T<aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)\&T<aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)+e(B5-B4)$$

$$Y-B3+aB1/d+b(B2-B1)/d+c(B3-B2)/d-T/d$$

$$if T>=aB1+b(B2-B1)+c(B3-B2)\&T<T<aB1+b(B2-B1)+c(B3-B2)+d(B4-B3)$$

$$Y-B2+aB1/c+b(B2-B1)/c-T/c$$

$$if T>=aB1+b(B2-B1)\&T<aB1+b(B2-B1)+c(B3-B2)$$

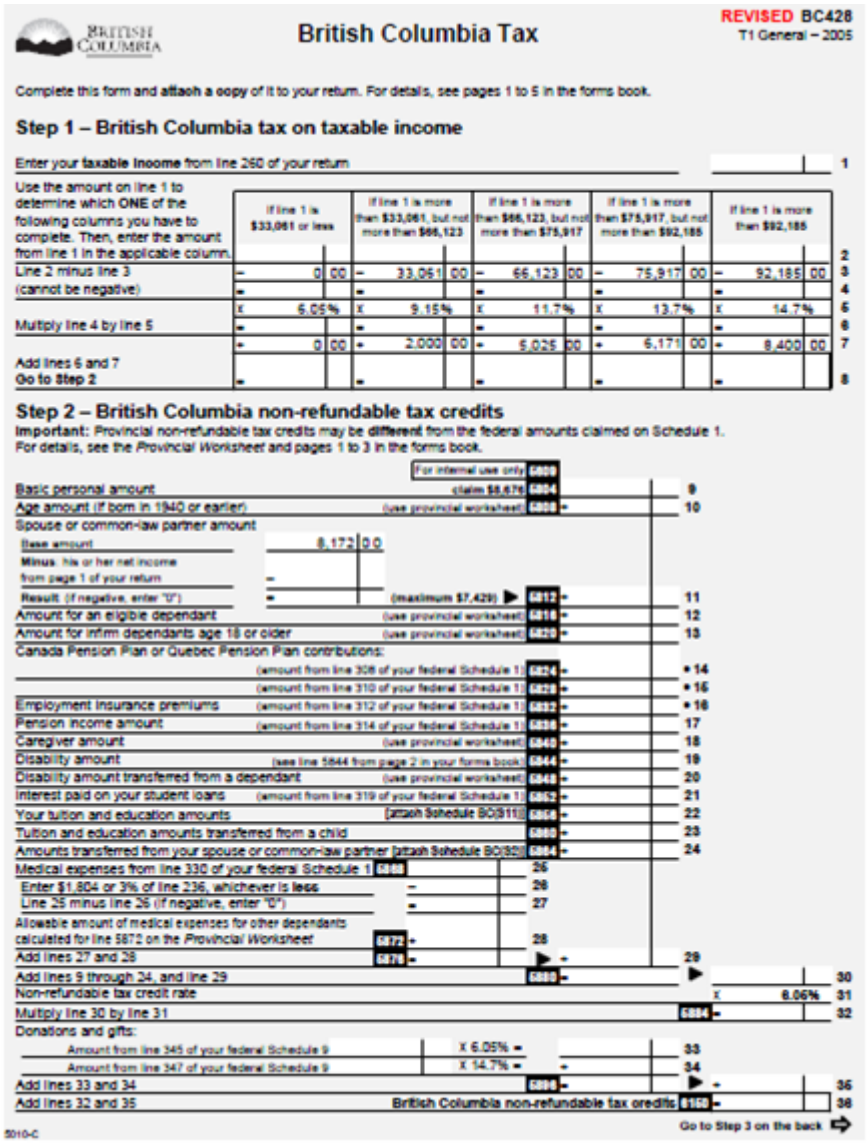
$$Y-B1+aB1/b-T/b$$

$$if T>=aB1\&T<aB1+b(B2-B1)$$

$$Y-T/aif T>=0\&T<aB1$$

Appendix B: Sample Tax Schedule

The following is a sample of a provincial estate tax schedule. Note that although there are only four tax brackets, none of these match with federal brackets, effectively resulting in eight tax brackets for the taxpayer (although in some provinces there are fewer effective brackets).



REVISED BC428
T1 General – 2005

British Columbia Tax

Complete this form and attach a copy of it to your return. For details, see pages 1 to 5 in the forms book.

Step 1 – British Columbia tax on taxable income

Enter your taxable income from line 260 of your return					1
Use the amount on line 1 to determine which ONE of the following columns you have to complete. Then, enter the amount from line 1 in the applicable column.	If line 1 is $33,061 or less	If line 1 is more than $33,061, but not more than $66,123	If line 1 is more than $66,123, but not more than $75,917	If line 1 is more than $75,917, but not more than $92,185	If line 1 is more than $92,185	2
Line 2 minus line 3 (cannot be negative)	– 0 00 =	– 33,061 00 =	– 66,123 00 =	– 75,917 00 =	– 92,185 00 =	3 4
Multiply line 4 by line 5	x 6.05% =	x 9.15% =	x 11.7% =	x 13.7% =	x 14.7% =	5 6
Add lines 6 and 7 Go to Step 2	+ 0 00 =	+ 2,000 00 =	+ 5,025 00 =	+ 6,171 00 =	+ 8,400 00 =	7 8

Step 2 – British Columbia non-refundable tax credits

Important: Provincial non-refundable tax credits may be **different** from the federal amounts claimed on Schedule 1. For details, see the *Provincial Worksheet* and pages 1 to 3 in the forms book.

	For internal use only			
Basic personal amount	claim $8,676			9
Age amount (if born in 1940 or earlier)	(use provincial worksheet)			10
Spouse or common-law partner amount				
Base amount	8,172 00			
Minus: his or her net income from page 1 of your return	–			
Result: (if negative, enter "0")	=	(maximum $7,429) ▶	+	11
Amount for an eligible dependant	(use provincial worksheet)		+	12
Amount for infirm dependants age 18 or older	(use provincial worksheet)		+	13
Canada Pension Plan or Quebec Pension Plan contributions:				
	(amount from line 308 of your federal Schedule 1)		+	• 14
	(amount from line 310 of your federal Schedule 1)		+	• 15
Employment insurance premiums	(amount from line 312 of your federal Schedule 1)		+	• 16
Pension income amount	(amount from line 314 of your federal Schedule 1)		+	17
Caregiver amount	(use provincial worksheet)		+	18
Disability amount	(see line 5844 from page 2 in your forms book)		+	19
Disability amount transferred from a dependant	(use provincial worksheet)		+	20
Interest paid on your student loans	(amount from line 319 of your federal Schedule 1)		+	21
Your tuition and education amounts	(attach Schedule BC(S11))		+	22
Tuition and education amounts transferred from a child			+	23
Amounts transferred from your spouse or common-law partner (attach Schedule BC(S2))			+	24
Medical expenses from line 330 of your federal Schedule 1				26
Enter $1,804 or 3% of line 236, whichever is less	–			26
Line 25 minus line 26 (if negative, enter "0")	=			27
Allowable amount of medical expenses for other dependants calculated for line 5872 on the *Provincial Worksheet*				
	+			28
Add lines 27 and 28	=	▶	+	29
Add lines 9 through 24, and line 29			= ▶	30
Non-refundable tax credit rate			x 6.06%	31
Multiply line 30 by line 31			=	32
Donations and gifts:				
Amount from line 345 of your federal Schedule 9	x 6.05% =			33
Amount from line 347 of your federal Schedule 9	x 14.7% =		+	34
Add lines 33 and 34			= ▶	35
Add lines 32 and 35	British Columbia non-refundable tax credits		=	36

5010-C

Go to Step 3 on the back

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Statistics Canada - CANSIM Table 102-0218: Life expectancy, abridged life table, by age group and sex, three-year average, Canada, provinces, territories, health regions and peer groups, occasional (years).

Statistics Canada - CANSIM Table 102-0504: Death and mortality rates, by age group and sex, Canada, provinces and territories, annual.

Table 1: The response of net worth to capital income and estate taxes; expected year of death definition.

	OLS	2SLS	
	(1)	(2)	(3)
$\ln(1+\mu_1)$ *capital income tax*	61.778***	-56.993**	-87.786**
	(2.469)	(26.813)	(37.453)
$\ln(1+\mu_B^I)$ *estate tax*	12.900***	-8.917	-18.619*
	(0.814)	(7.553)	(11.290)
sex	-0.312***	0.308***	0.535***
	(0.046)	(0.114)	(0.156)
age	0.184***	0.144***	0.113
	(0.009)	(0.052)	(0.077)
age^2	-0.002***	0.000	0.000
	(0.000)	(0.001)	(0.001)
kids	0.160***	0.077	0.052
	(0.054)	(0.073)	(0.085)
health	0.213***	0.461***	0.529***
	(0.020)	(0.054)	(0.071)
highschool	0.573***	1.069***	1.208***
	(0.063)	(0.120)	(0.152)
college	0.254***	0.594***	0.690***
	(0.050)	(0.090)	(0.113)
divorce	-0.189**	-0.148	-0.148
	(0.082)	(0.117)	(0.139)
inheritance	0.404***	0.473***	0.507***
	(0.049)	(0.073)	(0.089)
spouse	0.827***	1.531***	1.745***
	(0.053)	(0.116)	(0.147)
immigrant	0.254***	-0.069	-0.163
	(0.057)	(0.091)	(0.110)
constant	3.639***	3.993***	4.337***
	(0.196)	(0.686)	(0.992)
Obs.	4660	4660	4660
R^2	.54	.17	-
F statistic	421.07	186.27	141.73

*** signifies significance at the 1% level, ** the 5%, and * the 10%.

Table 2: The response of net worth to capital income and estate taxes; robustness checks.

	Capital Income Tax	Estate Tax
2SLS; demographic controls (province dummy instruments)	-68.374 *** (27.150)	-5.017 (7.975)
2SLS; demographic controls (exogenous tax level instruments)	-82.838 ** (36.154)	-19.973 * (12.075)
2SLS; marginal tax rate specification (province dummy instruments)	-4.433 * (2.531)	-14.648 * (8.953)
2SLS; marginal tax rate specification (exogenous tax level instruments)	-8.009 ** (3.725)	-25.132 * (13.604)
2SLS; tax price specification (province dummy instruments)	3.510 ** (1.490)	6.570 (7.880)
2SLS; tax price specification (exogenous tax level instruments)	4.790 ** (1.989)	16.970 (11.460)
2SLS; estate tax omitted (province dummy instruments)	-77.249 *** (20.877)	-
2SLS; estate tax omitted (exogenous tax level instruments)	-82.838 ** (36.154)	-
2SLS; capital income tax omitted (province dummy instruments)	-	-19.190 *** (5.435)
2SLS; capital income tax omitted (exogenous tax level instruments)	-	-36.928 *** (7.695)

*** signifies significance at the 1% level, ** the 5%, and * the 10%.

Table 3: The response of net worth to capital income and estate taxes; probability of death by year definition.

	OLS	2SLS	
	(1)	(2)	(3)
$\ln(1+\mu_1)$ *capital income tax*	68.354***	1.110	-34.659
	(2.485)	(52.111)	(66.773)
$\ln(1+\mu_B^{II})$ *estate tax*	1.760***	-16.314*	-21.080
	(0.279)	(9.682)	(12.897)
sex	-0.142***	0.263***	0.410***
	(0.046)	(0.091)	(0.117)
age	0.133***	-0.030	-0.062
	(0.008)	(0.140)	(0.184)
age^2	-0.001***	0.002	0.002
	(0.000)	(0.002)	(0.002)
kids	0.129**	0.338*	0.383*
	(0.055)	(0.179)	(0.231)
health	0.210***	0.377***	0.455***
	(0.021)	(0.086)	(0.109)
highschool	0.562***	1.019***	1.205***
	(0.064)	(0.138)	(0.171)
college	0.256***	0.481***	0.586***
	(0.051)	(0.131)	(0.163)
divorce	-0.229***	-0.176	-0.147
	(0.084)	(0.132)	(0.157)
inheritance	0.451***	0.475***	0.480***
	(0.050)	(0.077)	(0.092)
spouse	0.888***	1.318***	1.512***
	(0.054)	(0.190)	(0.240)
immigrant	0.252***	-0.072	-0.198
	(0.058)	(0.100)	(0.123)
constant	4.178***	6.839***	7.386***
	(0.200)	(2.159)	(2.844)
Obs.	4657	4657	4657
R^2	.52	-	-
F statistic	387.08	148.37	107.23

*** signifies significance at the 1% level, ** the 5%, and * the 10%.

Table 4: The response of taxable assets to capital income and estate taxes.

	OLS	2SLS	
	(1)	(2)	(3)
$\ln(1+\mu_1)$ *capital income tax*	56.863***	-6.945	-25.731
	(2.506)	(23.750)	(32.253)
$\ln(1+\mu_B^I)$ *estate tax*	17.889***	-4.452	-14.806
	(0.826)	(6.686)	(9.719)
sex	-0.393***	0.114	0.325**
	(0.047)	(0.101)	(0.134)
age	0.187***	0.111**	0.069
	(0.009)	(0.046)	(0.066)
age^2	-0.002***	0.000	0.000
	(0.000)	(0.001)	(0.001)
kids	0.015	-0.039	-0.058
	(0.054)	(0.065)	(0.073)
health	0.231***	0.375***	0.422***
	(0.021)	(0.047)	(0.061)
highschool	0.426***	0.721***	0.819***
	(0.064)	(0.107)	(0.131)
college	0.262***	0.464***	0.530***
	(0.051)	(0.080)	(0.097)
divorce	-0.147*	-0.153	-0.165
	(0.083)	(0.103)	(0.120)
inheritance	0.464***	0.541***	0.578***
	(0.050)	(0.065)	(0.077)
spouse	0.632***	1.094***	1.260***
	(0.053)	(0.103)	(0.126)
immigrant	-0.118**	-0.320***	-0.390***
	(0.058)	(0.081)	(0.095)
constant	3.386***	4.237***	4.722***
	(0.199)	(0.608)	(0.854)
Obs.	4661	4661	4661
R^2	.51	.32	.15
F statistic	372.64	199.59	159.87

*** signifies significance at the 1% level, ** the 5%, and * the 10%.

Table 5: Percentage of households facing a negative, zero, or positive change in excess burden resulting from tax reform; estimated for a variety of bequest shares, tax-elasticities of bequests, and parameter estimates; parameter estimates taken at face value.

Bequest share:		0.1		0.05		0		1
$\varepsilon_{BB} = 0$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	81.04	model (3):	81.04	model (3):	81.04	model (3):	0
$\frac{d\chi}{d\mu_B} = 0$		18.96		18.96		18.96		18.96
$\frac{d\chi}{d\mu_B} > 0$		0		0		0		81.04
$\frac{d\chi}{d\mu_B} < 0$	model (2):	63.89	model (2):	63.92	model (2):	63.92	model (2):	17.12
$\frac{d\chi}{d\mu_B} = 0$		18.96		18.96		18.96		18.96
$\frac{d\chi}{d\mu_B} > 0$		17.15		17.12		17.12		63.92
$\varepsilon_{BB} = -1.4$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	81.04	model (3):	81.04	model (3):	81.04	model (3):	18.96
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		18.96		18.96		0		81.04
$\frac{d\chi}{d\mu_B} < 0$	model (2):	63.92	model (2):	63.92	model (2):	63.92	model (2):	30.16
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		36.08		36.08		17.12		69.84
$\varepsilon_{BB} = -8.5$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	81.04	model (3):	81.04	model (3):	81.04	model (3):	14.01
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		18.96		18.96		0		85.99
$\frac{d\chi}{d\mu_B} < 0$	model (2):	67.82	model (2):	65.46	model (2):	63.92	model (2):	18.69
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		32.18		34.54		17.12		81.31

Table 6: Percentage of households facing a negative, zero, or positive change in excess burden resulting from tax reform; estimated for a variety of bequest shares, tax-elasticities of bequests, and parameter estimates; parameter estimates taken at one half face value.

Bequest share:		0.1		0.05		0		1
$\varepsilon_{BB} = 0$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	45.8	model (3):	45.8	model (3):	45.8	model (3):	35.24
$\frac{d\chi}{d\mu_B} = 0$		18.96		18.96		18.96		18.96
$\frac{d\chi}{d\mu_B} > 0$		35.24		35.24		35.24		45.8
$\frac{d\chi}{d\mu_B} < 0$	model (2):	0.58	model (2):	0.58	model (2):	0.58	model (2):	80.46
$\frac{d\chi}{d\mu_B} = 0$		18.96		18.96		18.96		18.96
$\frac{d\chi}{d\mu_B} > 0$		80.46		80.46		80.46		0.58
$\varepsilon_{BB} = -1.4$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	45.85	model (3):	45.81	model (3):	45.8	model (3):	46.27
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		54.15		54.19		35.24		53.73
$\frac{d\chi}{d\mu_B} < 0$	model (2):	0.64	model (2):	0.59	model (2):	0.58	model (2):	92.95
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		99.36		99.41		80.46		7.05
$\varepsilon_{BB} = -8.5$								
$\frac{d\chi}{d\mu_B} < 0$	model (3):	50.13	model (3):	47.39	model (3):	45.8	model (3):	28.08
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		49.87		52.61		35.24		71.92
$\frac{d\chi}{d\mu_B} < 0$	model (2):	3.35	model (2):	1.58	model (2):	0.58	model (2):	18.69
$\frac{d\chi}{d\mu_B} = 0$		0		0		18.96		0
$\frac{d\chi}{d\mu_B} > 0$		96.65		98.42		80.46		81.31

Table 7: Mean and median values of change in excess burden per dollar of retirement-age wealth resulting from tax reform; estimated for a variety of bequest shares, tax-elasticities of bequests, and parameter estimates.

		Estimates at face value				Estimates at half of face value			
		model (3)		model (2)		model (3)		model (2)	
ε_{BB}	$\frac{B}{W_1}$	mean	median	mean	median	mean	median	mean	median
0	0.1	-0.19	-0.19	-0.23	-0.14	-1.38	-0.18	0.16	0.08
-1.4	0.1	-0.20	-0.20	-0.17	-0.15	-0.98	-0.23	0.23	0.11
-8.5	0.1	-0.21	-0.22	0.27	-0.21	0.38	-0.37	2.24	0.17
0	0.05	-0.29	-0.29	-0.45	-0.28	-2.03	-0.33	0.32	0.16
-1.4	0.05	-0.29	-0.29	-0.36	-0.28	-1.61	-0.35	0.31	0.17
-8.5	0.05	-0.30	-0.31	-0.30	-0.31	-1.08	-0.45	0.40	0.23
0	0	-0.39	-0.38	-0.68	-0.42	-2.69	-0.49	0.49	0.24
-1.4	0	-0.39	-0.38	-0.68	-0.42	-2.69	-0.49	0.49	0.24
-8.5	0	-0.39	-0.38	-0.68	-0.42	-2.69	-0.49	0.49	0.24
0	1	1.53	1.54	3.82	2.39	10.33	2.21	-2.76	-1.32
-1.4	1	1.36	1.40	2.62	2.14	2.41	2.15	-4.19	-1.30
-8.5	1	1.05	1.07	0.62	1.30	3.23	1.13	-3.59	0.40

Table 8: Mean values of change in excess burden per household and aggregate change in excess burden resulting from tax reform; estimated for a variety of bequest shares, tax-elasticities of bequests, and parameter estimates.

		Estimates at face value			
		model (3)		model (2)	
ε_{BB}	$\frac{B}{W_1}$	mean	aggregate	mean	aggregate
0	0.1	-950696.1	-1.18E+13	-802273.7	-9.98E+12
-1.4	0.1	-964041.1	-1.20E+13	-697066.8	-8.67E+12
-8.5	0.1	-1023299	-1.27E+13	255995.7	3.18E+12
0	0.05	-1396586	-1.74E+13	-1549452	-1.93E+13
-1.4	0.05	-1402233	-1.74E+13	-1405487	-1.75E+13
-8.5	0.05	-1428955	-1.78E+13	-1064673	-1.32E+13
0	0	-1842475	-2.29E+13	-2296630	-2.86E+13
-1.4	0	-1842475	-2.29E+13	-2296630	-2.86E+13
-8.5	0	-1842475	-2.29E+13	-2296630	-2.86E+13
0	1	7075315	8.80E+13	1.26E+07	1.57E+14
-1.4	1	6640198	8.26E+13	7016208	8.73E+13
-8.5	1	5282538	6.57E+13	7450058	9.27E+13

		Estimates at half of face value			
		model (3)		model (2)	
ε_{BB}	$\frac{B}{W_1}$	mean	aggregate	mean	aggregate
0	0.1	-9350566	-1.16E+14	1982220	2.47E+13
-1.4	0.1	-7662126	-9.53E+13	1828026	2.27E+13
-8.5	0.1	-2808433	-3.49E+13	3.87E+07	4.81E+14
0	0.05	-1.36E+07	-1.69E+14	4065105	5.06E+13
-1.4	0.05	-1.21E+07	-1.50E+14	2671696	3.32E+13
-8.5	0.05	-8774139	-1.09E+14	3750770	4.66E+13
0	0	-1.79E+07	-2.22E+14	6147990	7.65E+13
-1.4	0	-1.79E+07	-2.22E+14	6147990	7.65E+13
-8.5	0	-1.79E+07	-2.22E+14	6147990	7.65E+13
0	1	6.73E+07	8.37E+14	-3.55E+07	-4.42E+14
-1.4	1	2.43E+07	3.02E+14	-2709595	-3.37E+13
-8.5	1	1.34E+07	1.67E+14	-3.33E+07	-4.14E+14

Table 9: Correlation between net worth and per-dollar, directional, and total change in excess burden resulting from tax reform; estimated for a variety of bequest shares, tax-elasticities of bequests, and parameter estimates.

Estimates at face value

$\frac{B}{W_1}$		$\varepsilon_{BB} = 0$		$\varepsilon_{BB} = -1.4$		$\varepsilon_{BB} = -8.5$	
		model (3)	model (2)	model (3)	model (2)	model (3)	model (2)
0.1	per \$ W_1	-0.002	0.016	-0.007	0.017	-0.024	0.002
	+/−	-0.065 *	-0.041 *	-0.065 *	-0.060 *	-0.065 *	-0.068 *
	total	-0.269 *	0.024	-0.251 *	0.045 *	-0.158 *	0.020
0.05	per \$ W_1	-0.008	0.014	-0.010	0.016	-0.016	0.010
	+/−	-0.065 *	-0.042 *	-0.065 *	-0.060 *	-0.065 *	-0.063 *
	total	-0.272 *	0.022	-0.265 *	0.030	-0.231 *	0.068 *
0	per \$ W_1	-0.011	0.014	-0.011	0.014	-0.011	0.014
	+/−	-0.065 *	-0.042 *	-0.065 *	-0.042 *	-0.065 *	-0.042 *
	total	-0.274 *	0.021	-0.274 *	0.021	-0.274 *	0.021
1	per \$ W_1	0.022	-0.013	0.013	-0.004	-0.006	0.006
	+/−	0.065 *	0.042 *	0.065 *	0.070 *	0.059 *	0.074 *
	total	0.280 *	-0.019	0.275 *	-0.076 *	0.217 *	0.132 *

Estimates at half of face value

$\frac{B}{W_1}$		$\varepsilon_{BB} = 0$		$\varepsilon_{BB} = -1.4$		$\varepsilon_{BB} = -8.5$	
		model (3)	model (2)	model (3)	model (2)	model (3)	model (2)
0.1	per \$ W_1	-0.027	0.044 *	-0.016	0.039 *	-0.001	0.039 *
	+/−	-0.077 *	0.049 *	-0.094 *	-0.046 *	-0.093 *	-0.104 *
	total	-0.084 *	0.060 *	-0.075 *	0.183 *	-0.019	0.036 *
0.05	per \$ W_1	-0.029	0.044 *	-0.016	0.049 *	-0.004	0.001
	+/−	-0.077 *	0.049 *	-0.094 *	-0.039 *	-0.094 *	-0.095 *
	total	-0.086 *	0.057 *	-0.080 *	0.187 *	-0.068 *	-0.003
0	per \$ W_1	-0.031	0.043 *	-0.031	0.043 *	-0.031	0.043 *
	+/−	-0.077 *	0.049 *	-0.077 *	0.049 *	-0.077 *	0.049 *
	total	-0.087 *	0.056 *	-0.087 *	0.056 *	-0.087 *	0.056 *
1	per \$ W_1	0.035	-0.043 *	0.002	0.000	-0.004	0.004
	+/−	0.077 *	-0.049 *	0.094 *	0.108 *	0.083 *	0.112 *
	total	0.090 *	-0.054 *	0.057 *	0.020	0.004	0.007

* signifies significance at the 1% level.