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Abstract:
The aging population has raised at least two concerns about tax policy. First, taxes will need to be increased to cover higher public-pension and medical-care expenses when baby boomers have retired. Second, taxes can be cut in the meantime, as the government realizes the "fiscal dividend" that accompanies its debt reduction program (that has been motivated by the aging population development). This paper uses a simple endogenous growth analysis to examine these issues. It is assumed that sales tax increases are infeasible on political grounds. Two conclusions emerge: the income tax rate levied on domestic residents should be cut during the debt-reduction period, and the tax rate on foreigners whose capital is operating in Canada should be increased later on when the bulk of the baby boomers have retired.

Keywords: fiscal policy, endogenous growth, open economy

JEL Classifications: E10, E60, F43, H30, O40

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1. Introduction

The aging population has raised at least two concerns about tax policy. On the one hand, there is the belief that the increased old-age dependency ratio will mean that governments will need to raise taxes to meet the increased costs of the public pension and medical-care programs. If so, a major policy issue is: which taxes should be raised? On the other hand, the federal government is attempting to partially insulate material living standards from the burden of the aging population by pursuing debt reduction now. The government has motivated its target of a 20% debt-to-*GDP* ratio (to be reached by 2020) on the basis of the aging population challenge. The idea is that lower debt interest payment obligations on the government's part will permit some tax cuts. These tax cuts can increase living standards and provide a cushion in the face of the threat to living standards that the aging population represents. A major policy issue is: which taxes should be cut as debt reduction proceeds?

Whether our focus is on the time period between now and 2030, when the bulk of the baby boomers will reach retirement, or after 2030, the same broad fiscal policy question emerges. Which form of taxation should be cut as we collect the "fiscal dividend" of debt reduction in the near future, and which form of taxation should be increased later on as the aging-baby-boomer phenomenon really sets in. Of course, public economics specialists have studied the efficiency and equity aspects of alternative forms of taxation for many years, and a consensus has emerged. Most economists (for example, Mintz (2001)) favour a progressive expenditure tax as the preferred form of taxation. Our

existing income tax system represents a partial acceptance of this consensus view. With the *RRSP* program and the fact that home owners pay no capital gains taxes on their principal residences, a significant part of household saving is tax exempt, and the resulting income-tax system is part way to being a consumption-based tax system.

Where does the corporate profits tax fit within this consensus view? If it were not for the fact that foreigners own some of the capital that is employed within our borders, this view calls for the elimination of the corporate tax. This advice is based on the presumption that it is inefficient and unfair to subject profit income to "double" taxation – at both the corporate and personal levels. But elimination of the corporate tax would mean that our government was giving up revenue that has been paid by foreigners. Thus, it is argued that the corporate tax should be maintained, but with domestic citizens having the right to claim – at the personal tax level – a complete rebate for all corporate taxes paid on that individual's behalf. This arrangement would turn the corporate income tax into a tax that is levied only on foreign investors. The question that remains is whether this tax on foreign-owned capital should be higher or lower than the tax levied on the incomes of domestic residents. The purpose of this paper is to use a simple endogenous growth model of an open economy to answer this question.

The remainder of the paper is organized as follows. In section 2, a standard macro model that can address this tax-policy question is explained. In section 3, a revenue-neutral tax substitution is examined, and it is shown that efficiency is enhanced, while equity is not compromised, if the personal income tax on domestics is cut, and this initiative is financed by an increase in the tax on foreign-owned capital. This result suggests that we should cut the taxes paid by domestics now – as we enjoy the fiscal

dividend of debt reduction – and that we should not reverse these tax cuts later on. Instead, we should raise the tax on foreign capital, when we need to finance the increased entitlements to the public pension and medical-care programs in the longer term. We relate this conclusion more specifically to existing studies, and offer concluding remarks, in section 4.

2. A Simple Growth Model

Barro and Sala-i-Martin (1995, p. 144-146) have suggested that we can consider a model of economic growth involving both physical and human capital, without complexity, if we assume that the same production process can be used to produce all items in the economy (both forms of capital, private consumption goods, and government services). We follow that suggestion here, and assume a Cobb-Douglas production function:

$$Y = \gamma K^{\alpha} H^{1-\alpha}$$

where the variables are: Y – output, K – physical capital (owned entirely by the rich segment of the population), and H – human capital (owned by both the rich and the poor segments of the population – in equal shares).

The economy's resource constraint is

$$Y = C + E + G + X + \dot{K} + \dot{H} + \Omega.$$

This equation states that output takes the form of: C – consumption by rich households, plus E – expenditures by poor households, plus G – government programs, plus X – export sales to citizens in the rest of the world, plus capital accumulation (increases in K and H (the dots indicate time derivatives)). In addition to these uses, the remainder of the

country's *GDP* is used to cover the transactions costs that must be incurred to satisfy foreign investors. These costs, denoted by Ω, are discussed below.

The government budget constraint is

$$G = \tau r(K - F) + \tau wH + \lambda rF.$$

This equation states that there is no government debt, and that the budget is balanced at each point in time. Program spending is financed by two proportional income taxes. The first is levied on the income of domestic citizens. This tax rate, τ, is levied on the earnings citizens receive from renting out physical capital, and this is represented by the first term on the right-hand side. F is the amount of the domestically employed physical capital that is owned by foreigners. This leaves $(K - F)$ as the amount owned by domestics. The domestic income tax rate, τ, is also levied on the earnings domestic citizens receive from renting out their human capital (the second term on the right-hand side). The remaining new notation is: r – the rental rate earned by physical capital, w – the rent earned by human capital. Both rich and poor domestics pay tax rate τ. The third term on the right-hand side of the government budget constraint is the revenue received by taxing foreigners. Their rents from their holdings of physical capital, rF, are taxed at rate λ.

The remaining equations of the model define optimal behaviour for households and firms. Rich households operate as ever-lasting dynasties. There is no labour-leisure choice, so the utility (U) function is simple and standard:

$$U = \int \ln C_t e^{-\rho t} dt$$

where ρ is the rate of time preference. Utility maximization leads to two conditions. The first is the Ramsey (1928) condition, which is the solution to the consumption-savings

choice. Households save if the after-tax return on capital exceeds their rate of impatience, and saving makes positive growth in consumption possible. Hence:

$$\dot{C}/C = r(1-\tau) - \rho.$$

The second optimizing rule is that each household's portfolio of assets must be in equilibrium, and since the rich pay the same tax rate on income from both physical and human capital, this requires that

$$r = w.$$

We want to have both rich and poor households in the model, so that equity aspects of the alternative taxes can be considered. The key difference between rich and poor households is that the latter are impatient. Since their time-preference rate exceeds the after-tax return on saving, it is never rational for these individuals to save. Thus, these households do not acquire the ownership of any physical capital, and this is why they remain poor. They do accumulate human capital, but only because they have to. It is assumed that there is compulsory attendance in school, so even poor households must invest in the human capital that is required to keep a job on an ongoing basis (in a balanced-growth equilibrium). Following Mankiw (2000), we assume that half the population is poor, so this group owns half the human capital stock . The consumption function for these households is simply their budget constraint; they consume all their current resources at each point in time, and so (in Mankiw's terminology) they live "hand-to-mouth". This expenditure function is:

$$E = (w(1-\tau)H/2) - \dot{H}/2.$$

Profit maximization by firms leads to two standard optimal hiring rules – that each factor be hired up to the point that its marginal product just equal its rental price:

$$\alpha Y / K = r$$

$$\beta Y / H = w$$

We complete the specification of the model by describing the accumulation identity for foreign holdings of capital employed within this economy, and the portfolio preferences of the foreign owners of physical capital. The country must allow foreign ownership of the physical capital that is employed domestically to increase each period by exactly the amount that its rent payments to foreigners that period (denoted by r^*F) exceeds that period's earnings achieved through export sales:

$$\dot{F} = r^* F - X.$$

r^* is the net interest rate on physical capital that this country pays out to foreign owners. This net yield is smaller than the pre-tax yield in the economy, r, for two reasons. First, foreigners must pay the withholding tax, levied at rate λ. Second, the transactions costs that are incurred to inform foreigners sufficiently to make them comfortable investing outside their own country must be covered. Following Van der Ploeg (1996) and others, we assume that these transactions costs are proportional to the "foreign indebtedness" level of the country (that is proportional to the F/K ratio). Hence, assuming interest arbitrage, we have the following relationship between domestic and foreign interest rates:

$$r(1-\lambda) = r^* + \theta F / K.$$

We cannot assume perfect international capital mobility, since this specification makes the domestic interest rate over-determined. In this case, the domestic interest rate is pinned down *both* by (exogenous) domestic technology parameters (as explained below) *and* by the (exogenous) foreign interest rate – a problem first emphasized by Milbourne (1995). In his survey article on endogenous growth in open economies, Turnovsky (2002)

notes that this problem can be overcome in several ways – such as by allowing for adjustment costs for capital or for a labour-leisure choice. Burbidge and Scarth (1995) solve this problem by imposing a finite lifetime (planning horizon) for households. But the most common strategy is to specify less than perfect capital mobility, as in Van der Ploeg, so we follow that practice here.

We are now in a position to specify the transactions-cost term in the economy's resource constraint. We assume that this term is given by

$$\Omega = (\theta F / K)F$$

To overcome the increased risk (due to incomplete knowledge) that foreign investors expose themselves to when employing their capital in another country, domestic agents must spend resources equal to $(\theta F / K)$ per unit of capital. Since foreigners are increasingly concerned about the security of their investment the more heavily "indebted" the country already is, we follow convention and specify this cost to be proportional to the foreign-ownership proportion.

This model can be specified in a more compact form, and the remainder of this section is devoted to explaining how. First, the equal-yield condition for the rich and the two optimal hiring rules imply

$$H / K = (1-\alpha)/\alpha.$$

Second, the production function can be divided through by *K*, and then this expression for the *H*/*K* ratio can be substituted in. The result is

$$Y = AK$$

where

$$A = \gamma((1-\alpha)/\alpha)^{1-\alpha}.$$

We see that the model has the detailed structure that has been outlined above, while at the same time, it can be solved as simply as the traditional "*AK*" model. The yield on both forms of capital is independent of tax policy since

$$r = w = \alpha A.$$

We explain below that a standard property of this class of models – that there is no transitional dynamics – applies in this case. Thus, the system is always in its balanced-growth equilibrium. Balanced growth means that *C*, *E*, *Y*, *K*, *H* and *F* all grow at the same rate. Several of the model's equations can be re-written so that this balanced-growth condition $(\dot{C}/C = \dot{K}/K = \dot{H}/H = \dot{F}/F = n)$ can be substituted in. First, the consumption function of the rich can be re-written as

$$n = r(1-\tau) - \rho. \qquad (1)$$

Then, we divide the poor households' expenditure function through by *K*, and substitute in the (*H*/*K*) expression, the balanced-growth assumption, the $r = w$ condition, and equation (1). The result is

$$e = \rho(1-\alpha)/2\alpha \qquad (2)$$

where $e = E/K$. This equation implies that there is no one-time consumption-*level* effect for poor households when the tax substitution takes place.

The foreign indebtedness accumulation identity is simplified by dividing this relationship through by *F* and substituting in the balanced growth condition:

$$x = (r^* - n) f$$

where *x* and *f* denote the *X*/*K* and the *F*/*K* ratios.

The economy's resource constraint can be re-written in a similar manner. We divide this relationship through by *K*, then substitute in the (*H*/*K*) and *x* expressions (and the balanced-growth condition) to get

$$A(1-g) = c + e + (n/\alpha) + (r^* + \theta f - n) f \qquad (3)$$

where $g = G/Y$ is the ratio of government program spending to *GDP*. This relationship can be further re-expressed by using the interest-arbitrage condition:

$$r(1-\lambda) = r^* + \theta f \qquad (4)$$

and equation (1) to yield:

$$(1-\alpha f)(r\tau + \rho) = \alpha(c + e - r\lambda f) + rg \qquad (5)$$

Finally, the government budget constraint is simplified by dividing through by *Y* and substituting in the optimal hiring rules. The result is

$$g = \tau + (\lambda - \tau)\alpha f . \qquad (6)$$

The model we solve in the next section is a five-equation system: equations (1), (2), (4), (5) and (6).

Before proceeding to the policy analysis, however, we assess whether there is gradual approach to the balanced-growth equilibrium. The fact that (H/K) equals $(1-\alpha)/\alpha$ means that *H* always grows at the same rate as *K*. Similarly, since the exogenous tax rate, τ, changes only once-for-all, if equations (4) and (6) are combined by substituting out the responding tax rate, λ, we see that *f* can change only once-for-all as well. This fact means that *F* always grows at the same rate as *K*. Thus, we can assess transitional dynamics by replacing *n* in equation (1) by $\dot{C}/C$, replacing *n* in equation (3) by $\dot{K}/K$, substituting these relationships into

$$\dot{c}/c = \dot{C}/C - \dot{K}/K,$$

and taking the differential of the result. Since the expression for $(d\dot{c}/dc)$ that emerges is necessarily positive, this unstable force is assumed to be eliminated by a jump in c that puts the economy in its balanced-growth equilibrium at the instant that the tax substitution occurs. Armed with this knowledge, we proceed to assessing the welfare implications of the tax substitution in the next section.

3. Policy Analysis

The system that was explained and summarized in the preceding section determines how five endogenous variables (n, c, e, f and λ) respond when there is an assumed change in any of the exogenous variables or parameters (r, r^*, g, τ, α, ρ, and θ). Since we are interested in a revenue-neutral switch in taxes between domestic and foreign owners of domestically employed capital, we consider a once-for-all decrease in the tax rate applied to the domestic citizens, τ, that is financed by an increase in the tax rate applied to foreigners, λ. We examine the effects of this tax substitution on the *growth rate* of living standards that is shared by all individuals in the economy, n. This is the *slope* of the (log of the) per-capita consumption time path. We also check for the existence of any one-time adjustment in the *level* of this per-capita consumption time path (its *intercept*). Since the physical capital stock cannot jump at a point in time, this intercept-shift effect can be determined by assessing whether either c or e respond to the tax substitution.

The policy multipliers follow immediately by taking the total differential of equations (1), (2), (4), (5) and (6). We evaluate the resulting coefficients from an initial situation in which the tax rates are equal. The results are:

$$d\lambda / d\tau = -(1-\alpha f)/\alpha f < 0$$

$$dn / d\tau = -r < 0$$

$$dc / d\tau = -\rho r(1-\alpha f)/(\alpha\theta f) < 0$$

$$df / d\tau = r(1-\alpha f)/(\alpha\theta f) > 0$$

$$de / d\tau = 0$$

The first result confirms that the cut in the tax on domestic citizens requires an increase in the tax levied on foreign investors. The second result indicates that the increase in the after-tax return on saving stimulates increased capital accumulation, and so leads to a higher growth rate of domestic living standards for both rich and poor households. The third result confirms that this long-term gain does not come at the expense of short-term pain. The one-time consumption-level effect for the rich is also an increase. The reason for this can be best appreciated by focusing on a simplified version of equation (5). If we abstract from government and the existence of the poor households, this equation becomes:

$$C = \rho[(1-\alpha f)K/\alpha]. \qquad (7)$$

This is Friedman's (1957) permanent-income version of the consumption function – with consumption proportional to broadly defined wealth (and the rate of time preference being the factor of proportionality). As usual, Friedman's characterization of the wealth-based approach to the consumption-savings choice is consistent with the Ramsey (1928) version (equation (1)). To appreciate this equivalence, it must be remembered that the

wealth of domestic citizens is ($K - F + H$), and (using the $H / K = (1-\alpha)/\alpha$ result and the definition of f) this expression can be represented as $[(1-\alpha f)K/\alpha]$.

Equation (7) lets us see the intuition behind the result that a cut in the tax on domestics has a favourable one-time consumption-level effect. This tax substitution leads to a lower level of foreign indebtedness (a lower f), and this outcome implies that there is a one-time increase in the ratio of *GNP* to *GDP*, $(1-\alpha f)$. With higher national income, nationals can support a higher level of consumption. So the living standards of the rich are improved in both the ongoing-growth-rate and the one-time-level dimensions.

The final policy result, $de/d\tau = 0$, indicates that this good news for the rich does not come at the expense of the poor. This other group benefits in the growth-rate sense, but these individuals are unaffected in the one-time level sense. This is because this group does not hold any physical capital. As a result, the reduction in the foreign ownership of physical capital cannot benefit these households.

Since the tax substitution helps *all* domestic households, it appears to be recommended. Thus, the question posed in the title of the paper, "Is Foreign-Owned Capital a Bad Thing to Tax?" is answered in the negative.

There is another way of rationalizing this conclusion. In this model, the tax on foreigners causes a redistribution between foreigners and domestic citizens, but it has no allocative effect. The productivity of human capital is not affected by who owns the physical capital that the human capital works with. But the other tax, the tax on domestics, *is* a distortion; it distorts the households' accumulation of capital decision. On efficiency grounds, it is always a good idea to replace a distorting tax with a non-distorting one. The formal model is useful for two reasons: it confirms this intuition

concerning efficiency, and it shows that there is no trade-off between the efficiency and the equity aspects of the tax substitution.

It would be a mistake to think that the general verdict we have reached hinges on the simple "*AK*" feature of this model. Indeed, the entire endogenous growth aspect can be dropped. The growth rate, *n*, can be taken as an exogenous variable, and the interest rate can be made endogenous (determined by the optimal hiring rule, $r = \alpha Y / K$ with the (Y/K) ratio not constrained to be constant). In this case, the production function becomes $Y = \gamma K^{\alpha}(qL)^{1-\alpha}$, with L being labour time (an exogenous constant) and worker productivity, q, growing at the exogenous rate n. With no investment in human capital, the expenditure function for poor households becomes

$$e = r(1-\alpha)(1-\tau)/2 \qquad (2a)$$

and the five-equation model (equations (1), (2a), (4), (5) and (6)) determine r, c, e, f and λ, instead of n, c, e, f and λ. It is left for the reader to verify two outcomes: that ($dc/d\tau$) is again negative, and that ($de/d\tau$) is again zero. Since there can be only consumption-*level* effects in this exogenous growth setting, these results confirm our earlier findings as much as is possible. In this case, the rich benefit, while the poor do not, when the tax burden is shifted toward foreign capitalists – but at least the poor are not harmed by this tax substitution.

4. Conclusions

Are the results of this analysis relevant to Canadian policy debate? Perhaps the best point of reference for answering this question is Mintz' (2001) prize-winning monograph. His focus (for example, p. 17) is on "the costs of doing business in Canada,"

and he argues (p. 25) that "capital … and business activities are more mobile today" and that "smart" taxation involves respecting this fact of modern economic life. He concludes (p. 165) that we should "increase our reliance on taxes that have less impact on Canada's competitiveness" – that is on taxes that "fall on relatively immobile bases." While Mintz does not directly address the tax comparison that is the focus of this paper, it is fair to say that many readers may likely conclude that his approach calls for avoiding taxes on highly mobile foreign-owned capital. But, as we have seen, our standard analysis does not support this application of Mintz' general proposition. It is for this reason that we argue that the analysis makes a contribution to the policy debate.

We began the paper by asking which taxes should be cut during Canada's debt-reduction years, and which taxes should be raised later on, if necessary, during the peak population-aging years. The most central answer to these questions is that it is income taxes that should be cut now, and expenditure taxes that should be raised later on. Mintz is explicit about this, and there is nothing in the present analysis that challenges this conclusion. This paper's contribution is more limited, since its focus is on what advice does standard analysis give when increases in expenditure taxes are deemed to be infeasible – on political grounds. If the government must focus only on income taxes, the issue becomes whose income tax should be adjusted. We have restricted our attention to this second-best question. The analysis suggests that it is the tax rate on domestic residents that should be cut during the debt-reduction period, and it is the tax rate on foreigners whose capital is operating in Canada that should be increased later on when the bulk of the baby boomers have retired.

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