# Taxing Foreign-Owned Capital: An Application of Second-Best Analysis

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## 1. Introduction

The efficiency criterion for judging taxes suggests that it is undesirable to levy a tax on an item that has a highly price-elastic supply curve. Other things equal, this high elasticity leads to a large substitution effect and a high excess burden of taxation. In his prize-winning monograph, Mintz (2001) has appealed to this standard reasoning. He concludes that governments should increase their reliance on taxes that "fall on relatively immobile bases" (p. 165). The most direct way to follow this advice is to rely on expenditure taxes, not income taxes. Further, if this is not possible, it would seem that the income tax should involve higher tax rates on labour income (than on capital income), since labour is less mobile internationally. Finally, since foreign-owned capital may be the most sensitive to differentials in rates of return across borders, the standard reasoning suggests that this item is the least desirable one to tax most heavily.

The purpose of this paper is to extend the growing literature that introduces second-best considerations into this debate. It has been shown that – if there is a pre-existing distortion in the labour market that generates involuntary unemployment – then the economy's most pressing problem is that there is "too little" labour being employed, not too little capital being hired. In this setting, it is welfare-improving to introduce an initiative that can reduce the labour-market distortion (such as an employment subsidy) even if that initiative must be financed by a tax on capital that is mobile internationally. This result emerges in a variety of settings – when the unemployment follows from there being unions (Koskala and Schob (2002)), asymmetric information (Moutos and Scarth (2004)), or search frictions (Domeij (2005)). This paper's modest contribution is to show that taxing foreign-owned capital can still be supported – even without any problem in the labour market – if there is a second-best problem that constrains the government itself. Specifically, if the government cannot levy expenditure taxes, then the government should raise the tax on foreign-owned capital to finance a broadly based income tax cut for domestics. As in the earlier analyses, this revenue-neutral package introduces a distortion that matters less than the pre-existing distortion that the initiative is partially relieving.

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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, although society's equity objective *may* be slightly compromised, if the tax on domestics is cut, and this initiative is financed by an increase in the tax on foreign-owned capital. We relate this conclusion more specifically to existing studies, discuss suggestions for future research, 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 $\Omega$, 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, $\tau$, 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, $\tau$, 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 $\tau$. 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 $\lambda$.

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 $\rho$ 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:

$$\alpha Y / K = r$$
$$(1-\alpha) Y / H = w$$

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 $\lambda$. 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 (see Schmitt-Grohe and Uribe (2003)), 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 in the endogenous growth literature 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. Several other approaches are compared – in models that focus on short-run cycles, not longer-term growth – in Schmitt-Grohe and Uribe (2003). They find that varying the specification across five alternatives does not affect the model properties. Given this reassurance, and the fact that it is a common strategy is to specify what Schmitt-Grohe and Uribe refer to as a debt-elastic interest-rate premium, we feel comfortable following this practice. Thus, we assume the slight departure from perfect capital mobility (that is specified in the last equation) in the present analysis.

We are now in a position to specify more fully 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. We assume that foreigners are increasingly concerned about the security of their investment the more heavily "indebted"

the country already is, and so 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 $e$ is independent of the tax substitution. As a result, there is an undesirable one-time consumption-*level* effect for poor households that can take place when the tax substitution is introduced. This effect follows from a straightforward implication of equation (2) – that $E$ must fall by the same percentage as does $K$. And $K$ does fall since an increase in the tax on foreign-owned capital induces some of this input to leave the country. There is more to work out, however, since the

poor households may still benefit in an ongoing-growth-*rate* dimension, and we have yet to determine the implications of the tax substitution for the rich households.

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 examine 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, $\tau$, changes only once-for-all, if equations (4) and (6) are combined by substituting out the responding tax rate, $\lambda$, 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 $\lambda$) respond when there is an assumed change in any of the exogenous variables or parameters (*r*, *r**, *g*, $\tau$, $\alpha$, $\rho$, and $\theta$). 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, $\tau$, that is financed by an increase in the tax rate applied to foreigners, $\lambda$. One thing we examine is the effect of this tax substitution on the ongoing *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 paths.

We also check for the existence of any *one-time* adjustment in the *level* of these per-capita consumption time paths – one for the rich and the other for the poor – that is, in the *intercepts* of these consumption-time graphs. The key to determining these initial effects is to focus on the fact that the overall level of domestic wealth, $(K + H - F) = K(1-\alpha f)/\alpha$, can*not* jump at a point in time. The constancy of this measure at the instant that the tax substitution takes place means that there is an immediate jump in the overall physical capital stock equal to

$$(dK/K)/d\tau = (\alpha/(1-\alpha f))(df/d\tau). \qquad (7)$$

The one-time level effects on living standards can then be determined as:

$$(dC/C)/d\tau = (dc/c)/d\tau + (dK/K)/d\tau \qquad (8)$$
$$(dE/E)/d\tau = (de/e)/d\tau + (dK/K)/d\tau \qquad (9)$$

The policy multipliers follow immediately by taking the total differential of equations (1), (2), (4), (5) and (6). We evaluate the resulting expressions from an initial situation in which the tax rates are equal. Before reporting these results, however, we facilitate intuitive interpretation by focusing on the special case that represents more standard analysis – the situation that involves no separate hand-to-mouth group of households. This situation emerges when variable *e* is set to zero. Further, we simplify equation (5) by using (6) to eliminate the endogenous tax rate, $\lambda$. The resulting more compact model is:

$$n = r(1-\tau) - \rho$$
$$r(1-\lambda) = r^* + \theta f$$
$$g = \tau + (\lambda - \tau)\alpha f$$
$$c = \rho(1-\alpha f)/\alpha$$

This last equation is Friedman's (1957) permanent-income version of the consumption function – with consumption proportional to broadly defined wealth (and with 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)).

The following results emerge:

$$d\lambda / d\tau = -(1-\alpha f)/\alpha f < 0$$
$$dn / d\tau = -r < 0$$
$$df / d\tau = r(1-\alpha f)/(\alpha\theta f) > 0$$
$$dc / d\tau = -\rho r(1-\alpha f)/(\alpha\theta f) < 0$$
$$dC / d\tau = 0$$

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. The third result states that the proportion of the capital stock that is foreign-owned is reduced by this tax substitution, and – given result (7) above – we know this happens because the higher tax on foreign-owned capital causes some capital to leave the country. The fourth result is needed along with (7) and (8) to determine the immediate one-time level effect on living standards – the last multiplier. This outcome indicates that the long-term gain (the higher growth rate of living standards) is *not* accompanied by any short-term pain.

The reason for this unambiguously good-news result is that both the standard Bhagwati-Ramaswami (1963) theorem, and second-best reasoning in general, apply here. That proposition states that the best way to lessen the costs of a pre-existing distortion is by introducing a government initiative that addresses it *at source*. In this case, the existing distortion is the tax on capital accumulation. Cutting this tax, $\tau$, has a first-order favourable effect on welfare. It is true that – to finance this initiative – the government has to increase another pre-existing distortion (the tax rate on foreigners, $\lambda$). But since this levy is not the most damaging distortion in the first place, the resulting unfavourable effect on welfare that accompanies the higher $\lambda$ is dominated. But why is it that the tax on foreign-owned capital is the less distorting tax in the initial equilibrium? The answer is that the foreign tax causes a *levels*-reduction effect on welfare, while the tax on domestics causes a *growth-rate*-reduction effect on welfare. As is often the case, permanent growth-rate effects can dominate once-time level effects. And on efficiency grounds, it is always a good idea to replace a more distorting tax with a less-distorting one.

But what about equity considerations? It is to address this supplementary question that we introduced the hand-to-mouth subset of households – the more general case to which we now return. All the earlier results remain the same, and we simply need to focus on the one new one: $de / d\tau = 0$, which – given equation (9) – implies that there is an unfavourable one-time-level effect on *E*, the level of the poor households' consumption. On a graph tracing the logarithm of this measure of living standards through time, we see

that the intercept of this upward-sloping straight line shifts down, while the slope pivots up. Thus, for this segment of the population (but only for this group), short-term pain must be incurred to secure the long-term gain. All we know is that this group's rate of time preference exceeds the after-tax interest rate, so it is not possible to reach an overall evaluation of the impact of the tax substitution on the welfare of these households. So the tax substitution *can* lead to a trade-off between the efficiency and the equity dimensions of fiscal policy. But it can still be the case – even if this trade-off exists – that this tax substitution can be defended on the basis of the usual criterion used in applied policy analysis – the hypothetical compensation criterion.

## 4. Conclusions

This paper is based on the assumption that governments may be constrained – perhaps on political grounds – from adopting the first-best tax policy (which in this framework is a progressive expenditure tax). Given this second-best starting point, the choice between alternative arrangements within the income-tax system become relevant. The paper has shown that a simple mainstream macro model can be used to defend the proposition that the tax on foreign-owned capital is the less distortionary aspect of the income-tax system. Thus – despite a high degree of international capital mobility – a tax on foreign capital can be justified as a way to finance a tax cut for domestic residentss. Clearly, this demonstration has been limited to one simple model, so the question of the robustness of this result arises. Nevertheless, since this outcome challenges conventional policy advice in this field, and since the model is entirely standard, perhaps the major contribution of the paper is that it may stimulate the further research that will be necessary to assess robustness.

There are several dimensions along which this sensitivity testing could proceed. First, there are other versions of endogenous-growth theory, and it would be equally worthwhile to re-work the analysis in an optimization-based but exogenous-growth setting as well. Second, as mentioned in the Introduction, there are a number of ways analysts have dealt with the over-determinacy of the interest rate in small open-economy models. The importance of switching between five of these alternatives – for the business-cycle-frequency implications of the various models – has been examined, and this sensitivity testing has been reassuring, since most of the models deliver almost identical dynamics. While further work is needed to establish whether there is similar robustness when the alternative models are used to address longer-term fiscal policies, the existing sensitivity tests are encouraging.

In addition to robustness, the other issue that warrants comment is the relevance of our results to existing Canadian policy debate. Again, as noted in the Introduction, perhaps the best point of reference for addressing 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.

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