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DIRECT TAXES IN A SMALL OPEN ECONOMY
WHEN CAPITAL IS PERFECTLY MOBILE
INTERNATIONALLY

by

Joel Fried

May, 1980
DIRECT TAXES IN A SMALL OPEN ECONOMY WHEN CAPITAL IS PERFECTLY MOBILE INTERNATIONALLY

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May 1980

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Abstract

This paper examines the consequences of direct taxes imposed by a small open economy when capital is perfectly mobile. Increases in the effective tax rate on foreign capital will generate an excess burden on labour. Thus, regulatory "taxes" will be (inefficiently) financed by labour. However, if non-residents can use host country taxes as credits for taxes due in their home country, the effective tax may be unchanged. This may generate different behavior by resident and non-resident capitalists to what appears to be the same tax incentives of the host country. Further, as a host country increases its tax rate on capital, non-resident capitalists will become more concentrated by country of nationality.
I. Introduction

If capital is perfectly mobile internationally and production functions are linear homogeneous then the incidence of taxes imposed by a small open economy will not be borne by non-resident owners of capital located in that economy. The purpose of this paper is to examine some of the implications of taxes on factors when capital is perfectly mobile and hence when non-resident capitalists are directly or indirectly free from the burden of these taxes. One issue considered is whether the burden of taxes collected directly from foreign capitalists will fall on domestic workers, domestic capitalists, or foreign governments. A second issue is to determine which direct taxes impose the greatest excess burden on society. Third, given that issues of foreign ownership and the behavior of subsidiaries appear to be of concern to policy makers, the pattern of foreign ownership and the responses of nationals of different countries to changes in tax policy are examined.

The model used to examine the above issues is a simple one. Perfectly competitive firms employing labour and capital produce a single composite good using a linear homogenous production technology. The single commodity assumption avoids the complications previously addressed by Jones (1967) in considering the effects of tariffs and capital movements in a two good model, and the use of two factors, one perfectly mobile and the other fixed, avoids a taxonomy based on elasticities of substitution among more than two factors of production (c.f. Mieszkowski (1972), pp. 87-9). The complications addressed by Mieszkowski and Jones are by no means unimportant and can be incorporated into my analysis but tend to obscure the basic insights of this paper without modifying them to any essential degree. As it is I examine the effects of four types of taxes, a tax on wage income
and three types of taxes on capital income. Of these last three, two are
residence specific—a personal capital income tax levied on domestic capitalists
and a "withholding tax" levied on foreign capitalists—and the third is
paid by all capitalists doing business in the country and cannot be used
by non-residents as a tax credit against their home country's taxes on income
earned abroad. The next section develops the analytical framework and the
incidence and excess burden of the four above mentioned taxes and Section
III considers other policy implications of the analysis. The final section
summarizes the major results and makes some concluding remarks.

II. The Model and the Incidence of Alternative Tax Policies

It is supposed that production in the economy can be characterized by a
linear homogeneous production function using labour and capital as inputs
and producing a composite good, Y, as output.

On a per capita basis output is

\[ y = \frac{Y}{N} = \frac{F(K,N)}{N} = f(k) \]  

(1)

where Y is total output, K is capital, N is the (fixed) supply of labour and \( k = \frac{K}{N} \).

A one sector model is used here rather than an explicit distinction between
an export good and an import and/or non-traded good for at least two reasons.

First, in the pure theory context where one factor is mobile, a given relative
price of output implies, in the absence of specialization and factor price
reversals, a unique set of relative factor prices. The imposition of a tax
on a factor will thus generally mean an outflow or inflow of the mobile factor
until there is commodity specialization in which case a one sector model is
an adequate description of the economy. Second, for stability, a decrease in
\( k \) must cause the marginal product of capital to rise irrespective of what
happens to relative output prices. From the Stolper-Samuelson Theorem,
in such a case, the (gross) rental rate on capital will rise and the wage rate will fall measured in units of either output. Therefore, for my purposes, supposing stability—which I shall do—generates the same qualitative results as in the one sector model.

The profit motivated firms that produce the composite good are assumed to be perfectly competitive so that the real wage paid to workers is equal to the workers' marginal product:

\[ w = f(k) - f'(k)k \]  \hspace{1cm} (2)

where \( w \) is the real wage.

The gross (before tax) rental rate on capital is

\[ r = f'(k) \]  \hspace{1cm} (3)

Because of the supply side assumption that consumption and capital goods are perfect substitutes in production we can also suppose that \( r \) represents the gross real rate of interest on capital.

Next consider a stylized government tax system. There are four types of taxes: a payroll tax, \( t_n \), on labour income; a home capital tax, \( t_h \), on resident capitalists' dividend income; a withholding tax, \( t_w \), on non-resident dividend income repatriated abroad; and a "common" capital tax, \( t_c \), on all capital income generated in the host country. Combining the various taxes, the tax rate for domestic labour is \( t_n \) and the effective tax rate for domestic capitalists, \( t_k \), is

\[ t_k = t + t_h (1-t_c) \]  \hspace{1cm} (4)

on each unit of rental income from capital. For the foreign capitalist, however, there are two tax jurisdictions to whom he is accountable: the host government and the government of the country in which he resides. Suppose that the latter levies a tax on dividend income of \( t_h^* \) and, as
is common, that any withholding taxes paid to the host government can be used as a tax credit to cover \( t_h^* \) on dividends generated in the host country. Thus the effective foreign tax rate on capital income generated in the host country, \( t_k^* \), is:

\[
t_k^* = t_c + t_h^*(1-t_c) \quad \text{if} \quad t_w < t_h^* \quad (5a)
\]

and

\[
t_k^* = t_c + t_w^*(1-t_c) \quad \text{if} \quad t_w > t_h^* \quad (5b)
\]

The total per capita tax revenue obtained by the host government from these taxes is:

\[
G = n_t w + n_t k^* r_k + (t_c + t_w^*(1-t_c)) r_k^*
\]

\[
= n_t w + n_t k^* r_k + (t_w-t_h)(1-t_c) r_k^*
\]

where \( k^* = K^*/N \) and \( K^* \) is non-residents' net claims on capital located in the host country and \( \tilde{k} = k-k^* \), domestically owned capital per worker. This revenue, \( G \), is distributed to residents by the government such that the government's budget is always in balance.

The international accounts for the economy are quite simple and follow directly from Walras' Law. If non-residents own capital in the host country then the dividend account \( (r_k^*(1-t_c)(1-t_w)) \) will equal the negative of the trade balance so that the current account will be zero. If non-residents increase (decrease) their ownership of capital in the host country the capital account surplus (deficit) will generate a trade balance deficit (surplus) of equal magnitude as tangible capital goods are imported into (exported out of) the country.

Resident households consume or save with their disposable income, \( y_d \). In particular, saving is directed toward achieving some target level of asset holding, that depends positively on the net (after tax) rate of return on capital in the host country. \(^7\) That is, in the long run,
\[ k = \hat{k}(1), \frac{\partial k}{\partial i} > 0 \]  

where \( \hat{k} \) is the per capita target level of capital ownership by domestic residents and \( i = r(1-t_k) \). Non-resident demand for capital assets in the host country depends on a different argument, specifically the net yield on host country assets relative to the net yield on assets in other parts of the world, \( i^* \). If capital is perfectly mobile then, by definition, the required rate of return after taxes on host country capital income must equal \( i^* \) if any non-resident is to own capital in that country. On the assumption that there is some foreign ownership the gross rental rate on capital is

\[ r = i^*/(1-t_k^*) = \begin{cases} 
\frac{i^*}{(1-t_h^*)(1-t_c^*)} & \text{for } t_h^* > t_w \\
\frac{i^*}{(1-t_w^*)(1-t_c^*)} & \text{for } t_h^* \leq t_w
\end{cases} \]  

Since \( r = f'(k) \) the capital labour ratio for the economy is

\[ k = g(i^*/(1-t_k^*)), \quad g' < 0 \]

where \( g( ) \) is the inverse of \( f'(k) \).

The incidence of changes in the tax system under the assumption that capital is perfectly mobile can now be examined. The structure of the model discussed above implies the following propositions:

**Proposition A**: If capital is perfectly mobile and \( k^* > 0 \) then \( i^* \), the net rate of return to non-resident owners of capital, is unaffected by any host country tax change.

Proposition A follows directly from the definition of capital mobility.

**Proposition B**: If capital is perfectly mobile and \( k^* > 0 \) then \( i \), the net rate of return to resident owners of capital, will be affected by a host country tax change if and only if \( (1-t_k) \) is changed relative to \( (1-t_k^*) \).

**Proof**: From the definition of \( i \) and from (8), \( i = (1-t_k) \frac{i^*}{(1-t_k^*)} \). From Proposition A, \( i^* \) is unaffected by any tax change so the only way for host country taxes to affect \( i \) is for \( \frac{1-t_k}{1-t_k^*} \) to change. Note that this can occur if \( t_h \) or \( t_w (t_h^*) \) is changed.
Proposition C: If capital is perfectly mobile, \( k^* > 0 \), and \( t_w < t_h^* \) then a change in \( t_w \) only affects the distribution of tax revenue between the host and foreign governments.

This follows directly from the assumption that withholding taxes paid to the host government are treated as a tax credit by foreign governments.

Proposition D: If capital is perfectly mobile and \( k^* > 0 \), the real wage is changed by tax changes if and only if \( t_k^* \) is changed.

Proof: Follows immediately from (9) and (2).

From these four propositions, the incidence of any tax can be unambiguously assigned. In particular, the incidence of:

1. An increase in \( t_n \) falls only on labour
2. An increase in \( t_c \) falls only on labour
3. An increase in \( t_h \) falls only on resident capitalists
4. An increase in \( t_w \) falls only on foreign governments if \( t_w < t_h^* \)
5. An increase in \( t_w \) falls only on labour if \( t_w > t_h^* \). (Note also that resident capitalists gain in this case)

While the incidence of any single tax change is unambiguous under our assumptions, these conclusions may be vitiated if the additional revenue generated is disbursed in a "non-neutral" fashion. To overcome this potential criticism I shall consider the incidence of all pairwise tax changes that generate a constant government revenue \( G \). If, for a given combination, the net factor reward \( (i^*, i, \text{ or } \phi = (1-t_n)w) \) to a member of a group (foreign capitalists, domestic capitalists or labour) fall (rises), that group is said to bear the incidence of (gain from) the change in tax regimes.\(^9\) These experiments are summarized in Table 1 under the simplifying assumption that \( t_w = t_h^* \).\(^{10}\)
Table 1

<table>
<thead>
<tr>
<th>Tax增加了</th>
<th>补偿税改变了</th>
<th>$\Delta i^*$</th>
<th>$\Delta i$</th>
<th>$\Delta [1- t_n w]$</th>
<th>$\Delta (k^*/k)^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_c$</td>
<td>$t_n$</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$t_c$</td>
<td>$t_h$</td>
<td>0</td>
<td>$\text{sign}(\partial G/\partial t_c)$</td>
<td>-</td>
<td>-if $\partial G/\partial t_c \leq 0$</td>
</tr>
<tr>
<td>$t_c$</td>
<td>$t_w^a$</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$t_c$</td>
<td>$t_w^b$</td>
<td>0</td>
<td>$-\text{sign}(dt_w/dt_c</td>
<td>_{dG=0})$</td>
<td>$\text{sign}(\partial G/\partial t_w)$</td>
</tr>
<tr>
<td>$t_h$</td>
<td>$t_n$</td>
<td>0</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$t_h$</td>
<td>$t_w^a$</td>
<td>0</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$t_h$</td>
<td>$t_w^b$</td>
<td>0</td>
<td>if $\partial G/\partial t_w &gt; 0$</td>
<td>$\text{sign}(\partial G/\partial t_w)$</td>
<td>+if $\partial G/\partial t_w \geq 0$</td>
</tr>
<tr>
<td>$t_n$</td>
<td>$t_w^a$</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>$t_n$</td>
<td>$t_w^b$</td>
<td>0</td>
<td>$-\text{sign}(\partial G/\partial t_w)$</td>
<td>$\text{sign}(\partial G/\partial t_w)$</td>
<td>$\text{sign}(\partial G/\partial t_w)$</td>
</tr>
</tbody>
</table>

a) for $t_w \leq t_h$

b) for $t_w > t_h$

c) This describes the long run change when $d(k-k^*)/di > 0$. For the short run $d(k-k^*)/di = 0$, $\text{sign}(\Delta k^*/k) = \text{sign} \Delta [1-t_n w]$ except for rows (5) and (8) where $\Delta (k^*/k) = 0$. 
The first point to note is in row 1 where an increase in the common
capital tax, $t_c$, does not improve the return to any capitalist but makes
workers worse off even when the direct tax imposed on labour is decreased.\(^ {11}\) The reason for this is because $t_c$ imposes an excess burden whereas the tax on
labour does not. Since labour bears the entire burden of an increase in
$t_c$ the amount of the excess burden is the amount that labour loses under this
change in tax regime.\(^ {12}\) From Proposition D an excess burden will also occur with
increased $t_w$ if $t_w > t_h^*$ but none is entailed with increases in $t_h$, $t_n$ or $t_w < t_h^*$. Thus the changes in tax regime described by rows 2 and 3 of Table 1 cause an
excess burden on labour because $t_c$ is increased and rows 7 and 9 reduce (increase)
the excess burden on labour because $t_w > t_h^*$ is reduced (increased). Rows 6 and
8 do not involve any excess burden but rather reflect the fact that domestic
residents pay the tax that was previously implicitly paid by foreign governments.

Row 4 bears on the issue of which tax, $t_c$ or $t_w > t_h^*$, causes the greatest
excess burden but is complicated by the fact that both $\partial G/\partial t_c$ and $\partial G/\partial t_w$ may be
negative.\(^ {13}\) Initially suppose the more reasonable case where $\partial G/\partial t_c$ and $\partial G/\partial t_w$
are positive. Then an increase in $t_c$ and a compensating decrease in $t_w$ will increase
$k$ and the real wage (see the appendix). This indicates that $t_w$, $t_w > t_h^*$ imposes
the greater excess burden and the reason it does so is because, to raise any
given amount of revenue in these circumstances $t_w$ must change by a greater
amount than $t_c$ due to the greater tax base of the latter. Since what causes
the excess burden is the net increase in $t_k^*$, an increase in $t_c$ and decrease in
$t_w$ causes $t_k^*$ to fall and reduces the excess burden. In the case where $\partial G/\partial t_c$
and $\partial G/\partial t_w$ are negative $t_c$ can be said to cause the greater excess burden
because increases in it cause smaller decreases in revenue than do increases
in $t_w$. The reason for this is because an equal increase in $t_w/(1-t_w)$ or
$t_c/(1-t_c)$ will decrease revenue via the tax on labour by an equal amount but
$t_c$ has a greater base to offset this fall. Thus $t_k^*$ and $t_c$ move together
under these circumstances.
It needs to be pointed out, however, that it is not "sensible" for a
government to operate in the region where \( \partial G/\partial t_c \) and/or \( \partial G/\partial t_w \) is negative
because not only can the government increase revenue by reducing these taxes,
by doing so they can, in principle, increase the welfare of all domestic
residents either through direct transfers or by reducing direct taxes on (some)
domestic residents. This is most clear in row 2 when \( \partial G/\partial t_c < 0 \). If \( t_c \) is
reduced, \( t_h \) can also be reduced and both workers and resident capitalists would
gain. Unfortunately, "sensibleness" is not a strong point in the writing of
tax law.

III. Policy Implications

The principal implication of this analysis is that if the effective
marginal tax rate on non-resident's capital income is increased, workers
will ultimately bear the full burden of that tax including the excess
burden arising from the flight of capital. If the objective of a given
tax is to maximize the size of labour income (as opposed to labour's after-
tax share of domestic output) then the appropriate tax scheme is to raise
revenue through the home capital tax, \( t_h \), the withholding tax, \( t_w \), if
\( t_w^{\ast} \) is less than \( t_h^{\ast} \) and, if there is a constraint on how high \( t_h \) can be
increased, to raise any additional revenue by a tax on labour income rather
than further increases in \( t_w \).

If the objective of tax policy is to maximize national income as opposed
to just labour income (perhaps in recognition that the classification of worker
and capitalist is partly a life cycle phenomenon) again \( t_w \) should not be
increased above \( t_h^{\ast} \) nor the common capital tax, \( t_c \), above zero. Taxes on residents
should then be set to maximize resident ownership of capital, which from (7)
implies that \( t_h \) should be set at zero and any additional revenue raised
through increases in \( t_n^{\ast} \). It should also be noted that such a program
also reduces net foreign ownership relative to a program maximizing the after
tax income to workers. This is to say that, given perfect capital mobility,
an increase in domestic saving reduces one for one the amount of foreign
investment in the economy. Increases in $t_w$ above $t^*_h$ may, of course, further
reduce the share of foreign ownership but this will be reflected in a lower
after tax real wage.

The fact that, for $t_w > t^*_h$, foreign capital is elastic with respect
to increases in $t_w$ (and $t^*_c$) implies that at some point further increases
in this rate will lead to decreases in total revenue raised. While policy-
makers should certainly keep this in mind in recommending alternative tax
schemes it should also be pointed out that where we might think we are on
the "Laffer curve" regarding taxes on labour income may possibly be misleading.
Consider for instance the following scenario. Suppose that with an unchanged
gross wage the tax on labour income, $t_n$, is set at its revenue maximizing
level, i.e., $\frac{\partial G}{\partial t_n} = 0$. If $t^*_c > 0$ and/or $t_w \geq t^*_h$, then a decrease in
either of these will increase the real wage and $t_n$ could then be raised and
total revenue could be increased. This is only to say that other tax settings
must be taken into account in order to determine the revenue maximizing tax
on labour.

One problem with using the analysis of Section II to devise a tax
schedule to attain the desired objectives is the difficulty in determining
whether or not a given tax on non-resident capital income will affect the
marginal yield. For instance suppose the desire is to set $t_w$ at $t^*_h$ to
extract all foreign government rents accruing to investment in the host
country. The immediate issue is to determine what the relevant $t^*_h$ is.
Given the diversity of tax laws across nations, at a minimum $t^*_h$ would be
country specific. Thus any change in $t_w$ will affect some nationals at the
margin while extracting foreign government rents through others. This will mean that ownership by nationals of countries with low \( t_{w}^* \) will tend to fall if \( t_{w} \) is increased implying a concentration of foreign ownership by nationals of high \( t_{h}^* \) countries. Thus, for instance, Canada's apparent policy of setting tax rates on foreign capital just below tax rates in the U.S. encourages U.S. ownership relative to say, European ownership because effective European \( t_{h}^* \) are lower. Europeans, on the other hand would tend to gravitate toward nations with low \( t_{w} \).  

The diversity of foreign tax laws also makes it difficult to determine whether any specific form of tax on capital income will or will not affect the gross rental rate on capital. Thus \( t_{c} \) is also hard to identify. However, implicit taxes associated with government regulation may well be linked with \( t_{c} \) for purposes of this analysis. If this is so, the following observations can be made. First, the analysis of \( t_{c} \) implies that workers will bear the full cost of this type of regulation so it would be preferable to obtain the benefits the regulation was to have obtained through direct taxation of workers and direct governmental purchase. Second, if the regulations were instituted to remove some externality (e.g., pollution through larger smokestacks, etc.), the direct government purchase should take the form of a subsidy. It should not take the form of a tax credit insofar as this credit accrues to the foreign government rather than the foreign company since there would then be no incentive for the firm to operate in a manner that would generate the tax credit. The interesting point about this is that the use of tax credits for allocation or short-term stabilization purposes will generate different behavior by domestic and (some) foreign owners of capital and perhaps lead some to charge that foreign companies are poor corporate citizens. In point of fact, the foreign-owned
company may be quite willing to respond in the same manner as a domestic firm if faced with the same incentives: The problem is that a "tax cut" that appears to affect all capital owners impartially is a tax cut to domestic capitalists and a revenue generator to foreign governments. If the foreign firm did respond in the same fashion as the domestic firm, logic would require us to say that foreigners were simply instruments of the foreign government and therefore were potentially behaving as poor corporate citizens of the host country. I suppose economic nationalists may choose to use one argument or the other in making a case against foreign ownership but they clearly should not use both. 16

IV. Concluding Remarks

In this paper I have shown that in a world of perfect capital mobility taxes on non-resident income from capital will be borne entirely by workers insofar as these changes increase the effective marginal tax rate. To affect the marginal tax rate the tax increase cannot be used as a tax credit against the non-resident's taxes levied in his country of domicile. Taxes for which such a condition holds are difficult to identify but would generally encompass local property taxes, taxes "in kind" imposed through government regulation and corporate taxes higher than those prevailing in other parts of the world. For the policy maker the most attractive source of additional revenue is through the withholding (or corporate income) tax ($t_w$) provided foreign tax rates ($t_h^f$) are greater than $t_w$ for then the revenue is extracted from foreign governments rather than domestic residents. However, in a world with many countries having different tax rates on income earned outside the country determination of exactly how much can be extracted from foreign governments without affecting the effective tax rate on capital is complex and, in addition, will generally mean a concentration of foreign ownership by nationals of
specific countries. Judging from statements on the Canadian scene such a concentration is viewed as undesirable. Furthermore the issue of good "corporate citizenship" becomes more difficult to untangle if \( t_w \) is less than \( t_h \) since what may at first appear as equal tax incentives to domestic and non-resident capitalists will not be. This is because any tax credit provided by the host government is effectively taxed at a 100% rate by the government of the non-resident. Thus, even if all capitalists would behave the same way if faced with the same incentives, actual behavior may in fact differ depending on tax policies in tax jurisdictions outside the host country.

The assumption of perfect capital mobility has played a crucial role in the analysis of this paper and, in terms of real capital movements, appears to be violated in the real world. What if capital is imperfectly mobile? If, by imperfect capital mobility we suppose that firms take into account transactions and other adjustment costs in making their investment decisions but still are motivated to maximize expected profits then, over time, the qualitative results of the perfect capital mobility framework will continue to hold: rates of return (after taxes levied at home and abroad) will be equalized for a national of a country wherever he invests. However, in the short run, host governments may be able to extract a rent from foreign capital in place. Depending on the rate of time preference of a country's decision makers it may then by desirable to increase capital taxes above foreign rates to extract some of these short-run rents. On the other hand, to the extent that entrepreneurs recognise that taxes can be extracted from capital in place they will need a higher required rate of return to engage in investment abroad or will avoid the risk by investing at home thereby only dealing with the capriciousness of one tax jurisdiction.
Footnotes

1 The reader may therefore view this analysis as an exercise in the theory of the second best where only direct taxes can be altered and that more detailed implications about tax incidence requires a more detailed model than employed here.

2 Examples would be respectively the personal tax on interest and dividend income plus corporate taxes; the treaty established withholding tax on interest and dividends going across borders and, for U.S. corporations, the host country's corporate income tax; and local property taxes or capital levies.

3 The requirement that labour is fixed in supply is a simplifying assumption that is discussed in more detail in the next section.

4 See Jones (1967) for a full analysis of the two sector model with mobile capital. It should be notes that the assumption of a small open economy that cannot affect world relative prices or the rate of interest makes this analysis a special case of Jones' work and removes the opportunity to impose an optimal tariff and capital income tax policy exploiting the rest of the world. For the policy issues I am concerned with, the gain in analytical manageability seems worth the loss of some generality involved in making this assumption.

5 I have abstracted from corporate financial policy and supposed that all profits are distributed immediately in the form of dividends. It is convenient to suppose that $t_h$ and $t_w$ are collected from the individual while $t_c$ is collected from the firm prior to the distribution of dividends and is treated as an expense of the firm.
Because government revenue is transferred back to residents, disposable income corresponds to net national product. For the representative agent

\[ y_d = y - r(1-t_w)(1-t_c)k^*. \]

7. c.f. Fried (1980a) or (1980b) for a more detailed discussion of capital accumulation behavior. It is pointed out there that if decision units are finite lived and/or markets for streams of income are imperfect, an increase in wages plus government transfers will increase capital ownership whereas if these conditions do not hold, the demand for capital will be negatively related to wage and transfer increases. For convenience here I suppose \( \partial k/\partial w = 0. \)

Note that \( i^* = r^*(1-t^*_h)(1-t^*_c) \) where \( r^* \) and \( t^*_c \) are the foreign equivalents of \( r \) and \( t_c \). Increases in \( t^*_c \) are operationally indistinguishable from decreases in \( i^* \) and both are outside the control of the government of a small open economy.

In the context of this model, looking at after tax factor returns is equivalent to examining the incidence of tax changes in the "short run" where the short run encompasses the period of time in which non-residents adjust their holdings of capital assets while resident claims to capital remain unchanged. The "long-run" corresponds to that point in time where residents have fully adjusted to their desired capital stock described by (7) above.

This assumption is made for computational convenience. To provide some qualitative information about the effect of this assumption the last column of Table 1 shows what happens to \( k^*/k \). If it increases and if \( t_w < t_h \) \( (t_w > t_h) \) then the compensating tax would be required to change more (less) than if the assumption was valid.

This is shown mathematically in the appendix as are the effects of a \( (t_c, t_w), t_w > t^*_h \), tax change on \( \Delta i \) and \( \Delta (1-t_n)w \) in row 4 of Table 1.
12. The reason this difference can be identified as the excess burden is because $dN/dw(l-t_n)$ is assumed to be zero so that $t_n$ (as well as $t_w$ if $t_w < t_h^*$, and, in the short run, $t_h$) can be treated as a lump sum tax. If labour supply were positively sloped, the excess burden from the $(t_c, t_n)$ change in tax regime would not be as great since the decrease in $w(l-t_n)$ would cause workers to substitute toward leisure even if $t_n$ has fallen. However, the fall in measured output would be greater if labour supply is positively related to the real wage.

13. Under the assumption that $t_w = t_h$, the condition for $dG/dt_c > 0$ is

$$
\eta_h < \frac{1-t_n}{1-t_c} \eta_k,
$$

where $\eta_k$ is the elasticity of $k$ with respect to $t_k$ given $t_h$, i.e., $-(t_k/k)(dk/dt_c) = \eta_k$. For those attracted to the concept of the "Laffer curve", this analysis may provide a partial justification for selective tax cuts to raise government revenue.

14. This must be qualified by the comment made in footnote (7) above. To the extent that wage and transfer income affect the desired capital stock some $t_h > 0$ may be preferred in order to reduce $t_n$.

15. The issue for European investors vis-a-vis U.S. investors might be a problem of whether or not a given tax would fall under $t_c$ or $t_w$. In general European tax credits are less liberal than the U.S. so that more Canadian taxes are not deductible and fall under the $t_c$ classification for the European.

16. The same sort of analysis can be applied to the issue of transfer pricing. (c.f. Booth and Jensen (1977).) For firms owned by nationals of low $t_h$ countries an incentive exists for such pricing decisions whereas for firms owned by nationals of countries where $t_h^* > t_w$ it does not. For the welfare of the host country this type of pricing should be encouraged when $t_h^* < t_w$.


18. This taxation risk will imply that domestic saving and investment will be positively correlated across countries. c.f. Feldstein and Horioka (1979).
Bibliography


Appendix

To derive the general results for Table 1, substitute (2) and (3) into (6), totally differentiate and set $dG = 0$. This gives

$$
dG = \frac{wdt_n}{n} + (1-t_c) r \left[ (k-k*) + (t_w-t_h) \frac{\partial k}{\partial t_h} \right] dt_h \\
+ \left[ (f''k(t_n-t_c) + rt_k) \frac{\partial k}{\partial t_c} + (1-t_h) r_k + (t_w-t_h)(1-t_c) (f''k \frac{\partial k}{\partial t_c} + r\frac{\partial k}{\partial t_c} - \frac{rk}{1-t_c}) \right] dt_c \\
+ \left[ (f''k(t_n-t_c) + rt_k) \frac{\partial k}{\partial t_w} + (1-t_c) r_k + (t_w-t_h)(1-t_c) (f''k \frac{\partial k}{\partial t_w} + r\frac{\partial k}{\partial t_w}) \right] dt_w \\
= \psi_n dt_n + \psi_h dt_h + \psi_c dt_c + \psi_w dt_w = 0 \tag{A1}
$$

where $\frac{\partial k}{\partial t} = \frac{\partial k}{\partial t} = 0$ for $t^* > t_c$ and $\psi_i = \frac{\partial G}{\partial t_i}$, $i = n, h, c, w$. This equation can then be used to determine $\frac{dt_j}{dt_i} \bigg|_{dG=0}$ for a $(t_i, t_j)$ tax change and is then substituted into the various equations describing $\frac{dx}{dt_i} \bigg|_{dG=0}$, $x = i^*, i, \phi$, where $\phi = (1-t_n) w$. I now derive $d\phi/dt_c$ for a $(t_c, t_n)$ tax change assuming $t_w = t_h$. From A1:

$$
\frac{dt_n}{dt_c} \bigg|_{dG=0} = -\psi_n / \psi_c = -\frac{(f''k(t_n-t_c) + rt_k) \frac{\partial k}{\partial t_c} + (1-t_c) r_k}{w} \tag{A2}
$$

Further, from (8):

$$
f'' \frac{\partial k}{\partial t_c} = f'/(1-t_c) = r/(1-t_c) \tag{A3}
$$

From (2) $\phi = (f-f'k)(1-t_n)$ and, using A2 and A3, we get

$$
\frac{d\phi}{dt_c} \bigg|_{dG=0} = -f''k(1-t_n) \frac{\partial k}{\partial t_c} - \frac{wdt_n}{dt_c} \\
= -f''k(1-t_n) \frac{\partial k}{\partial t_c} + [f''k((1-t_n) - (1-t_c)(1-t_h)) + rt_k] \frac{\partial k}{\partial t_c} + (1-t_h) r_k \\
= rt_k \frac{\partial k}{\partial t_c} \tag{A4}
$$

Because, from (9), $\frac{\partial k}{\partial t_c}$ is negative $d\phi/dt_c$ for a tax change $(t_c, t_n)$ is also negative: the after tax real wage falls with revenue compensated increases in $t_c$. 
I now derive \( \frac{d\varphi}{dt_c} \) and \( \frac{d\Omega}{dt_c} \) corresponding to row 4 of Table 1 under the assumptions \( t_h = t_w > t_h^* \). From (9)

\[
\frac{\partial k}{\partial t_w} = \frac{1-t}{1-t_w} \frac{\partial k}{\partial t_c}
\]

and substituting this into \( A1 \) gives:

\[
\left. \frac{dt_w}{dt_c} \right|_{dG=0} = -\frac{\psi_w}{\psi_c} = -\frac{(f''k(t_c-t_n) + rt_k)\partial k/\partial t + (1-t_h)rk}{(f''k(t_c-t_n) + rt_k)\partial k/\partial t + (1-t_c)rk^*}
\]

\[
= -\frac{1-t_w}{1-t_c} \frac{(f''k(t_c-t_n) + rt_k)\partial k/\partial t + (1-t_h)rk}{(f''k(t_c-t_n) + rt_k)\partial k/\partial t + (1-t_w)rk^*}
\]

From (8) and \( A6 \) and making use of \( t_h = t_w^* \):

\[
\left. \frac{dr}{dt_c} \right|_{dG=0} = \frac{r}{1-t_c} \frac{1-t}{t_w} \frac{dt_w}{dt_c}
\]

\[
= -\frac{r}{1-t_c} \frac{r(1-t_w)(k-k^*)}{(f''k(t_c-t_n) + rt_k)\partial k/\partial t + (1-t_w)rk^*}
\]

\[
= -r^2 \frac{(k-k^*)}{\psi_w}
\]

Because \( k-k^* > 0 \):

\[
\text{sign} \left( \frac{dr}{dt_c} \right) = -\text{sign}(\psi_w)
\]

Since \( \partial w/\partial r = (\partial w/\partial k) \cdot g' < 0 \), it follows that:

\[
\text{sign} \left[ \frac{d\varphi}{dt_c} \right]_{(t_c, t_w)} = \text{sign} (\psi_w)
\]

Furthermore, because \( \partial i/\partial t_w > 0 \) and \( dt_c > 0 \) in row 4 of Table 1, i will decrease only if \( \left. \frac{dt_w}{dt_c} \right|_{dG=0} \) is positive. That is:

\[
\text{sign} \left( \frac{di}{dt_c} \right)_{(t_c, t_w)} = -\text{sign} \left( \frac{dt_w}{dt_c} \right)_{dG=0}
\]