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ABSTRACT

Taxation if Capital is Not Perfectly Mobile: Tax Competition versus Tax Exportation

This Paper analyses the tax competition and tax exporting effect of financial integration. On the one hand, financial integration increases capital mobility and thus the incentive for countries to compete for capital. On the other hand, financial integration increases foreign ownership of firms and capital and allows for exportation of source taxes. Both effects have contrary implications for capital taxes. Allowing for imperfectly mobile capital, our analysis suggests that currently the tax exportation effect is dominating, which implies excessive capital taxation. From studying the benchmark of full financial integration we find that capital taxes are likely to increase from current levels. We further examine the tax exportation effect empirically and find that it is significant as well as quantitatively important for the US.

JEL Classification: F20 and H12
Keywords: capital mobility, cross-ownership and tax competition

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1 Introduction

The dramatic rise in international capital flows in recent years has caused an extensive debate in both academic and policy circles about the consequences of tax competition. Tax competition arises because governments have in the presence of internationally mobile capital an incentive to undercut each other's capital income taxes in order to attract capital. It can lead to a 'race to the bottom' that results in inefficiently low taxes on capital. Spurred by the observed decline in capital taxes over the last two decades this argument has led to calls for internationally coordinated rises in capital tax rates (for example Tanzi, 1999, the Ruding and the Primarolo report for tax coordination in the European Union, 1992 and 1999).

However, despite the apparently low frictions to international capital movements, taxes on capital income are still rather high.[1] This is in contrast to standard tax competition models that predict zero capital income taxes in the case of perfect capital mobility (i.e., Razin and Sadka, 1991). An explanation for this phenomenon is that ongoing financial integration increases foreign ownership of firms and capital, which may enable the government to export source taxes to foreigners. A government faces then lower costs of taxation (in terms of a reduction in domestic income) and may hence set a higher tax on capital. Huizinga and Nielsen (1997) have shown that if firms are partly foreign-owned, capital taxes serve to shift rents from foreigners to domestic residents. If the government is not able to fully tax firms' profits, optimal capital tax rates do then increase with the degree of foreign ownership. This *tax exporting effect* offsets the effect of tax competition on capital income taxes. If the tax exporting effect is dominating, financial integration can actually increase taxes. Moreover, the welfare implications of coordinated tax rises may reverse. It is therefore an interesting question whether one of the two effects is likely to outweigh the other. Mintz (1994) conclude that this question cannot be answered a priori. Sørensen (2001), analyzing the welfare gains from tax coordination, suggests that for his framework tax competition is dominating the tax exporting incentive.

The main aim of this paper is to explicitly study the relative importance of the tax exportation

[1] For example, top statutory tax rates average at around 35% for the major industrial countries.

and tax competition effect. In contrast to the previous literature we allow for partly immobile capital and foreign ownership of firms *and* capital. The motivation is that when capital is to some extent foreign-owned and not completely mobile, a second tax exporting motive arises. The intuition is similar to the first one: an increase in foreign ownership of capital reduces the costs of capital taxes in terms of reduced domestic income and gives the government an incentive to set a higher tax on capital.[2] Using empirical estimates for the tax elasticity of capital mobility we find that for the current situation the immobility of capital suggests excessive taxation, i.e., the tax exporting effect is dominating. This also holds if profits can be fully taxed, in this case there is no motive for rent shifting due to foreign ownership of firms as emphasized in the literature.

Although a high level of financial integration has already been achieved among the major industrial countries, we are still far away from full financial integration. This is indicated by the relatively low estimates for the tax elasticity of capital but also by the observed low international diversification.[3] In order to get insights about possible future trends in capital taxation, we also study capital taxes for the benchmark case of full financial integration. Under full financial integration, new investment is completely mobile internationally. In contrast, relocation (even domestically) of capital that has already been installed remains costly. This has the consequence that although there is perfect competition for new capital, the existing capital stock is partly immobile. Lee (1997) has considered a two-period model with foreign ownership in which capital that has been invested in the first period is fixed in the second. He finds that excessive taxation can arise. Our approach differs from his in that we develop a fully dynamic model with depreciating capital and endogenous capital formation, which allows to derive quantitative implications. We further characterize full financial integration by full foreign ownership. This is consistent with complete international risk-pooling but also with the sole existence of multinational firms. We

[2] Notably this effect vanishes if there is completely mobile capital.

[3] A consensus estimate for the tax elasticity of FDI is -0.6% (Hines, 1999), which is far less than what models of full capital mobility imply. International portfolio diversification is around $5-20\%$ for major industrial countries, also this is much lower than what is implied by standard portfolio models (which suggest near 100% foreign ownership share for a small country).

find that in the case of completely flexible installed capital, equilibrium capital income taxes are substantial (41%) under full financial integration. If relocating installed capital is costly, much higher income taxes can arise (i.e., larger than 91%). This is true even for for relatively small costs of relocation.

The second aim of the paper is to examine the tax exporting effect due to foreign ownership empirically. To our best knowledge this is the first study that tests for the tax exporting effect. Using yearly panel data from 1977 to 1998, we estimate the influence of foreign ownership in the U.S. (on the state level) on state corporate taxes. Both of our measures of foreign ownership turn out to be significant. The estimated parameters imply that the increase in foreign ownership during the sample period has led to an increase in the corporate tax burden by $5 - 17\%$. Our results also suggest that given the low current extent of foreign ownership (which indicates a high potential for increases in cross-border ownership) the tax exporting effect will be an important determinant of capital taxation as the world move towards more financial integration.

The remainder of the paper is organized as follows. The next section analyzes public goods provision in a simple static model with exogenously given foreign ownership share and capital mobility. The third section studies capital taxes in the steady state under full financial integration. Section 4 contains the empirical evidence for the tax exporting effect. The final section concludes.

2 Public Good Provision under Foreign Ownership

Consider a small economy with a representative household that is endowed with a fixed amount of capital $\overline{k}$. The degree of cross-ownership is μ, meaning that a share μ of the domestic firm and the capital (k) employed in the domestic firm are held by foreigners.[4] The part of the capital stock $\overline{k}$ that is not invested at home is invested at the world interest rate r. The government can only raise a source tax on capital in order to finance a public good. In equilibrium, the after-tax

[4]There are two reasons why we consider cross-ownership of capital *and* firms. First, if both profits and capital income are risky, optimal diversification requires cross-ownership in both. Second, it is in practice difficult to separate between both types of income. Ownership claims have therefore typically a profit and a capital income component.

return on domestic capital equals the world interest rate: $f - \tau = r$. The consumer's and the government's budget equations are:

$$\begin{aligned} c &= (1-\mu)[f - f'k] + (1-\mu)(f' - \tau)k + r(\overline{k} - (1-\mu)k) \\ &= (1-\mu)[f - \tau k - rk] + r\overline{k} \qquad (1) \\ g &= \tau k \qquad (2) \end{aligned}$$

where c and g are private and public consumption, respectively. The government maximizes the utility of the representative household $u(c) + v(g)$ subject to (1) and (2) and taking r as given. Compared to a closed economy without foreign ownership, the optimal taxation problem changes as follows. First, an increase in the tax rate leads to capital flight (since $\partial k/\partial \tau = k' < 0$), which erodes the tax base and reduces the incentives for taxation (tax competition effect). Second, since a share μ of the production of the country goes to foreigners, the cost of additional taxation in terms of a reduction in the representative household's income is reduced (tax exporting effect).

Proposition 1 *The equilibrium marginal rate of substitution (MRS) between public and private good in the absence of a profit tax is given by:*

$$MRS = (1-\mu)/(1+\varepsilon) \qquad (3)$$

where $\varepsilon = k' * (\tau/k)$ is the tax elasticity of capital.

Proof. *From the government's FOC $u'\partial c/\partial \tau + v'\partial g/\partial \tau = 0$ we have $MRS = v'/u' = (-\partial c/\partial \tau)/(\partial g/\partial \tau)$. The proposition follows with $\partial c/\partial \tau = (1-\mu)[f'k' - k - \tau k' - rk'] = -(1-\mu)k$ (using $r = f' - \tau$) and $\partial g/\partial \tau = k + \tau k'$.* ■

Proposition 1 illustrates the two effects of financial integration on public good provision. First, financial integration increases capital mobility ($|\varepsilon|$ rises) and hence the incentives for cutting taxes. This leads to less provision of the public good (the MRS rises). Second, by reducing the cost of international diversification, financial integration increases the degree of cross-ownership μ, which will increase the public good provision (the MRS falls). Alternatively, the increase in cross-ownership can also be brought about by an increasing importance of MNE's due to

financial integration (MNE's create cross-ownership because they invest in different countries and have typically a multinational shareholder base).

According to proposition 1, there is overprovision of the public if $\mu > |\varepsilon|$. Hines (1999) reports a consensus tax elasticity of -0.6 for the investment between the U.S. and the rest of the world (in both directions). This foreign direct investment elasticity is defined as $\varepsilon_{FDI} = \partial FDI/\partial\tau * (\tau/FDI)$, where FDI refers to the FDI-position in the country under consideration. With $FDI = \mu k$ and $\partial FDI/\partial\tau = k'$[5] it follows that $\varepsilon_{FDI} = \varepsilon/\mu$. The condition for overprovision of the public good becomes $|\varepsilon_{FDI}| < 1$, which is independent of μ. The intuition for the latter is that an increase in μ will increase the tax exporting effect but also ε (because the tax sensitive FDI rises as a share of total capital). Both effects are canceling out. Hines' elasticity thus suggests overprovision of the public good (and thus excessive taxation).[6] [7]

This result may be sensitive to the assumption that profits cannot be taxed and hence there is no cost of capital flight in terms of reduced profit tax income. With only the income tax available, income taxes are not even zero in the standard case of no foreign ownership and full capital mobility. If we assume to the contrary that the government fully taxes profits, the motive for taxing capital in order to extract profit rents from foreigners (as in Huizinga and Nielsen, 1997) is absent. Consequently, there will be less provision of the public good.[8]

[5] This assumes that a change in the capital stock is fully brought about by changes in FDI.

[6] Some researcher find more elastic capital. For example, Gorter and Parikh (2001) estimate an elasticity of -1.3 for the European Union, which would imply a dominating tax competition effect and hence underprovision of the public good.

[7] A MRS smaller than one does not necessarily imply inefficiency because the government can distribute excess revenues to the household. However, there will be an inefficiently high distortion in the saving decision due to excessive capital income taxation if one allows for capital formation.

[8] Alternatively, if due to admininstrative reasons the government can only tax profits and capital income at the same rate, public good provision is determined by $MRS = (1-\mu)/(1+\alpha\varepsilon)$ for $f = k^{\alpha}$ (for the proof see Appendix). The condition for overprovision becomes then $\alpha\,|\varepsilon| < 1$, which implies higher provision of the public good compared to Proposition 1 for $\alpha < 1$.

Proposition 2 *In the case of full profit taxation, the marginal rate of substituion is:*

$$MRS = \frac{(1-\mu)(1-f''k')}{1-f''k'+\varepsilon}. \tag{4}$$

Proof. *Private and public good consumption are given by* $c = (1-\mu)(f'-\tau-r)k + r\overline{k}$ *and* $g = f-(f'-\tau)k$. *With* $\partial c/\partial\tau = (1-\mu)[(f''k'-1)k + (f'-\tau-r)k' = (1-\mu)(f''k'-1)k$ *and* $\partial g/\partial\tau = (1-f''k')k + \tau k'$ *the proposition follows.* ■

In the case of full capital mobility we have $f''k' = 1$ (this is obtained by differentiating the no-arbitrage condition $f'-\tau = t$ with respect to τ). Then $\partial g/\partial\tau < 0$ for all τ and the tax rate will be set to zero (its minimal value). Hence, the standard result from the tax competition literature that a small open economy should not tax capital (Razin and Sadka, 1991) carries through for foreign ownership of both firms and capital. For less than perfect capital mobility the condition for overprovision is given by: $|\varepsilon_{FDI}| < 1-f''k'$ (from rearranging 4). Using $f = k^{\alpha}$, $f'(k) = r+\tau$ and $k' = 1/f''$ this condition can be transformed to $|\varepsilon_{FDI}| < 1-(1-\alpha)\,|\varepsilon_{FDI}|\,\mu(r+\tau)/\tau$. For Hines' consensus elasticity of $\varepsilon_{FDI} = -0.6$, a degree of cross-ownership of $\mu = 0.2$ and a capital share in GDP of $\alpha = 0.3$, the condition implies overprovision of the public good for *capital income* tax rates of higher than 21% (for the conversion between capital and capital income tax rates see the Appendix). Most industrial countries have capital income tax rates well above 21% (the average of major countries is around 37%, see Volkerink and De Haan, 1999), hence the immobility of capital suggests overprovision of the public good also in the case of complete profit taxation.

3 Capital Taxation under Full Financial Integration

A shortcoming of the previous analysis is that it neglects possible dynamic implications of taxation, i.e., a change in the tax rate may have effects on the capital stock beyond the current period. This will be the case if capital that has already been installed in the economy is less flexible than new investment. The current capital stock will then to a certain extent depend on the past capital stock. Heterogeneity of capital induces furthermore an asymmetry in the response of the

capital stock to taxes. The relatively less mobile installed capital can create an incentive for the government to set higher tax rates (at the cost of less investment). In the following we will study capital taxation in a fully dynamic model in which a distinction is made between capital that has already been installed and new capital (investment). We study the benchmark case of full financial integration, which we define by the absence of any costs to cross-border capital movements. Hence new capital is completely mobile. In the presence of country-specific uncertainty to capital and profit income, optimal international risk-pooling requires that all households end up holding only shares in the (fictitious) world portfolio (both in terms of capital and profit income). We again study the case of a small economy, hence its share in the world portfolio is minuscule. Domestic households receive then only a negligible part of their income from domestic sources, implying that domestic firms and domestically invested capital are effectively held by foreigners ($\mu = 1$ in terms of the preceding section's notation).

Assume that capital depreciates at the rate $\delta > 0$. There is further a proportional cost γ ($0 \leq \gamma \leq 1$) of relocating installed capital. This cost is interpreted in a broad sense. It comprises, among others, installation and transportation costs, the loss of location specific capital (such as investment in immobile human capital) and information costs. All of these costs are not directly related to *cross-border* mobility and will therefore remain under perfect financial integration. There are infinitely many periods in the model. In the beginning of each period the government sets the tax rate τ on capital taking the world interest rate as given. After, the domestic (representative) household decides on how much of its endowment to invest at the world interest rate r and how much to consume, similarly, foreign investors decide how much capital to invest in the country. Maximization of returns (by foreign investors) requires that the returns on domestic investment are equal an investment at the world capital market at rate r as long as the fixedness of installed capital ($\gamma > 0$) is not binding. Households maximize life time utility by allocating their period endowment between consumption c_t and investment at the world capital market ($b_t - b_{t-1}$) at rate r:

$$\max_{\{b_t\}} \sum_{t=0}^{\infty} \beta^t u(c_t), \text{ s.t. } c_t + (b_t - b_{t-1}) = f(\overline{k}) - rf(\overline{k}) + rb_{t-1} \tag{5}$$

where $f(\overline{k}) - rf(\overline{k})$ is their (fixed) foreign profit income from the world portfolio. Note that domestic consumption does not depend on the domestic tax rate. We assume further $(1+r)\beta = 1$, which is consistent with the world economy being in steady state. It follows from the household's first order condition that b_t and c_t are constant. The government levies a tax τ on capital. There is further an exogenously given share υ of the firm's profits that are taxed. The tax revenue in period t is then $h_t = \upsilon(f(k_t) - f'(k_t)k_t) + \tau k_t = \upsilon f(k_t) + (\tau - \upsilon f'(k_t))k_t$. The government maximizes the utility of the domestic household *at each* $T \geq 0$:

$$\begin{aligned} & \max_{\{\tau_j\}_{j\geq T}} \sum_{t=T}^{\infty} \beta^t (u(c_t) + v(g_t)), \qquad (6) \\ \text{s.t. } g_t + b_{g,t} - b_{g,t-1} &= \upsilon f(k_t) + (\tau - \upsilon f'(k_t))k_t + r b_{g,t-1}, \text{ where } k_t = k_t(\{\tau_j\}_{j\leq t}) \end{aligned}$$

i.e., the government cannot commit and faces a typical time-inconsistency problem: a tax rate announced in earlier periods may not be optimal later on. $b_{g,t}$ denotes government saving at the world capital market. $k_t(\{\tau_j\}_{j\leq t})$ is the countries' capital stock after a history of tax rates $\{\tau_j\}_{j\leq t}$ and is a shortcut for writing $k_t(\{\tau^e_{T,j}\}_{j\geq t})$, where $\tau^e_{T,t}$ are investor's beliefs at time T about the tax in τ and are a function of the entire history of taxes, i.e., $\tau^e_{T,t} = \tau^e_{T,t}(\{\tau_j\}_{j\leq T})$. Atomistic foreign investors take government actions and the domestic capital stock as given when making their decisions. Return maximization requires that at each T:

$$\sum_{t=T}^{\infty} \beta^{t-T+1}(f'(k_t(\tau^e_{T,t})) - \tau^e_{T,t} - \delta) \leq 1 \qquad (7)$$

$$\sum_{t=T}^{\infty} \beta^{t-T+1}(f'(k_t(\tau^e_{T,t})) - \tau^e_{T,t} - \delta) \geq 1 - \gamma \qquad (8)$$

Condition (7) states that the present discounted value of after-tax returns on investment in domestic capital cannot be larger than one, otherwise investors could increase their return by shifting capital from the world capital market into domestic capital. If new investment takes place in T, i.e., $k_T > k_{T-1}(1-\delta)$, then (7) holds with equality. Condition (8) requires that the after-tax returns have to be at least the value of capital net of costs γ of moving capital.[9] Lastly, in order to form an equilibrium, beliefs have to be fulfilled: $\tau_t = \tau^e_{s,t}$ for all $s, t \geq 0$ and $s \leq t$.

[9] Condition (8) suggests that for portfolio investment the parameter γ is one. This is because even so investors may trade their investment shares among themselves, this does not affect the amount amount of capital invested

We are first interested in the equilibrium taxes that would prevail in the case of fully flexible capital ($\gamma = 0$). Since the domestic tax does not influence private consumption domestically, the government maximizes $\sum_{t=T}^{\infty} \beta^t v(g_t)$. Because the interest rate corresponds to the rate of time preference, i.e., $(1+r)\beta = 1$, and the government can save and borrow at r, it will simply maximize the sum of revenues discounted at the rate of time preference $\sum_{t=T}^{\infty} \beta^t h_t$ and smooth public expenditure using the world capital market whenever necessary. For $\gamma = 0$ we have from equation (8) that equation (7) holds with equality, hence the no-arbitrage condition $f'_t - \tau_t - \delta = r$ is fulfilled in each period. The government's maximization problem reduces then to maximizing $h_t = \upsilon f(k_t) + (\tau - \upsilon f'(k_t))k_t$ subject to $f'_t - \tau_t - \delta = r$. This is a static problem and we can drop the time subscripts. Throughout the analysis we further assume that the production function is given by $f(k) = k^\alpha$

Proposition 3 *The equilibrium capital tax rate under perfectly mobile capital ($\gamma = 0$) is*

$$\tau^* = \frac{(r+d)(1-\upsilon)(1-\alpha)}{1-(1-\upsilon)(1-\alpha)}$$

Proof. *The government's FOC is: $\partial h/\partial \tau = k - \upsilon f'' k' k + \tau^* k' = 0$. Differencing the no-arbitrage condition wrt. τ yields $f'' k' = 1$, substituting for k' in the FOC and rearranging gives: $\tau^* = -(1-\upsilon) f'' k$. With $f'' k = -\alpha(1-\alpha)k^{\alpha-1} = -(1-\alpha)f' = -(1-\alpha)(r+\tau^*+\delta)$ the proposition follows.* ■

This transfers into a *capital income* tax rate of $\tau_{inc} = (1-\alpha)(1-\upsilon)$ (for the conversion between capital and capital income tax rates see Appendix). The extent of profit taxation υ lowers the equilibrium capital income tax rate because an increase in τ_{inc} reduces the capital stock and.lowers profits (and thus government revenues if $\upsilon > 0$). For $\upsilon = 1$ we obtain the standard tax competition result of zero taxes on capital. Figure 1 shows the equilibrium capital income tax rates as a function of υ for $\alpha = 0.3$ (which corresponds to a capital income share of GDP of 0.3). In the following we assume that, due to administrative restrictions, the government

in the country. Moreover, with efficient markets the price of an asset will equal its present discounted after-tax returns, hence an investor has never an incentive to sell an asset.

has to tax profits and capital income at the same rate in equilibrium. It follows then from $\tau_{inc} = (1-\alpha)(1-\upsilon) = (1-\alpha)(1-\tau_{inc})$ that $\tau_{inc} = (1-\alpha)/(2-\alpha)$.[10] The equilibrium tax depends on α (which is positively related to the return elasticity of capital, $\partial k/\partial f'/(k/f') = (1/f'')/(k/f') = 1/(1-\alpha)$) in the usual way: a lower α reduces the sensitivity of the capital stock with respect to taxes. This reduces the costs of taxation in terms of a lower tax base, which in turn leads to higher taxes. Figure 2(a) depicts τ_{inc} as a function of α for $\tau_{inc} = \upsilon$. For $\alpha = 0.3$ we get $\tau_{inc} = 41\%$, which is a bit above current average effective tax ratios (about 35% for major industrial countries, Volkerink and de Haan, 1999 and Devereux, Griffith and Klemm, 2001).

Next, we derive minimum requirements on tax rates that have to prevail in an equilibrium with $\gamma > 0$ such that the government has no incentive to exploit the immobility of the *existing* capital by raising the tax rate.[11] An exploitation of existing capital is given if equation (7) is not binding. The minimum taxes can thus be interpreted as the restriction on equilibrium tax rates imposed by the fixedness of installed capital. We consider two different equilibria called *no punishment* and *full punishment* equilibrium, respectively. These equilibria are obtained by restricting investors' beliefs about future taxes after the government has deviated from the equilibrium tax (off-equilibrium beliefs). In the no punishment case, a deviation does not have any implications for investors' beliefs about future taxation: we assume that whatever tax rate the government sets in the current period, investors expect the government to return to the equilibrium tax in the next period. In the full punishment equilibrium, investors believe that the government will completely tax away future returns after a deviation from the equilibrium. The motivation for picking these equilibria is the following. By having no dynamic implications at all (the no punishment case), deviations from the equilibrium are made most attractive and require a high minimum equilibrium tax. On the other hand, choosing strong consequences of deviations (full punishment) gives low incentives for the government to deviate and results in a

[10] Note that with this definition the government does not take into account that if it raises τ the profit tax υ is also increased. If this were the case, the incentive to tax were even higher.

[11] A complete characterization of the equilibria is beyond the scope of the paper and is given the multiplicity of equilibria not instructive.

low minium tax. Comparison of both equilibria gives us then information about the sensitivity of the minimum tax rates with respect to investor's beliefs.

No Punishment Case. Consider an equilibrium with tax rate τ^* and capital stock k^*. We restrict us to deviations from τ^* that last only one period. Let a deviation from the equilibrium tax rate in the current period be τ ($\tau \neq \tau^*$) and the new capital stock k. Since beliefs are not history dependent the capital stock k^* is again achieved in the next period (after the government sets the tax rate back to τ^*). This means that one has to consider only the change in tax revenues in the current period in order to decide whether a deviation is worthwhile. We consider only increases in the tax rate sufficiently high such that no new investment takes place (otherwise equation 7 holds with equality and the fixedness of installed capital is not binding). For the same reason deviations should not result in capital leaving the country.[12] With the capital stock in the deviation period then being $k = k^*(1-\delta)$, the latter restriction writes:

$$f'(k^*(1-\delta)) - \tau - \delta + 1 \geq (1-\gamma)(1+r) \tag{9}$$

Equation (9) ensures that an investor cannot achieve a higher return by moving capital out of the country and investing at the world interest rate. In order for τ^* to constitute an equilibrium, the deviation to τ should not result in higher revenue in the period:

$$\upsilon f(k^*(1-\delta)) - (\tau - \upsilon f'(k^*(1-\delta))k^*(1-\delta) \leq \upsilon f(k^*) - (\tau^* - \upsilon f'(k^*))k^* \tag{10}$$

Proposition 4 *In the no punishment case, the minimum tax is:*

$$\underline{\tau}^* = \frac{(r+\delta)\Phi + (1-\delta)^2 - (1-\gamma)(1+r)(1-\delta)}{1-\Phi}, \text{ where } \Phi := (1-\delta)^a(\upsilon/\alpha - \upsilon + 1) - \upsilon/\alpha + \upsilon$$

[12] Consider to the contrary that the government deviates with a tax rate $\overline{\tau}$ sufficiently high that capital leaves the country. The new no-arbitrage condition writes then $f' - \tau - \delta + 1 = (1-\gamma)(1+r)$. Differentiating with respect to τ gives the same restriction ($k' = 1/f''$) as in the flexible case. Since $\partial h/\partial\tau = \tau k' + k - \upsilon f'' k' k = \tau k' + (1-\upsilon)k$ and $\overline{k} < k^*$, $\overline{\tau} > \tau^*$ and $\overline{k}' = k^{*\prime} < 0$, it follows that such a deviation can only be wortwhile if τ^* is not optimal in the flexible case (i.e. $h'(\tau^*) > 0$).

Proof. *For the most profitable deviation, (9) will hold with equality. Solving (9) for τ, inserting in (10) yields $\tau^* \geq f'(k^*)\Phi + (1-\delta)^2 - (1-\gamma)(1+r)(1-\delta)$. Using $f'(k^*) = r + \tau^* + \delta$ and solving again for τ^* gives the proposition.* ■

For the parameters $\alpha = 0.3$, a real interest rate of $r = 0.05$ (which corresponds to a discount rate $\beta = 1/(1+r) \approx 0.95$), a rate of depreciation of $\delta = 0.07$ and proportional cost γ of relocating installed capital of 15%, Figure 1 present the minimum capital income tax rates as a function of υ. $\underline{\tau}_{inc}$ is relative insensitive to the extent of profit taxation, for $\upsilon = 0$ and $\upsilon = 1$ we get $\underline{\tau}_{inc} = 98\%$ and $\underline{\tau}_{inc} = 94\%$, respectively. If the profit tax rate is restricted to be τ_{inc} then $\underline{\tau}_{inc} = 95\%$. Tables 2(a)-2(d) depict the sensitivity of $\underline{\tau}_{inc}$ (for $\underline{\tau}_{inc} = \upsilon$) for the various parameters. It can be seen that the capital income tax rate is relative insensitive to plausible variations in α, the discount factor β and the rate of depreciation δ and stays well above the equilibrium tax rate from the flexible case (41% from proposition 5). The intuition for the relation between the minimum tax in these parameters is as follows. An increase in α increases the sensitivity of the capital stock to taxes (as in proposition 3) and reduces minimum taxes. The influence of β comes through the relation between β and the interest rate. An increase in β reduces the steady-state interest rate r, which ceteris paribus increases the equilibrium marginal productivity of capital f'. Both changes in r and f' affect the no-capital-flight and the no-deviation-condition (equation 9 and 10) and lead for our parameter values to an increase in the minimum tax rate. Finally, an increase in δ directly reduces the incentives to deviate from an equilibrium by increasing the depreciation of the capital stock (and hence the tax base).

From Figure 2(c) it can be seen that the minimum tax rate becomes sensitive to γ for values of γ smaller than $5 - 10\%$. However it falls below the equilibrium income tax rate for flexible capital only if $\gamma < 0.05\%$ (for $\gamma = 0$: $\underline{\tau}_{inc} \approx 40\%$). Hence, the fixedness of capital is always binding (relative to the flexible capital case) for plausible parameter values. Moreover, very high capital income tax rates are implied (larger than 90%) if the cost of relocating installed capital is not too small (i.e., larger than 7%). The intuition for the relation between γ and the minimum tax is straightforward: an increase in the costs of relocating capital increases the maximum tax

for which the no-capital-flight-condition (equation 9) is still fulfilled and thus makes deviations more attractive.

Full Punishment Case. According to investors' beliefs in the full punishment case, the government will fully tax future returns after a deviation from τ^*. Hence, for $\gamma > 0$ it is always beneficial for investors to shift the complete capital stock in the period abroad. Taking into account that the capital stock in the periods after a deviation will then be zero, the government will set the deviation tax τ to maximally exploit the existing capital stock ($= k^*(1-\delta)$) in the current period. The restriction the government faces in doing so is that the after tax return on capital plus the value of capital shifted abroad in the next period has to be at least the value of capital shifted abroad now and invested at the world interest rate (no-capital-flight condition). This restriction writes:

$$[f'(k^*(1-\delta)) - \tau + (1-\gamma)(1-\delta)](1-\delta)k^* \geq (1-\gamma)(1+r)(1-\delta)k^* \text{ for all } T \geq 0 \qquad (11)$$

The condition for the non-profitability of deviations from the equilibrium is:

$$\upsilon f(k^*(1-\delta)) + (\tau - \upsilon f'(k^*(1-\delta)))k^*(1-\delta) \leq \sum_{t=T}^{\infty} \beta^{t-T} \upsilon f(k^*) + (\tau - \upsilon f'(k^*))k^* \qquad (12)$$

Proposition 5 *In the full punishment case, the minimum tax is given by:*

$$\begin{aligned} \underline{\tau}^* &= \frac{(r+\delta)\Theta - (1-\beta)(1-\gamma)(r-\delta)(1-\delta)}{1-\Theta} \\ \textit{where } \Theta &: = (1-\delta)^{\alpha}(1-\beta)(\upsilon/\alpha - \upsilon + 1) - \upsilon/\alpha + \upsilon \end{aligned}$$

Proof. Again, for the most profitable deviation, (11) will hold with equality. Using (11) to substitute τ in (12) and applying $f'(k^*) = r + \tau^* + \delta$ one obtains the proposition. ■

With the parameters from above, $\underline{\tau}_{inc} = 5\%$ for $\upsilon = 0$ and $\underline{\tau}_{inc} = 2\%$ for $\upsilon = \underline{\tau}_{inc}$ (Figure 1). This values are way below the equilibrium tax in the flexible case (41%). This is also true for all the variations in parameters considered above for the no-punishment case: the minimum tax rate never exceed 3%. Hence, if one assumes that the equilibrium tax for $\gamma > 0$ does not fall below the equilibrium tax for the flexible case, the fixedness of installed capital is not binding. Together with the results from the no punishment case, our results suggest that financial integration will

ultimately *not* decrease capital taxes compared to current levels. Depending on equilibrium selection, the level of capital taxes may even rise drastically.

4 Empirical Evidence on the Tax Exportation Effect

In the following we want to study whether an increase in foreign ownership is associated with higher corporate taxes. The preceding analysis focused hereby on capital income taxation. Propositions (1) and (2) predict that a higher share of foreign ownership of both firms and capital (μ) increases the equilibrium capital income tax rate. However, for profit taxes are the incentives for taxation equally increased in the presence of foreign ownership. To see this start from the assumptions of proposition (1) and moreover assume that the government has a pure profit tax τ_π available. A marginal increase in the profit tax decreases domestic private income by $(1-\mu)\pi$ and increases tax revenues by π (where π is the domestic firm's profit). For the equilibrium profit tax we have then $MRS = -(\partial c/\partial \tau_\pi)/(\partial g/\partial \tau_\pi) = 1-\mu$, which is decreasing in μ.[13] Since it is in empirical work difficult to separate between pure profits and capital income, we concentrate on the effect of foreign ownership on the tax rate on the income of corporations and interpret this tax rate τ as applying to profits *and* capital income.[14] This is also consistent with our empirical measures of foreign ownership, which comprises claims to both capital income and profits.

There are several difficulties involved in estimating a relationship between μ and τ. One is that of omitted factors that determine corporate taxes and are possibly correlated with foreign ownership. In particular, an increase in capital mobility lowers taxes through an increased tax base effect but also affects μ because of lower cost of diversification. A time series regression is therefore likely to understate (or even reverse) the influence of μ on τ if capital mobility increases

[13] There are no tax base effects since firm's are immobile. In a more realistic model, increased profit taxes may result in a relocation of business activities in a similar vein as capital income taxes affect marginal investment. Nevertheless, the cost of additional profit taxes in terms of higher domestic tax burden will ceteris paribus decrease as foreign ownership increases.

[14] As noted earlier in Section 2, $MRS = (1-\mu)/(1+\alpha\varepsilon)$ in the presence of combined profit and income tax, hence τ raises with μ.

over time. Moreover, there are likely to be important country-specific effects. For example, capital mobility may differ substantially among countries. It is also known from the literature of optimal taxation that large countries will set higher taxes, this biases the results in a cross-section analysis if country sizes are correlated with foreign ownership shares.

To adequately deal with these issues we run a panel study. Instead of looking at variations across countries, we study U.S.-states. Like countries, these states have general autonomy with respect to their corporate taxation. Analogous to the government of a country, a state government that cares about its residents faces lower costs of taxation if there is investment from outside the state. Choosing the U.S. has (despite the excellent availability of data) the advantage that although capital mobility varies over time, it is fair to assume that at a given point of time the capital mobility for each state is the same. We can then treat changes in capital mobility as a common time-specific effect.

An additional complication arises from simultaneity. This is because tax rates influence the level of capital and profit activities in the country. To the extent that there is a heterogeneous response by foreign and domestic owners, there will be a reverse causality from τ to μ. If for example foreign investment is more sensitive (as usually assumed) an increase in τ will lower foreign ownership μ and the influence of μ on τ will not be identified in the regression of τ on μ. It is therefore necessary to test for a causal effect of foreign ownership on taxes.

4.1 The Data

The Bureau of Economic Analysis (BEA) conducts yearly surveys of foreign affiliates in the U.S., part of these data are on the state level. A foreign affiliate is a company which is to more than 10% foreign owned. A widely used measure for foreign investment (as a stock variable) is PPE, the book value of real productive assets of foreign-owned affiliates. It differs from FDI in two important respects. First, it does not include pure financial investment such as debt financing. Second, it does not correct for partial foreign ownership of a corporation. Consistent with our theory, PPE measures both ownership of capital and profits: acquisition of a firm by a foreigner

will increase PPE as an increase in the capital stock of a foreign affiliate will do. Beside PPE we use as a second proxy of foreign ownership the share of employees that are employed in foreign affiliates. The latter has the advantage that it is a better proxy for the tax base (the tax exporting motive is determined by the share of the tax base owned by foreigners) in case of human-capital intensive industries.

A shortcoming of the data is that it measures foreign ownership from outside the U.S., i.e., it does not include cross-state ownership (the tax exporting motive depends on the *total* ownership share from outside the state). Foreign investment is probably highly correlated with cross-state investment (on the state level), so the coefficient in the regression of τ on foreign ownership will measure the combined effect of foreign ownership and cross-state ownership.

Our sample runs from 1977 to 1998 (22 years). Figure 3(a) shows the development of the ratio of employment of affiliates to total employment over time (EMPLRATIO), which more than triples during the sample (from roughly 1% to 3.5%). Other measures that are more closely related to the tax base suggest a somewhat higher influence of affiliates. The affiliates share in total profits was roughly 7% per cent in 1998 (1977: 3%) and federal corporate income taxes collected from affiliates totalled at 14% (1977: 6%). In any case, there was a significant increase in foreign ownership in the sample period. In the presence of the tax exporting effect, this should have affected the corporate taxes.

Since we do not exclusively focus on marginal investment decisions, the relevant concept for measuring the tax burden is the *effective average tax rate* (EATR). The EATR is defined as the ratio of the tax burden to the pre-tax income. The EATR has been shown relevant for discrete location decisions (Devereux and Griffith, 2001) and thus for profit locations (but has also been used to proxy marginal tax rates, see Swenson, 1994) . An advantage of the relatively simple to compute and robust EATR is further that it takes into account important aspects of the tax code such as depreciation allowances, tax base changes and investment credits. A disadvantage is that both pre-tax income and the tax burden depend on economic activity, which may be related to foreign ownership and thus create an additional simultaneity.

The literature that studies optimal corporate tax rates in the open economy has almost exclusively focused on the role of corporate income tax rates. However, corporate income taxes do only constitute a part of the total tax burden of corporations. As Desai and Hines (2001) point out, indirect income taxes can influence foreign investment as much as direct income taxes do. This is particularly true since many countries do not allow for foreign tax credits for other than corporate income taxes. The by far most important indirect taxes in the U.S. are the property and the sales tax. To illustrate their effect on after-tax income, consider the following tax rules. Beside an income tax τ (on both profit and capital income), a sales tax τ_s has to be paid on total sales (which are a fraction s of the firm's output $f(k)$) and a property tax τ_p has to be paid on all capital invested in property (assumed to be a share p of total capital). The after tax income is then given by: $[(1-\tau_s s)f(k)-\tau_p pk](1-\tau)$. Obviously, all three taxes reduce after-tax income and thus affect investment decisions. This is confirmed by Desai and Hines' empirical study. They find that indirect taxes have important consequences for the location of profits and capital. For our purpose, we concentrate therefore on the *total* average tax rate for corporations as defined by ratio of the total tax burden (indirect taxes plus corporate income taxes) to the pre-tax income (but do also report estimations for the corporate income tax rate).[15] We compute the tax rates from aggregate data (per state). The corporate income tax revenues are collected from the Statistical Abstract of the U.S., the indirect business taxes are from the national account database compiled by the BEA.[16] It should be noted that in principal all taxes apply to foreign and domestic companies equally.[17]

One may object that due to institutional constraints, the variation in tax rates is too low to be identified in a regression. However, with several tax instruments at hand there are plenty of possibilities to change the tax burden. Alone the top statutory corporate income tax rates did

[15] A potential shortcoming of having such a broad measure of corporate tax revenue is that indirect taxes (i.e., property taxes) apply also to private households.

[16] Indirect business taxes consists to a small part (15%) of federal taxes. We do not correct for this because federal taxation is the same across states.

[17] An important condition for the tax exportation effect is that the government does not discriminate foreign owned income.

change on average 2-3 times per state during the sample period. Moreover, there were major changes in the income tax base.[18] Figure 3(b) presents as a simple measure of the corporate tax burden the corporate income tax revenues as a share of dividends. One can observe a clear downward trend, which has been commonly interpreted as (at least partly) the result of tax competition arising from increased capital mobility. The question is whether this development would have been more pronounced did the increased capital mobility not lead to an increase in foreign ownership at the same time.

Our data consists further of a set of national account data (on the state level): dividends, interest payments, rental income and the compensation for employment (these variable make roughly up for state income). We use further data on employment, population and property income (all of the data is from the BEA). Since we use time dummies in our panel regression, we do not need to include any aggregated (by state) or foreign variables.

We delete from our data set the states without corporate income taxation (Nevada, South Dakota, Texas, Washington, Wyoming). We further exclude Alaska because the reported corporate income tax revenue varies enormously from year to year and the District of Columbia, for which some data was not available. This leaves us with 44 states. Table 1 presents descriptive statistics for corporate income tax revenue (INCTAX), indirect business taxes (INDTAX), employment and PPE of foreign affiliates (F_EMPL and F_PPE).

A relationship between μ and τ can be estimated in a straightforward way with the following equation:

$$\tau_{it} = \alpha_i + \beta\mu_{it} + \gamma_t + \varepsilon_{it} \tag{13}$$

where the indices i and t refer to state and time, respectively, τ_{it} is the average total tax rate, α_i is a state specific fixed effect (for example state size), μ_{it} a measure of foreign ownership and γ_t captures time specific factors that influences taxation. Because capital mobility is assumed to be identical across states, changes in it will be picked up by γ_t. In order to avoid heterogeneity

[18] Nevertheless, due to this institutional constraints the influence of μ on τ is likely to be understated in the regression.

problems, all variables are estimated in logs.

With our data, equation (13) cannot be sensibly estimated. This is because it turns out that the estimation results are quite sensitive to the proxy used for pre-tax income, such as dividends or commercial income (the sum of dividends, rental income and interest income). We therefore take a more flexible approach and use tax revenues as the left hand variable and correct for various proxies for income on the right side (since variables are in logs, adding control variables has a scaling effect on level tax revenues). Further, we do not have appropriate data for total PPE (foreign plus domestically owned). In order to compute the ownership share from the PPE of affiliates, we include absolute PPE of affiliates as explanatory variable and use different income variables to control for total PPE. For the foreign ownership share in employment (EMPLRATIO), we use the ratio of employment in affiliates to total employment. We thus estimate the following modification of (13)

$$taxrev_{it} = \alpha_i + \beta\mu_{it} + \boldsymbol{\gamma}_t + \boldsymbol{\delta}_t \mathbf{I}_{it} + \varepsilon_{it} \tag{14}$$

where $taxrev$ is the tax revenue, μ either foreign ownership or foreign ownership share and $\mathbf{I}$ a set of income variables.

4.2 Results and Interpretation

In a first step we are interested in whether there is any cross-sectional relation between foreign ownership and corporate tax burden. Table 2 reports a regression of the total tax revenue (TOTTAX) on the measures for foreign ownership for 1998, controlling for income variables. The first two columns in Table 2 include the ratio of foreign to total employment (EMPLRATIO) as a measure of foreign ownership, the third and fourth column use the PPE of affiliates (F_PPE). In the first and third column, dividends (DIV) are used to control for the total income, in the second and fourth column interest income (INT), rental income (RENT), and labor compensation (COMP) are added. In all regressions, the coefficient for foreign ownership is positive and significant (although significance declines with the inclusion of more income variables), thus states with higher foreign ownership share have also a higher corporate tax burden. This somewhat surprising

result may stem from an omitted variable bias, i.e., a correlation of state-specific variables with both foreign ownership and taxes. We also report time series regressions of (unweighted) state averages over the sample period (Table 3).The parameter estimate for foreign ownership is positive and significant in all regressions except for column 2, where the parameter for EMPLRATIO is negative and significant.

In order deal with unobserved time and state effects we estimate panel regressions according to equation (14). Table 4 presents the GLS-estimates. Parameter β is significant and positive in the regressions using DIV as control variable (column 1 and 3) for both measures of foreign ownership. When more income variables are added (column 2 and 4), the sign of β reverses.[19] The likely reason for the latter is the reverse causality running from taxation to foreign investment. To address this simultaneity problem, we instrument the measures of foreign ownership by different functional forms of state population (POP) and property income (PROP). Both instruments can be considered as fairly exogenous with respect to corporate taxation. They produce high adjusted R^2's in the first stage regressions, the numbers are 0.82 (0.97) and 0.96 (0.999) for EMPLRATIO and F_PPE, respectively (weighted adjusted R^2's are in parentheses). Table 5 reports regressions with the instrumented foreign ownership variables. The coefficient for foreign ownership is now significant and positive in all regressions, i.e., higher foreign ownership causes higher taxes. Since we obtained partly negative coefficients when we measured correlations between foreign ownership and taxes, this also suggests the presence of reverse causality.[20] In Table 6 we report regressions for corporate income taxation and indirect business taxes separately. Again, in all regressions the coefficient for foreign ownership is positive and significant. The estimated sensitivity for corporate income taxation (INCTAX) with respect to foreign ownership is substantially larger than for the indirect taxes (INDTAX) (about 3-4 times). A possible explanation for that is that corporate income taxes solely relate to corporations and do not cause additional distortions in the private sector (as sale and property taxes do). Consequently they should be more sensitive to changes in

[19] This indicates the earlier mentioned sensitivity of the results with respect to the scaling of the tax revenues.

[20] For the literature that studies the impact of taxation on the location of capital and profits this shows that it is necessary to treat taxes as endogenous. Failing to do so results in non-identification.

the foreign ownership. We further test for robustness by splitting the sample period in two equal periods. The coefficients for foreign ownership are still positive and significant in both sample periods, although slightly insignificant for the second period from 1988-1998 (not reported). We test for possible non-stationarity of the residuals by running a pooled unit root test. The ADF-test firmly rejects the unit root (but unit root tests are not very informative with only 22 years of data). The Durbin-Watson-statistic reports first order auto correlation. We include an AR(1) term in our regression (instead of time dummies),[21] with no qualitative changes in our results.

What can be said about the magnitude of the influence of foreign ownership on taxes? The estimated elasticities from Table 5 for the extensive set of income measures are 0.047 for PPE and 6.7 for the share of employment of affiliates (the latter being a semi-elasticity). The former number implies that an increase in PPE of foreign affiliates by one percentage, everything else being constant, increases corporate taxes by 0.047% (after controlling for corporate income). An assumed (but realistic) increase in foreign PPE by 100% over the sample period would than have caused an increase in state corporate taxes by 4.7%. The foreign employment share has risen by 2.5 percentage *points* over the sample period, this implies according to a semi-elasticity of 6.7 a rise in the tax burden by 16.75% ($= 6.7 \cdot 2.5$). These numbers are small compared to the drop of average taxes during the sample period (50%) but are substantial considering that we are far away from full diversification (which would imply a share of foreign ownership close to one for a small country). Assuming a constant elasticity, an increase in the foreign employment share by 15 percentage points would for example imply a doubling of the tax burden.[22]

5 Conclusions

This paper has studied optimal capital taxation under cross-ownership of firms and capital and imperfectly mobile capital. Both our theoretic and empirical analysis indicate that the tax exporting effect is relatively important (when compared with the tax competition effect). This

[21] Inclusion of both results in near-collinearity of the regressors.

[22] This number should be taken with some caution because we probably measure the combined effect of foreign ownership and cross-state ownership. Moreover, elasticities are unlikely to remain constant for such large changes.

is in contrast to the previous literature that has generally emphasized tax competition. The findings are consistent with a the relatively high level of corporate taxation in the presence of a considerable degree of financial integration. Our analysis moreover suggests that further reductions in frictions to cross-border capital movements lead actually to an increase in capital taxes, which is diametrical to the common concern that further integration undermines the ability of the government to raise revenues.

There are obvious implications for policy. If the tax exportation effect is dominating the tax competition effect, capital taxes will be too high and not too low from a global welfare perspective and tax competition becomes welfare improving. Accordingly, international tax coordination should then aim at lowering taxes and not at setting minimum taxes. Our analysis lays open the importance of investors' beliefs for optimal taxation in a financially integrated world. The multiplicity of equilibria that stems from the time-inconsistency of government actions (the government wishes to announce low tax rates in order to lure capital into the country but has an incentive to tax capital heavily once investment has taken place) introduces an additional role for tax coordination: international agreements can help to coordinate on favorable equilibria. Governments may also gain by using commitment devices to reduce the time inconsistency (such as tax holidays).[23] More general, as foreign ownership increases (and thus the time inconsistency becomes more severe) the *credibility of fiscal policy* will become crucial for countries' welfare, both in terms of equilibria selection and in reducing time inconsistency. This seems an interesting area for further research. However, while unilateral policies to reduce the time inconsistency can actually improve domestic welfare, they may not be beneficial on the world level. This is because they allow governments to compete more effectively for capital, which can lead to a domination of the tax competition effect and result inefficiently low taxes.

[23] Multinational firms can themselve protect against excessive taxation by building excess capacity abroad (Janeba, 2000).

6 Appendix

Public good provision for common profit and capital income tax.

If τ applies to profits and income, then $c = (1-\mu)[(1-\tau)(f-f'k)+(1-\tau)f'k]+r(\overline{k}-(1-\mu)k) = (1-\mu)[(1-\tau)f-rk]+r\overline{k}$, $g = \tau f$, $\partial c/\partial\tau = (1-\mu)[-f+(1-\tau)f'k'-rk'] = -(1-\mu)f$ for $r = (1-\tau)f'$ (no-arbitrage condition), $\partial g/\partial\tau = f + \tau f'k' \Rightarrow MRS = (1-\mu)f/(f+\tau f'k') = (1-\mu)/(1+\alpha\varepsilon)$ (with $f = k^\alpha$). ■

Conversion between capital and capital income tax. Let η the tax rate on capital returns. Then $f'(1-\eta)-\delta = r \Longrightarrow \eta = 1-(r+\delta)/f'$ (for section 2 set $\delta = 0$). With $f' = r+\tau+\delta$ the conversion from τ to η is given by $\eta = \tau/(r+\delta+\tau)$. ■

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Table 1: Summary Statistics

	INCTAX	INDTAX	EMPLRATIO	F_PPE
Mean	454.29	8149.27	0.03	8307.00
Std. Dev.	746.01	10586.21	0.02	12187.06
Observations	968.00	968.00	968.00	968.00
Cross sections	44.00	44.00	44.00	44.00

Table 2: Cross-Sectional Relation between Total Corporate Tax Burden and Foreign Ownership, 1998

Variable	(1)	(2)	(3)	(4)
CONST	-5.4676170	-3.6739270	-4.2354400	-3.4950720
	(0.01843)	(0.240776)	(0.030638)	(0.066349)
EMPLRATIO	5.6537670	1.1444960		
	(0.210673)	(0.673361)		
F_PPE			0.2521510	0.0817620
			(0.003613)	(0.014569)
DIV	0.937190	0.0802720	0.7165800	0.0743330
	(0.000931)	(0.030115)	(0.004129)	(0.013725)
RENT		0.2286460		0.1712930
		(0.023746)		(0.017127)
INT		0.1600760		0.1830580
		(0.031064)		(0.015554)
COMP		0.5074210		0.4745450
		(0.0438)		(0.037719)
Unweighted Adjusted R-squared	0.99	0.98	0.97	0.98

Notes: Dependent Variable is TOTTAX, Estimation method is GLS, White heteroskedasticity-consistent standard errors in parentheses

Table 3: Relation between (unweighted) Average Corporate Tax Burden and Foreign Ownership, 1977-1999

Variable	(1)	(2)	(3)	(4)
CONST	0.4319800 (0.066516)	-2.2617200 (0.063075)	1.1965390 (0.060264)	-1.4898180 (0.141245)
EMPLRATIOMEAN	12.824220 (0.489642)	-0.4388580 (0.212424)		
F_PPEMEAN			0.2554510 (0.004846)	0.0462760 (0.008667)
DIVMEAN	0.5396230 (0.005453)	-0.0691520 (0.011496)	0.3618170 (0.006898)	-0.0753130 (0.010498)
RENTMEAN		-0.0077260 (0.008096)		-0.0170690 (0.004796)
INTMEAN		-0.0681620 (0.003753)		-0.1143080 (0.010259)
COMPMEAN		1.2381090 (0.020693)		1.2163530 (0.021618)
Unweighted Adjusted R-squared	0.9853210	0.9975880	0.9928070	0.9976470

Notes: Dependent Variable is TOTTAX, Estimation Method: GLS, White heteroskedasticity-consistent standard errors in parentheses

Table 4: Relation between Corporate Tax Burden and Foreign Ownership 1977-1998

Variable	(1)	(2)	(3)	(4)
EMPLRATIO	1.4685870 (0.407194)	-0.6615090 (0.245811)		
F_PPE			0.0525600 (0.005677)	-0.0122940 (0.005161)
DIV	0.2144900 (0.011309)	-0.0579390 (0.013121)	0.2161190 (0.010832)	-0.0629450 (0.012802)
RENT		0.0296840 (0.008697)		0.0281310 (0.008884)
INT		0.1142710 (0.024307)		0.1009330 (0.02528)
COMP		0.8074270 (0.037373)		0.8157850 0.0370060
Unweighted Adjusted R-squared	0.9904910	0.9951310	0.9906920	0.9950810

Notes: Dependent Variable is TOTTAX, Estimation Method: GLS, White heteroskedasticity-consistent standard errors in parenthesis, fixed effects and time effects not reported

Table 5: Causal Effect of Foreign Ownership on the Corporate Tax Burden (Panel) 1977-1998

Variable	(1)	(2)	(3)	(4)
FIT_EMPLRATIO	32.479540 (1.191873)	6.6593040 (1.687328)		
FIT_F_PPE			0.2785670 (0.010444)	0.0474270 (0.014615)
DIV	0.2296550 (0.011224)	-0.0312720 (0.013448)	0.2419410 (0.011136)	-0.0346030 (0.013359)
RENT		0.0200900 (0.007506)		0.0233700 (0.0083020)
INT		0.0955110 (0.024591)		0.0964190 (0.024612)
COMP		0.7178810 (0.033355)		0.7359580 (0.033399)
Unweighted Adjusted R-squared	0.9940730	0.9952210	0.9938380	0.9951760

Notes: Dependent Variable is TOTTAX, Estimation Method: GLS, White heteroskedasticity-consistent standard errors in parenthesis, time dummies and fixed effects not reported

Table 6: Causal Effect of Foreign Ownership on Indirect and Direct Corporate Tax Burden (Panel) 1977-1998

Variable	INCTAX	INCTAX	INDTAX	INDTAX
EMPLRATIO	23.246410		6.7208850	
	(3.940697)		(1.523574)	
F_PPE		0.1892060		0.0493690
		(0.033375)		(0.012738)
DIV	0.1582090	0.1593120	0.0294310	0.0257440
	(0.049623)	(0.04944)	(0.012586)	(0.012628)
RENT	-0.0971100	-0.0940540	0.0216240	0.0242050
	(0.021158)	(0.021183)	(0.007628)	(0.00823)
INT	0.0043620	0.0033920	0.1426010	0.1435270
	(0.076579)	(0.076178)	(0.025591)	(0.025662)
COMP	0.7411210	0.7884740	0.7169850	0.7351620
	(0.125066)	(0.120315)	(0.031242)	(0.031259)
Unweighted Adjusted R-squared	0.9648960	0.9648200	0.9948380	0.9948030

Notes: Estimation Method: GLS, White heteroskedasticity-consistent standard errors in parentheses, time dummies and fixed effects not reported

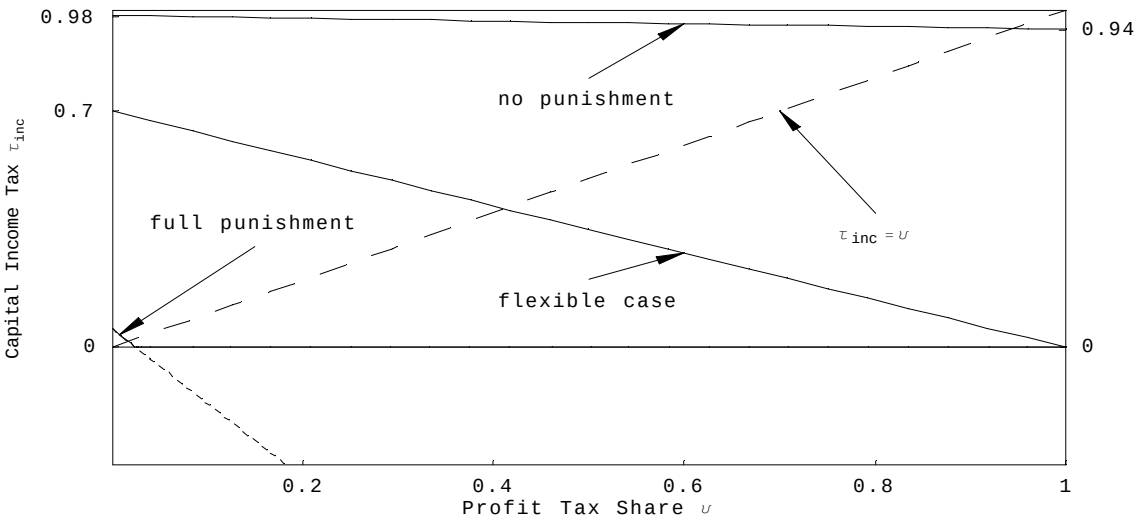

Figure 1: (Minimum) Capital Income Tax τ_{inc} and Extent of Profit Taxation υ

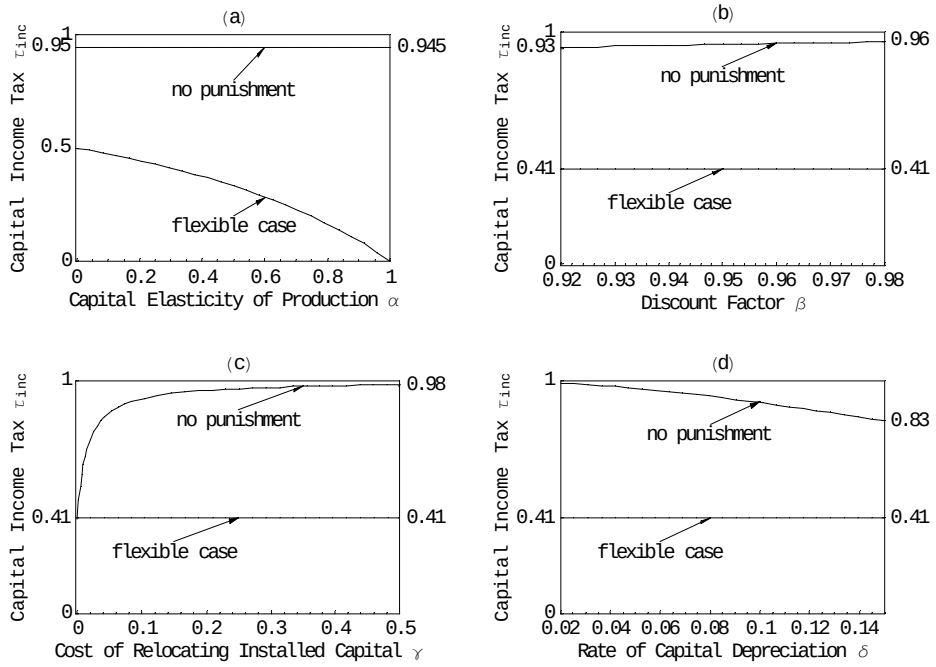

Figure 2: Sensitivity of the (Minimum) Capital Income Tax τ_{inc}

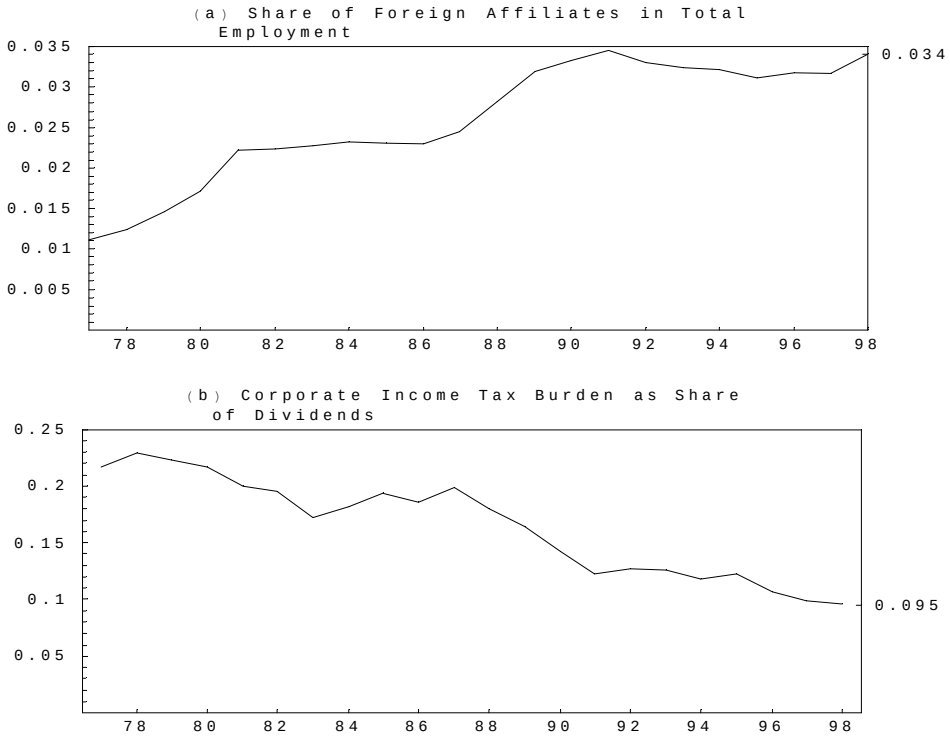

Figure 3: Foreign Ownership and Corporate Tax Burden 1977-1998