Why the fiscal barriers protecting us from tax havens are missing

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Abstract

We develop a tax competition model to explain the fact that most OECD-countries do not employ fiscal barriers to tax havens. Essentially, we argue that liberalizing capital flows between countries enables multinational corporations to circumvent fiscal barriers to tax havens by means of international tax planning. This, in turn, induces countries to reduce barriers below optimal levels.

In our model, countries have access to two tax instruments: A corporate tax and a withholding tax on cross-border debt that serves to reduce the tax benefits of profit shifting. Firms operate in one country but may set up finance entities in other countries that allow them to shift profits to tax havens and reduce global tax liabilities. In particular, firms may shift profits to tax havens either directly or through conduit entities in third countries. When countries are unconstrained, they optimally set the withholding tax rate high enough to eliminate all profit shifting to tax havens. When a group of countries create a common capital market by removing withholding taxes on cross-border debt within the common capital market (e.g. like the EU), it triggers a harmful tax competition where countries reduce fiscal barriers to tax havens in order to limit the use of conduit structures by domestic firms and to attract conduite entities of foreign firms.

Keywords: Tax competition, profit shifting, tax havens

1 Introduction

Mulitnational corporations (MNCs) face strong incentives to reduce global tax liabilities by shifting profits from high-tax jurisdictions to low-tax jurisdictions. A simple tax planning technique uses intra-group debt to shift profits between jurisdictions. Essentially, MNCs inject equity into entities in low-tax countries which, in turn, issue debt to entities in high-tax countries. This generates a net global tax saving equal to the interest payments multiplied by the difference between the high and the low tax rate.

There is relatively strong empirical evidence that MNCs actually use such finance structures. Desai et al. (2004) consider the debt–asset ratio of foreign affiliates of US MNCs and estimate a positive elasticity with respect to the tax rate facing the foreign affiliate. In another recent study, Huizinga et al. (2007) use data for the financial structure of European multinationals and their subsidiaries to show that increases in the corporate tax rate in one country are associated with higher debt-asset ratios in that country and lower debt-asset ratios in other countries. Both studies are consistent with the presumption that MNCs allocate financial assets and liabilities in ways that minimize global tax payments.

As pointed out by Mintz (2004), withholding taxes on interest payments to foreign entities reduce the tax savings of finance structures. When the withholding tax rate equal the statutory corporate tax rate, firms have no incentive to shift profits. Hence, countries have access to a tax instrument capable of eliminating profit shifting altogether.

It is important to realize, however, that whereas withholding taxes on interest payments to foreign entities offer protection against profit shifting, they also have an efficiency cost in terms of suboptimal market integration since, clearly, wihholding taxes on cross-border interest flows leave MNCs at a disadvantage compared to national firms. It follows that withholding taxes should balance two concerns: Protection against profit shifting and economic efficiency.

The efficiency cost of not achieving market integration with tax havens is likely to be negligible considering their relative smallness and modest endowments of natural resources (see Dharmapala and Hines, 2006). Conversely, the loss of tax base by allowing free interest flows to trading partners is likely to be limited because countries typically have corporate tax rates at broadly similar levels. This seems to suggest that countries should prefer high fiscal barriers to tax havens and low or no fiscal barriers to trading partners.[1]

Table 1 shows current withholding taxes on interest payments to foreign group entities.[2] The table reveals that recent efforts to achieve cross-border market integration have driven withholding taxes on interest flows between OECD-countries down to very low levels. Most notably, an EU Directive abolished withholding taxes on interest payments between related companies within the EU as from 2004.[3] More surprisingly, withholding tax rates on interest

[1] There are at least two qualifications to our tentative conclusion that countries necessarily prefer high fiscal barriers to tax havens and no barriers to other countries. Hong and Smart (2007) show that profit shifting by MNCs allows countries to establish a *de facto* differentiated corporate tax system with mobile MNCs facing a lower effective tax rate than immobile domestic firms, which is potentially welfare-improving from the point of view of an individual country. Johannesen (2008) shows that from the point of view of a group of countries, profit shifting to tax havens can improve welfare by reducing tax competition for shifted profits among countries.

[2] The differentiated withholding tax structure is typically created by a high rate stipulated by domestic law and a set of bilateral tax treaties and international agreements that reduce the rates on flows to selected countries. Generally, countries do not conclude treaties with tax havens and the withholding tax rate set out in the domestic law therefore applies to interest payments to tax haven entities.

[3] Council Directive 2003/49/EC of 3 June 2003. Note that Portugal and Greece were

flows to tax havens are considerably lower than corporate tax rates and many countries do not tax interest flows altogether.[4]

In the present paper, we seek to explain this somewhat puzzling pattern of low fiscal barriers to tax havens. We argue that the liberalisation of interest flows between OECD-countries has increased the scope for conduit structures whereby a firm circumvents fiscal barriers by financing its activities with a loan from a conduit entity in another country, which is, in turn, financed by a loan from a tax haven entity.[5] We show that the use of conduit finance structures may trigger a tax competition dynamics where countries dismantle fiscal barriers to tax havens to limit the erosion of the domestic tax base through conduit finance structures and attract foreign tax base in the form of conduit entities.

The main contributions of the paper are the following: Firstly, we take an important step towards a better understanding of MNC behaviour by explicitly modelling the decision to set up a more sophisticated finance structure than the simple structure with a tax haven finance subsidiary. In particular, we highlight the importance of conduit finance structures, which have largely been neglected in the public finance literature.[6] Secondly, we illustrate a more general point, namely that the rise in international tax planning may be seen as an endogenous response by MNCs to liberalizations of capital flows between OECD-countries. Arguably, the most important tax planning tool of MNCs is bilateral tax treaties and EU Directives that eliminate the tax cost of interest and dividends flows within complex group structures. Thirdly, we show that international tax planning introduces mixed incentives for countries when choosing their policy position towards tax havens: On one hand, countries wish to protect the domestic tax base by employing high fiscal barriers to tax havens. On the other hand, countries have an incentive to lower fiscal barriers to tax havens in order to limit the use of conduit structures by domestic firms and to attract conduite entities of foreign firms.[7] In equilibrium, fiscal barriers to tax havens are unambiguously too low. Finally, we show that fiscal barriers to tax havens have important implications for the optimal corporate tax rate.

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conceeded transitory arrangements allowing them to retain withholding taxes on interest payments.

[4] It is fair to say that in a number of countries, withholding taxes on interest flows as a means to protect the domestic tax base against profit shifting to tax havens have been replaced by more sophisticated regulation most notably CFC-rules according to which passive income of foreign entities directly or indirectly controlled by a domestic entity may be subject to domestic corporate tax if taxed at a low rate in the foreign jurisdiction.

[5] This is commonly known as a "back-to-back" loan in the jargon of international tax planning.

[6] One exception is Mintz (2004) who computes the cost of capital with and without conduite entities but does not formally analyze optimal tax policy within thisframework.

[7] The analysis of optimal tax policy obviously changes when countries are allowed to apply preferential tax treatment to conduite entities. Such an analysis falls outside the scope of this paper but is related to the literature on preferential tax regimes in the presence of highly mobile tax bases as represented by Keen (2001). Interestingly, Belgium has recently set up such a special regime exempting interest payments from withholding tax when "...two related companies with tax residence outside Belgium are involved in a financial transaction with the intervention of a Belgium based intra-group financial enterprise" (source: PwC Global Tax Summaries).

The paper is structured in the following way: In section 2, we set out the general modeling framework and discuss our assumptions. In section 3, we analyze optimal tax policy in a world consisiting of one country and one tax haven. We show that the country optimally taxes debt to tax haven entities so heavily that no firms shift profits whereas the optimal corporate tax rate is the same as in standard tax competition models without profit shifting. In the two following sections, we analyze optimal tax policy when a group of countries create a common capital market (CCM) by abolishing withholding taxes on cross-border debt within the CCM under different assumptions about the costs of profit shifting. In section 4, we assume that firms can add a conduite entity to a finance structure at no extra cost and show that fiscal barriers to tax havens are effectively eliminated in equilibrium. In section 5, we assume that establishing a conduit entity is costly and show that under mild assumptions any equilibrium exhibits (small) countries without fiscal barriers to tax havens and (large) countries with fiscal barriers to tax havens. In both cases, we demonstrate that there is an important link between optimal withholding taxes and optimal corporate taxes although it is indeterminate whether optimal corporate taxes are higher or lower than in standard tax competition models. In section 6, we discuss policy implications of our results and conclude.

2 General framework

We assume that governments maximize a welfare function $W(y, g)$ with standard propoerties where y is private consumption and g is government revenue. The objective funtion may or may not coincide with the utility function of a representative consumer and our formulation therefore encompasses truly benevolent governments as well as Leviathan governments that attach more weight to public spending than consumers.

Governments have access to two capital tax instruments: a corporate tax t^P and a withholding tax t^W. For simplicity, we assume that the corporate tax rate applies to the fraction of the capital stock that is financed by equity subject to a thin capitalization threshold $\overline{d}$. Hence, a firm with capital stock k_i and debt d_i has a corporate tax base of $k_i - d_i$ if $d_i/k_i \leq \overline{d}$ and a corporate tax base of $(1 - \overline{d})k_i$ if $d_i/k_i > \overline{d}$. The withholding tax applies to the fraction of d_i held by foreign entities.

Governments do not exclusively rely on capital taxes to raise revenue but have access to alternative sources characterized by constant marginal costs in terms of private consumption:

$$-\frac{dg}{dy} = \mu < 1$$

Governments operate in an international environment with tax havens and we simply assume that tax havens do not employ capital taxes. Hence, in tax havens $t^C = t^W = 0$. While we do not explicitly model the optimal tax policy of tax havens, our assumption is broadly in line with the actual tax environment

in tax havens. As pointed out by Schön (2005) some tax haven jurisdictions do levy fiscal charges on firms operating out of their territory although rarely in the form of corporate taxes and withholding taxes. Whereas the revenue raised by these charges may make up a significant portion of total revenue in small tax havens, the cost to individual firms is negligible, which justifies our assumption of tax havens as zero-tax jurisdictions.

Firms have real activities in one country and maximize global after-tax profits by choosing optimal levels of real investment and optimal financial structures given the world after-tax return to capital r and given the international tax environment . Production in firm i is given by the production function $f(k_i)$ common to all firms. Firms are heterogenous with respect to cost parameters c_i and b_i which indicate costs related to international tax planning as described below.

In section 3, we analyze optimal tax policy in a world consisting of one country and one tax haven. Firms are able to reduce global tax payments by setting up a finance subsidiary in the tax haven and finance its activities with debt issued by the finance subsidiary. We refer to this type of tax planning as a simple finance structure. We assume that setting up and operating the simple finance structure is associated with costs c_i which has a distribution described by a continuous cumulative distribution function $H(c_i)$ and density function $h(c_i)$ over the interval $[0; c]$. Obviously, it is optimal to invest in a finance structure if and only if the tax savings generated by the finance structure exceed its costs c_i.

In sections 4 and 5, we analyze optimal tax policy in in a world consisting of more countries and one tax haven, which implies that firms are able to circumvent high fiscal barriers to tax havens by means of conduit entities in the following way: The firm sets up a finance subsidiary in a tax haven and a conduit subsidiary in a country with low fiscal barriers to tax havens. The former entity grants a loan to the conduit entity, which passes on the loan to the parent company. We refer to this as a conduit finance structure and assume that its cost amount to $c_i + b_i$. In section 4, we analyze the special case where $b_i = 0$. In section 5, we extend the analysis to the more general case where b_i is positive and perfectly correlated with c_i, i.e. $b_i = \alpha c_i$

Cost parameters c_i and b_i capture costs related to the setting up and management of a finance structure and include the costs of incorporating subsidiaries in foreign jurisdictions, formulating loan contracts, keeping accounts of subsidiaries, complying with local regulatory requirements (i.e. annual audit) and ensuring a minimum level of 'substance' as required by many tax administrations in order to recognize foreign subsidiaries as foreign entities.[8] These costs mostly

[8] Such 'substance' typically involves a phone number, an address registered in local phone books, a secretary on the payroll and annual board meetings held in the country of residence. The notion of "substance" is closely related to the notion of "effective place of management", which is an important determinant of the "deemed" jurisdiction of residence for tax purposes. Essentially, many tax administrations will consider that foreign finance subsidiaries or conduit subsidiaries of a domestic firm are effectively managed on domestic territory and thus subject to domestic tax if they exhibit an insufficient level of substance.

represent expenses to tax advisors, lawyers, domiciliation service providers, accountants and auditors.

Our description of the cost structure of international tax planning involves several important assumptions. Firsly, we assume that costs c_i and b_i are fixed in the sense that they are independent of the amount of shifted profits. This seems reasonable since we do not expect fees charged by advisors, lawyers and others to depend on the size of the loans involved in the finance structure.[9] Many papers on profit shifting assume that costs associated with profit shifting are increasing in the amount of profits shifted. Which specification is most correct depends on the specific profit shifting technique under consideration. Haufler and Schjelderup (2000), for instance, specifically analyze profit shifting by means of manipulated transfer prices in which case it seems very plausible that costs increase with the amount of profits shifted. In our context of profit shifting by means of debt finance, our assumption of a fixed cost of profit shifting seems more appropriate.

Secondly, we assume that costs of setting up finance structures are heterogenous across firms. Arguably, it would be more realistic to assume that firms differ in size and face the same costs of international tax planning. In such a framework, only large firms with large potential tax savings from profit shifting would invest in finance structures, which seems to be a reasonable prediction. Our assumption of heterogenous costs of tax planning is, however, analytically much more tractable and gives rise to qualitatively identical results.[10]

Finally, we assume that an exogenous fraction θ of the costs incurred by firms to set up finance structures are converted into profits in the jurisdictions where finance or conduit entities are established. We justify this assumption with the casual observation that markets for tax planning services seem to exhibit an oligopolistic structure with a small number of very large providers.[11] It is also consistent with the fact that some countries are keen to attract foreign entities even when no fiscal charges are levied on such entities.

[9] However, if advisors or lawyers issue a legal opinion on the expected tax treatment of the finance structure, a fraction of the fee covers the risk that the actual tax treatment goes against the opinion and the client claims damages. In this case, we would expect this risk premium to be an incresing function of the amounts involved in the transactions.

[10] Bucovetsky (2007) suggests a third approach by assuming that firms differ in the fraction of profits they may shift to tax havens. The paper explores profit shifting by means of allocation of patents to tax haven subsidiaries where royalty payments erode the corporate tax base of the firm. This kind of profit shifting is limited by the importance of patents on the balance sheet, which obviously varies across firms. In our context of profit shifting by means of debt financing, assuming variation in the fraction of profits firms are able to shift to tax havens would amount to assuming variation in the thin capitalization threshold $\overline{d}$ which is not very meaningful.

[11] The market is dominated by a group of international accountancy firms known as "the Big Four".

3 Fiscal barriers to tax havens in a single country

In this section, we consider a world consisting of one country and one tax haven. We initially characterize the optimal real investment and financial policy of firms and then proceed to characterize the optimal tax policy of the country.

3.1 Firms

We first note that firms have no incentive to issue debt to another domestic entity because the tax saving in the hands of the entity issuing the debt would be exactly matched by the tax cost at the level of the entity holding the debt. We also note that firms with a simple finance structure optimally choose a debt-equity ratio of $\overline{d}$. This follows from the fact that once a tax haven entity is in place, there is a tax saving of $t^P - t^W$ per unit of debt issued up to the thin capitalization threshold $\overline{d}$ and a tax loss of t^W per unit of debt issued beyond the threshold. These considerations also tell us that in cases where $t^W \geq t^P$ there is no incentive to shift profits and no firms optimally choose to set up a simple finance structure and we therefore focus on cases where $t^P \geq t^W$.

If firm i chooses not to have a finance structure, its profits are:

$$(\pi_i|^{NOFIN}) = f(k_i) - k_i t^P - k_i r \tag{1}$$

where r is the world after-tax return to capital. Maximizing (1) with respect to the capital stock k_i yields the standard first-order condition:

$$f'(k^L) = r + \tau^L \tag{2}$$

which implicitly defines the optimal capital stock k^L of a firm with no finance structure as a function of the effective capital tax rate facing such a firm τ^L where $\tau^L = t^P$. Similarly, if firm i chooses a simple finance structure, its profits (net of the fixed cost c_i) are:

$$(\pi_i|^{FIN}) = f(k_i) - k_i(1-\overline{d})t^P - k_i\overline{d}t^W - k_i r \tag{3}$$

Maximizing profits with respect to the capital stock k_i gives the following first-order condition:

$$f'(k^H) = r + \tau^H \tag{4}$$

Equation (4) implicitly defines the optimal capital stock k^H of a firm with a simple finance structure as a function of the effective capital tax rate facing such a firm τ^H where the latter is defined as follows:

$$\tau^H \equiv (1-\overline{d})t^P + \overline{d}t^W$$

The definition of τ^H shows us that firms with a simple finance structure face a lower effective capital tax rate than firms without a finance structure as long

as $t^W \leq t^P$. Hence, we may think of firms opting for a simple finance structure as incurring a cost c_i in order to face a reduce the effective capital tax rate from τ^L to τ^H.

We note that k^L and k^H are common to all firms. Inserting k^L in (1) and k^H in (3), we obtain expressions for the maximum profits that may be earned (net of c_i) by a firm i in the case where it does not set up a finance structure π^L and the case where it does π^H.

$$\pi^L \equiv f(k^L) - k^L(r + \tau^L) \tag{5}$$

$$\pi^H \equiv f(k^H) - k^H(r + \tau^H) \tag{6}$$

We define the δ as the increase in profits (net of c_i) due to investment in a simple finance structure:

$$\delta \equiv \pi^H - \pi^L$$

We assume for simplicity that firms breaking exactly even on a finance structure choose to implement such a structure. Hence, firms with $c_i \leq \delta$ opt for a finance structure and firms with $c_i > \delta$ do not. This implies that a fraction $H(\delta)$ of the firms opt for a simple finance structure whereas the remaining fraction $(1-H(\delta))$ of the firms do not.

3.2 The production function

To avoid complications that are merely due to unreasonable properties of the production function, we proceed to impose mild restrictions on the latter. As a first step, we set out the link between higher-order derivatives of the production function and the the tax elasticity of optimal capital stock $\varepsilon_{k,t}$ in the following lemma.

Lemma 1 *When $f'''(k)$ is not too positive, the elasticity of the optimal capital stock with respect to the effective tax rate $\varepsilon_{k,t}$ is a decreasing function of the tax rate. This property holds, for instance, when the production function is of the standard type $f(k) = k^a$ and $a < 1$.*

Proof. We derive the tax elasticity of the optimal capital stock by differentiating (2) with respect to the effective capital tax rate τ:

$$\varepsilon_{k,\tau} = \frac{\tau}{f''(k)k} \tag{7}$$

We now differentiate $\varepsilon_{k,\tau}$ with respect to τ to find:

$$\frac{\partial \varepsilon_{k,\tau}}{\partial \tau} = \frac{f''(k)k - \tau[f'''(k)k + f''(k)]\frac{\partial k}{\partial \tau}}{[f''(k)k]^2} \tag{8}$$

We note that the denominator is positive whereas all terms in the numerator are unambiguously negative except the term involving $f'''(k)$, which is positive if $f'''(k)$ is positive. It follows that unless $f'''(k)$ is so positive that it dominates

the two negative terms in the numerator, the sign of (8) is negative. We complete the proof by computing (8) for the special case when $f(k) = k^a$ and $a < 1$.

$$\frac{\partial \varepsilon_{k,\tau}}{\partial t^C} = \frac{(a-1)r}{[a(a-1)k^{a-1}]^2} < 0$$

■

On the basis of Lemma 1, we make the following assumption about the production function, which we shall maintain throughout the paper.

Assumption 1 *$f'''(k)$ is sufficiently small for $\varepsilon_{k,\tau}$ to be a non-increasing function of τ evaluated at all relevant tax rates.*

In order to justify this assumption, we note that if $\varepsilon_{k,\tau}$ were instead an increasing function of the tax rate over some range, it could be optimal, for reasons entirely unrelated to profit shifting, to let identical firms face different effective tax rates. To see this, consider the classical tax competition result that the (inverse) marginal cost of raising public funds with capital taxes equals $(1 + \varepsilon_{k,\tau})$.[12] Starting from a situation where all firms face the same tax rate τ, gradually decreasing the tax rate to τ' for a random sample of firms and gradually increasing the tax rate to τ'' for another random sample of firms would lower the deadweight cost of taxation if $\varepsilon_{k,\tau}$ were an increasing function of the tax rate over the range $[\tau'; \tau'']$ simply because each unit of private consumption created by lowering τ' has a cost of only $1 + \varepsilon_{k,\tau}(\tau')$ in terms of government revenue whereas each unit of private consumption foregone by raising τ'' creates additional government revenue of $1 + \varepsilon_{k,\tau}(\tau'')$. We consider this type of results nonsensical and rule them out by assuming that the properties of the production function are such that $\varepsilon_{k,\tau}$ is a non-increasing function of the tax rate.

3.3 Withholding taxes

We normalize the total mass of firms to one and find the following expression for government revenue:

$$g = H(\delta)k^H\tau^H + (1 - H(\delta))k^L\tau^L \tag{9}$$

whereas total private consumption is given by:

$$y = H(\delta)\pi^H + (1 - H(\delta))\pi^L - \int_0^\delta c_i h(c_i)dc_i + rs \tag{10}$$

where s is an exogenous capital endowment. The integral reflects total ressources spent on finance structures by firms. We are now prepared to present our first result.

[12] This is the typical result derived in a setting without profit shifting (see for instance Eijffinger and Wagner, 2001).

Proposition 1 *In a world economy with one country and one tax haven, the country optimally sets t^W high enough to prevent any profit shifting to tax havens.*

We prove proposition 1 by considering a situation where t^W is sufficiently low to induce some firms to set up a finance subsidiary in the tax haven. We then show that there exists a tax reform that increases government revenue g while leaving private consumption y unchanged.

We determine the impact of tax reform on private consumption by total differentiating (10) with respect to y, t^P and t^W and rearranging:

$$dy = H(\delta)k^H d\tau^H + (1 - H(\delta))k^L d\tau^L \tag{11}$$

It follows from (10) that tax reforms may potentially affect firm behaviour through various channels. Firstly, tax reforms change the fraction of firms with a finance structure. However, only firms that are initially indifferent between setting up a finance structure or not are affected by small reforms and for such marginal firms the fixed cost of setting up a finance subsidiary c_i exactly equals the difference between profits with and without a finance subsidiary δ. Hence, small tax reforms have no net effect on private consumption through changes in firms' financial policies. Secondly, tax reforms change the user cost of capital, which changes optimal investment levels. However, since the marginal product of capital initially equals its user cost, there is no effect on private consumption through this channel. It follows that the only net effect on private consumption is the direct effect, i.e. the effect on firms' tax bills absent any behavioral responses. This is exactly what (11) is stating.

Likewise, we determine the impact of tax reform on government revenue by total differentiating (9) with respect to g, t^P and t^W:

$$\begin{aligned} dg &= h(\delta)(\frac{d\delta}{dt^C}dt^P + \frac{d\delta}{dt^W}dt^W)(k^H\tau^H - k^L\tau^L) + && (12)\\ &\quad H(\delta)k^H(\frac{d\tau^C}{dt^P}dt^P + \frac{d\tau^C}{dt^W}dt^W)(1+\varepsilon^H) + && (13)\\ &\quad (1 - H(\delta))k^L dt^P(1+\varepsilon^L) && (14) \end{aligned}$$

where ε^H is the elasticity of k^H with respect to τ^H and ε^L is the elasticity of k^L with respect to τ^L. The first line reflects the impact of changes in firms' financial policy on government revenue. Tax reforms that raise (lower) δ cause a revenue loss (gain) proportional to the tax bill paid by firms without a finance subsidiary $k^L\tau^L$ and a revenue gain (loss) proportional to the total tax bill paid by firms with a finance subsidiary $k^H\tau^H$. Governments never optimally set t^P above the rate that maximizes revenue from firms without a finance structure. In other words, governments always operate to the left of the peak of the Laffer curve. This tells us that the total tax bill of firms unambiguously falls with the effective tax rate they are facing, hence $(k^H\tau^H - k^L\tau^L) < 0$. The second and third lines reflect the revenue effect of tax reform conditional on firms' financial

policy. For each type of firms, the revenue effect equals the direct effect as stated in (11) scaled down by a factor $(1+\varepsilon)$. The scaling factor reiterates the traditional tax competition result that tax increases (decreases) have a smaller positive (negative) effect on revenue due to lower (higher) optimal levels of firm investment.

We now consider a tax reform that lowers t^P by some small amount dt^P and raises t^W by the following amount:

$$dt^W = -\frac{H(\delta)(1-\overline{d})k^H + (1-H(\delta))k^L}{H(\delta)\overline{d}k^H}dt^P \tag{15}$$

By construction, the tax reform defined by (15) lowers t^P and raises t^W just enough to leave private consumption unchanged. This may be verified by inserting (15) into (11) to find $dy = 0$. Similarly, inserting (15) into (12) yields:

$$dg = [h(\delta)k^L(T^H - T^L) + (1-H(\delta))k^L(\varepsilon^L - \varepsilon^H)]dt^P \tag{16}$$

where we have introduced the short-hand notation T^H an T^L for the total tax bill of a firm with and without a finance structure respectively. We previously argued that $(T^H - T^L) < 0$. This implies that the revenue effect associated with lowering t^P and raising t^W (both of which work to raise δ) is positive because firms induced to give up their finance structure by the tax reform pay a higher tax bill. Moreover, it follows from Assumption1 that $(\varepsilon^L - \varepsilon^H) < 0$. The reform defined by (15) lowers τ^L and raises τ^H and therefore generates a revenue gain proportional to the efficiency gain of ε^L at the level of firms without a finance structure and a revenue loss proportional to the efficiency loss ε^H at the level of firms with a finance structure, which amounts to a net gain. In conclusion, as long as t^W is low enough to induce some companies to set up a finance structure, the government may increase government revenue without decreasing private consumption by lowering t^P and raising t^W according to the formula (15). This completes the proof.

The result is very intuitive. Profit shifting to tax havens has two adverse effects. Firstly, it distorts the allocation of capital by introducing a wedge between the effective tax rate faced by firms with a finance structure and firms without a finance structure. Secondly, profit shifting is associated with wasteful use of ressources. Since profit shifting has no offsetting beneficial effects, the country optimally raises prohibitive fiscal barriers to tax havens.

3.4 Corporate taxes

In order to derive the (inverse) marginal cost of raising public funds with the corporate tax rate under the assumption of a prohibitive withholding tax, we merely divide (12) by (11) while setting $H(\delta) = h(\delta) = 0$ to find:

$$-(\frac{dg}{dy}|t^P) = 1 + \varepsilon^L \tag{17}$$

This is nothing more than the classical tax competition result relating the cost of public funds to the tax elasticity of real investment. Under Assumption 1 the cost of public funds is an increasing function of the tax rate, which ensures a unique equilibrium where the corporate tax is used up to the point where $1 + \varepsilon^L = \mu$.

4 Fiscal barriers to tax havens in a common capital market ($b_i = 0$)

In this and the following section, we analyze the interaction between countries that have formed a common capital market, which, in our context, has the following meaning:

Definition 1 *A common capital market (CMM) is a group of N countries (where $N \geq 2$) that apply no fiscal barriers to intragroup debt within the common capital market.*

As dicussed earlier, there are various reasons why a group of countries would form a common capital market. Most importantly, taxation of international debt constrain financial policies of multinational corporations and thus hampers the cross-border integration of firms that is thought to improve economic performance by creating economies of scale and increasing competitive pressure. The most prominent real world example of a common capital market is the European Union that suppressed withholding taxes on intra-group interest flows between EU entities as from 1 January 2004.

We let $\mathbf{t}$ be short-hand notation for a vector that represents the tax policies of all countries belonging to the CMM, i.e. $\mathbf{t} = \{t_1^W, ., t_N^W, t_1^P, ., t_N^P\}$ where t_n^W is the withholding tax rate on debt to tax havens in country n and t_n^P is the corporate tax rate in country n. We sometimes simply refer to t_n^W as the withholding tax rate of country n since withholding tax rates on debt to countries within the CMM equal zero by definition of a CMM.

4.1 Firms

As pointed out above, in a multi-country setting, firms may use conduit finance structures to circumvent high fiscal barriers to tax havens in the country where they operate. In this section, we assume that adding a conduit entity to a finance structure does not increase the cost of the structure, i.e. $b_i = 0$. As we shall see, this assumption leads to particularly stark results. In section 5, however, we extend the analysis to a more general situation where firms incur a fixed cost c_i to set up the finance subsidiary and an additional fixed cost b_i to set up a conduit entity.

We consider the optimal policy choice of a country n and refer to the lowest withholding tax rate among the other $N-1$ as t^{WL}. We let $\mathcal{L}$ denote the set of L countries applying the withholding tax rate t^{WL}. Since there is no additional

cost to setting up a conduit structure, firms use the least taxed route when directing interest payments from the firm to its finance subsidiary. Hence, all firms in country n that opt for a finance structure use a direct structure when $t_n^W \leq t^{WL}$ and a conduit structure through one of the L countries belonging to $\mathcal{L}$ when $t_n^W > t^{WL}$.[13] Moreover, we assume that firms with a conduit finance structure randomize over the L countries belonging to $\mathcal{L}$ when choosing the country in which to set up its conduit entity.

Generally, firms located in country n opting for a finance structure face the following effective tax rate on capital:

$$\tau_n^F \equiv (1-\overline{d})t_n^P + \overline{d}\min[t^{WL}; t_n^W]$$

As before, firms with no finance subsidiary face an effective capital tax rate of τ_n^L and we let k_n^L and π_n^L denote the optimal capital stock and the maximum profits given this tax rate. Setting up a finance subsidiary reduces the effective capital tax rate to τ_n^F and we let k_n^F and π_n^F denote the optimal capital stock and the maximum profits given this tax rate. We define $\delta_n \equiv \pi_n^F - \pi_n^L$. It follows that a fraction $H(\delta_n)$ of firms in country n opts for a direct finance structure if $t_n^W \leq t^{WL}$ and for a conduit finance structure if $t_n^W > t^W$ whereas a fraction $1 - H(\delta_n)$ of firms does not use a finance structure.

4.2 Withholding taxes

We normalize the total mass of firms in the N countries to one and let λ_n denote the share of those firms located in country n. Without loss of generality, we rank the N countries according to size so that $\lambda_1 < ... < \lambda_n < ...\lambda_N$. Private consumption in country n is given by:

$$y_n = \lambda_n \left\{ H(\delta_n)\pi_n^F + (1 - H(\delta_n))\pi_n^L - \int_0^{\delta_n} c_i h(c_i) dc_i + rs \right\} \tag{18}$$

Government revenue depends on the relative size of t_n^W:

$$g_n = \lambda_n \left\{ H(\delta_n)(1-\overline{d})k_n^F + (1 - H(\delta_n))k_n^L \right\} t_n^P + G_n^W \tag{19}$$

where

$$G_n^W = 0 \quad \text{if} \quad t_n^W > t^{WL}$$

$$G_n^W = \left\{ \lambda_n H(\delta_n)\overline{d}k_n^F + \sum_{k \notin \mathcal{L}} \frac{\lambda_k H(\delta_k)\overline{d}k_k^F}{L} \right\} t_n^W \quad \text{if} \quad t_n^W = t^{WL}$$

$$G_n^W = \sum_{k=1}^{N} \lambda_k H(\delta_k)\overline{d}k_k^F t_n^W \quad \text{if} \quad t_n^W < t^{WL}$$

The term G_n^W is the government revenue from the withholding tax, which is a highly discontinuous function of t_n^W. We are now prepared to present the main result of this section:

[13] We have thus assumed that no firms in country n opt for a conduit structure in the special case when $t_n^W = t^{WL}$.

Proposition 2 *Assume that $b_i = 0$. In a world economy consisting of a common capital market and a tax haven, a tax vector* $\mathbf{t}$ *constitutes an equilibrium if and only if $t_n^W = t_m^W = 0$ for at least two countries m and m. In such an equilibrium, all countries in the common capital market are effectively without fiscal barriers to tax havens.*

We prove proposition 2 by considering all possible combinations of relative tax rates.

First, consider cases where $t_n^W > t^{WL} > 0$ for at least one country n. It is easy to see that this cannot constitute an equilibrium since country n can increase its government revenue without changing private consumption by reducing t_n^W until $t_n^W = t^{WL}$.

Next, consider cases where $t^W = t^{WL} > 0$ for all countries. We argue that this cannot constitute a Nash equilibrium since any of the countries can increase private consumption and public revenue by lowering its withholding tax rate marginally. If country n reduces t_n^W marginally, it increases private consumption by reducing the tax bill of firms with a finance structure. Government revenue in country n is affected through various channels. Firstly, the lower tax bill of firms with a finance structure reduces g_n although this effect is mitigated by increased investment levels by those firms. Secondly, the reduced withholding tax rate induces more firms to set up a finance subsidiary, which also causes a reduction in g_n. Finally, a small reduction in t_n^W triggers an increase in government revenue because firms located in all other countries that previously opted for a direct finance structure now chose a conduite structure through country n. Whereas the first and the second effects on government revenue are proportional to the tax change, the last effect is a discrete change independent of the magnitude of the redcution in t_n^W. Hence, if the reduction in t_n^W is sufficiently small, the last effect dominates the first and the second effect. This implies that both y_n and g_n unambiguously increase following a sufficiently small reduction in t_n^W.

We now turn to cases where $t_m^W = t^{WL} = 0$ for one country m and $t^W > 0$ for all other countries. In these cases, the withholding tax revenue is zero in all countries. This cannot constitute an equilibrium since country m is able to increase its government revenue without reducing private consumption. We know from proposition 1 that a small increase in t_m^W combined with a proportional reduction in t_m^P given by (15) raises government revenue while leaving private consumption unchanged. This only takes into account tax revenue from domestic firms. Moreover, a small increase in t_m^W creates a revenue from foreign firms.

Finally, we consider cases where $t_n^W = t_m^W = 0$ for two countries n and m. In these cases, the withholding tax revenue is zero in all countries. No country can change private consumption nor government revenue by changing its tax rate. Hence, $t_n^W = t_m^W = 0$ is a sufficient condition for Nash equilibrium. Since all firms with a finance structure face an effective capital tax rate of $(1 - \overline{d})t^P$ all countries are effectively without fiscal barriers to tax havens. This completes the proof.

The intuition is straightforward. Essentially, countries compete for the withholding tax base and since this base is infinitely responsive to differences in taxation, tax rates are competed down to zero in equilibrium. This is a simple example of Bertrand competition. The contrast between proposition 1 and proposition 2 is striking. Proposition 1 states that in absence of other considerations countries prefer to set fiscal barriers to tax havens at prohibitive levels. Proposition 2 states that in a common capital market where firms have access to conduit finance structures, effective fiscal barriers to tax havens are competed down to zero in equilibrium.

4.3 Corporate taxes

We derived proposition 2 without saying anything about corporate tax rates. In this section, we characterize the optimal corporate tax rate in countries belonging to a CMM and compare it to the results derived in section 3.4 for a country not belonging to a CMM.

We differentiate (18) and (19) with respect to t_n^P and evaluate in the equilibrium described in proposition 2 to find the following expressions:[14]

$$\frac{dy}{dt^P} = \overline{k}' \tag{20}$$

$$\frac{dg}{dt^P} = \overline{k}'(1+\overline{\varepsilon}') - (T^L - T^F)h(\delta)(k^L - (1-\overline{d})k^F) \tag{21}$$

where $\overline{k}$ is the average corporate tax base of firms and $\overline{\varepsilon}$ is a weighted average of elasticities ε^L and ε^H with weights reflecting the share of the total corporate tax base:

$$\overline{k}' \equiv H(\delta)(1-\overline{d})k^F + (1-H(\delta))k^L$$

$$\overline{\varepsilon}' = \frac{H(\delta)(1-\overline{d})k^F\varepsilon^F + (1-H(\delta))k^L\varepsilon^L}{H(\delta)(1-\overline{d})k^F + (1-H(\delta))k^L}$$

It is useful to take a closer look at equations (20) and (21). Changes in t^P affect real investments of firms with and without a finance structure, hence the marginal deadweight loss on the real investment side $\overline{\varepsilon}'$ comprises responses by both types of firms ε^F and ε^L weighted by their share of the total corporate tax base. Changes in t^P also affect the financial decisions of firms. In particular, an increase in t^P is associated with an increase in δ which induces some firms not engaged in profit shifting to set up a finance structure and thereby reduces government revenue by an amount proportional to $(T^L - T^H)$.

Combining (20) and (21), we obtain the following expression for the (inverse) marginal cost of public funds in a country belonging to a CMM.

$$-(\frac{dg}{dy}|t^P) = (1+\overline{\varepsilon}') - \frac{(T^L - T^F)h(\delta)(k^L - (1-\overline{d})k^F)}{\overline{k}'} \tag{22}$$

This allows us to set out our bext proposition:

[14] We have suppressed the subscript n to enhance readability

Proposition 3 *Assume that $b_i = 0$. The optimal corporate tax rate of a country in a CMM may be higher or lower than the optimal corporate tax rate of a country not in a CMM.*

In order to proof this result, we compare (17) and (22). We first note that $\overline{\varepsilon}' < \varepsilon^L$, hence the marginal deadweight loss on the real investment side associated with an increase in t^P is smaller in a country with no fiscal barriers to tax havens than in a country with prohibitive fiscal barriers. This is closely related to the point made by Mintz and Smart (2004) that profit shifting reduces the tax sensitivity of real investment. We also note, however, that in countries with no fiscal barriers to tax havens there is a deadwight loss on the financial side associated with an increase in t^P because higher corporate taxes induce more firms to invest in finance structures. On balance, it is ambiguous whether the marginal deadweight loss of corporate taxation is largest in a country with no fiscal barriers or in a country with prohibitive fiscal barriers and, hence, it is indeterminate where the corporate tax rate is higher.

5 Fiscal barriers to tax havens in a common capital market $(b_i > 0)$

5.1 Firms

In this section, we assume that firms incur a cost of $b_i > 0$ when adding a conduite entity to their finance structure. In particular, we assume that $b_i = \alpha c_i$, which implies perfect correlation between the cost of setting up a simple finance structure c_i and the total cost of setting up a conduite finance structure $(1+\alpha)c_i$.[15]

As opposed to the situation where $b_i = 0$, firms do not necessarily opt for the least taxed route when directing interest payments to tax haven entities since the cost of adding a conduite entitiy to a simple finance structure b_i may exceed the tax savings. Hence, firms optimally pursue one of three different financial strategies: (i) no finance structure in which case the optimal capital stock k^L and profits π^L are given by (2) and (5), (ii) a simple finance structure in which case the optimal capital stock k^H and profits π^H are given by (4) and (6) and (iii) a conduite finance structure. Conditional on having invested in a conduite finance structure, the profits of firm i are:

$$(\pi_i|^{CON}) = f(k_i) - k_i(1-\overline{d})t_n^P - k_i\overline{d}t^{WL} - k_i r \tag{23}$$

where t^{WL} as usual refers to the lowest withholding tax rate on debt to tax haven entities employed by any country within the CCM. This gives rise to the

[15] We have experimented with the assumption that b_i is distributed according to a cumulative distribution function $G(b_i|c_i)$, which is a more general specification of correlation between c_i and b_i. This merely adds complexity to the model without changing the nature of the results.

following first-order condition, which implicitly defines the optimal capital stock k_n^C and profits π_n^C:

$$f'(k_n^C) = r + \tau_n^C$$
$$\pi_n^C = f(k_n^C) - k_n^C(r + \tau_n^C)$$

where τ_n^C is the effective capital tax rate faced by companies with a conduite finance structure:

$$\tau_n^C \equiv (1 - \overline{d})t_n^P + \overline{d}t^{WL}$$

We introduce the following definition of ρ_n as the increase in profits (net of b_i) due to the augmentation of a simple finance structure with a conduite entity:

$$\rho_n \equiv \pi_n^C - \pi_n^H$$

As in section 3, firms prefer a simple finance structure to no finance structure if and only if $c_i < \delta$. When $t_n^W = t^{WL}$, firms have no incentive to set up a conduite finance structure (since $\rho_n = 0$), hence a fraction $H(\delta_n)$ of firms set up a simple finance structure and a fraction $1 - H(\delta_n)$ do not invest in a finance structure.

When $t_n^W > t^{WL}$, firms prefer a conduit finance structure to a simple finance structure if and only if $\alpha c_i < \rho_n$ and a conduit structure to no finance structure if $(1+\alpha)c_i < \rho_n + \delta_n$. It follows that we need to distinguish between two separate cases. When $\frac{\rho_n}{\alpha} < \delta_n$, a fraction $H(\frac{\rho_n}{\alpha})$ of firms set up a conduit finance structure, a fraction $H(\delta_n) - H(\frac{\rho_n}{\alpha})$ of firms set up a simple finance structure whereas a fraction $1 - H(\delta_n)$ of firms do not invest in a finance structure. When $\frac{\rho_n}{\alpha} > \delta$, a fraction $H(\frac{\rho_n}{\alpha})$ of firms set up a conduit finance structure and a fraction $1 - H(\frac{\rho_n}{\alpha})$ of firms do not set up a finance structure.

5.2 Tax policy

We reiterate that firms with conduit finance structures set up conduit entities in the country with the lowest fiscal barrier to tax havens t^{WL}. If several countries apply the same withholding tax rate t^{WL}, firms randomize over these countries when choosing where to locate their conduit entity. Hence, the set of countries with the lowest fiscal barrier to tax havens $\mathcal{L}$ effectively share the tax revenue generated by applying t^{WL} to the loans of conduite entities and the profits earned by providers of tax planning services.

It follows that private consumption and government revenue in country n are given by:

$$y_n = \lambda_n Y_n^D(\mathbf{t}) + Y_n^F + rS \tag{24}$$

$$g_n = \lambda_n G_n^D(\mathbf{t}) + G_n^F \tag{25}$$

where we have introduced the following short-hand notation: $Y_n^D(\mathbf{t})$ is the sum of profits of all firms in country n net of costs related to finance structures,

Y_n^F is profits earned by providers of tax planning services, $G_n^D(\mathbf{t})$ is the total revenue generated in country n by taxation of domestic firms and G_n^F is the revenue generated in country n by applying a withholding tax to conduit entities of foreign firms. We note that Y_n^F and G_n^F are highly discontinuous functions of the withholding tax rate t_n^W:

$$\left\{Y_n^F, G_n^F\right\} = \{0, 0\} \quad \text{if } t_n^W > t^{WL}$$

$$\left\{Y_n^F, G_n^F\right\} = \left\{\theta\alpha \sum_{k \notin \mathcal{L}} \frac{\lambda_k}{L} \int_0^{\frac{\rho}{\alpha}} c_i h(c_i) dc_i; \;\; t_n^W \sum_{k \notin \mathcal{L}} \frac{\lambda_k}{L} H(\frac{\rho_k}{\alpha}) \overline{d} k_k^C \right\} \quad \text{if } \; t_n^W = t^{WL}$$

$$\left\{Y_n^F, G_n^F\right\} = \left\{\theta\alpha \sum_{k \neq n} \lambda_k \int_0^{\frac{\rho}{\alpha}} c_i h(c_i) dc_i; \;\; t_n^W \sum_{k \neq n} \lambda_k H(\frac{\rho_k}{\alpha}) \overline{d} k_k^C \right\} \quad \text{if } \; t_n^W < t^{WL}$$

When deriving the effects of tax policy in a country n, we need to distinguish between cases where $n \in \mathcal{L}$ and $n \notin \mathcal{L}$, which we shall refer to as n being a low-barrier country and a high-barrier country respectively. Obviously, being a high- or low-barrier country depends on the choice of t^W and is thus endogenous. We show in proposition 4, however, that under certain mild assumptions, equilibrium always comprises at least one high-barrier country and at least one low-barrier country. We therefore proceed to a characterization of optimal capital taxes in high-barrier and low barrier countries respectively.

5.3 High-barrier countries

We first determine the impact of marginal tax changes in a high-barrier country n under the assumption that $\delta > \frac{\rho}{\alpha}$. For simplicity, we suppress the subscript when this refers to country n. By differentiating (24) and (25) with respect to t^W, we obtain the following expressions:

$$\frac{dy}{dt^W} = -\overline{d} k^H \left\{H(\delta) - H(\frac{\rho}{\alpha}\right\} \tag{26}$$

$$\frac{dg}{dt^W} = \overline{d} k^H \left[\left\{H(\delta) - H(\frac{\rho}{\alpha})\right\}(1 + \varepsilon^H) + (T^L - T^H) h(\delta) - (T^H - T^C) h(\frac{\rho}{\alpha})\right] \tag{27}$$

It is instructive to inspect first-order effects (26) and (27). Changes in t^W only affect firms with a direct finance structure since firms without a finance structure do not pay withholding taxes and firms with a conduite structure are subject to withholding taxes in the conduite country. In line with our previous arguments, an increase in t^W reduces π^H with an amount equal to the increase in the tax bill absent any behavioral responses, hence the expression (26). Behavioral responses of firms exposed to the tax increase, however, affect government revenue. Firstly, firms with a simple finance structure reduce their level of real capital, which implies that the direct revenue effect of the tax increase is scaled down by the factor $(1 + \varepsilon^H)$. Secondly, some firms respond to an increase in t^W by changing their financial policy: Firms that were previously

(close to) indifferent between a simple finance structure and a conduite finance structure are induced to opt for the latter, which reduces government revenue by an amount proportional to $(T^H - T^C)$ whereas firms that were previously (close to) breaking even on their simple finance structure are induced to give up the finance structure, which increases government revenue by an amount proportional to $(T^L - T^H)$. This illustrates the fundamental dilemma of high-barrier countries: Raising fiscal barriers to tax havens has the beneficial effect of reducing the incentive to set up simple finance structures but also has the adverse effect of increasing the incentive to circumvent fiscal barriers by means of a conduite finance structure.

Expressions (26) and (27) may be combined to obtain the (inverse) marginal cost of raising public funds with t^W:

$$-(\frac{dg}{dy}|t^W) = (1+\varepsilon^H) + \frac{(T^L - T^H)h(\delta)}{H(\delta) - H(\frac{\rho}{\alpha})} - \frac{(T^H - T^C)h(\frac{\rho}{\alpha})}{H(\delta) - H(\frac{\rho}{\alpha})} \tag{28}$$

Similarly, we derive the effects on y and g of a marginal increase in t^P

$$\frac{dy}{dt^P} = -\overline{k}'' \tag{29}$$

$$\begin{aligned} \frac{dg}{dt^P} &= \overline{k}''(1+\overline{\varepsilon}'') - \frac{\overline{d}t^{WL}}{\overline{d}t^{WL} + (1-\overline{d})t^C} H(\frac{\rho}{\alpha})(1-\overline{d})k^C\varepsilon^C + \\ &\quad (T^H - T^C)h(\frac{\rho}{\alpha})(1-\overline{d})(k^C - k^H) - (T^L - T^H)h(\delta)(k^L - (1-\overline{d})k^H) \end{aligned} \tag{30}$$

where $\overline{k}''$ is the average corporate tax base of firms and $\overline{\varepsilon}''$ is a weighted average of elasticities ε^L, ε^H and ε^C with weights reflecting the share of the total corporate tax base

$$\overline{k}'' \equiv (H(\delta) - H(\frac{\rho}{\alpha}))(1-\overline{d})k^H + (1-H(\delta))k^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C$$

$$\overline{\varepsilon}'' = \frac{(H(\delta) - H(\frac{\rho}{\alpha}))(1-\overline{d})k^H\varepsilon^H + (1-H(\delta))k^L\varepsilon^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C\varepsilon^C}{(H(\delta) - H(\frac{\rho}{\alpha}))(1-\overline{d})k^H + (1-H(\delta))k^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C}$$

Changes in t^P affect effective tax rates and hence optimal real investment levels of all three types of firms. This implies that the marginal deadweight loss on the real investment side - the first line in (30) - comprises responses by all three types of firms. Interestingly, the first term $(1+\overline{\varepsilon}'')$ is increased by a second term which reflects that a fraction of the revenue lost when firms with a conduit structure reduce real investment following an increase in t^P is borne by the conduit country. This may be interpreted as a tax exporting effect tending to raise corporate taxes to suboptimally high levels. [16][17]

[16] The seminal article on tax exporting is Huizinga and Nielsen (1997)

[17] We note, however, that in the equilibrium described in proposition 4, the tax exporting disappears because t^{WL} is driven to zero.

The corporate tax rate t_n^P also affects tax planning decisions through its impact on the relative profitability of firms of different types. Since the corporate tax base of firms with no finance structure k^L is larger than that of firms with a simple finance structure $(1-\overline{d})k^H$, an increase in t^P reduces π^L more than π^H and thus induces some firms without a finance structure to acquire a simple finance structure. Similarly, the corporate tax base of firms with a conduite finance structure $(1-\overline{d})k^C$ is larger than that of firms with a simple finance structure $(1-\overline{d})k^H$, hence an increase in t^P reduces π^C more than π^H and thus induces some firms to replace a conduite finance structure with a simple finance structure. On the financial side, changes in t^P may therefore be associated with deadwight losses or deadweight gains depending on the relative strength of the two responses and their fiscal effects, $-(T^L-T^H)$ and (T^H-T^C) respectively.

We combine (29) and (30) to obtain the (inverse) marginal cost of raising public funds with t^C:

$$\begin{aligned} -(\frac{dg}{dy}|t^P) &= (1+\overline{\varepsilon}'') - \frac{\overline{dt}^{WL}}{\overline{dt}^{WL}+(1-\overline{d})t^C}\frac{H(\frac{\rho}{\alpha})(1-\overline{d})k^C}{\overline{k}''}\varepsilon^C + \\ & \frac{(T^H-T^C)h(\frac{\rho}{\alpha})(1-\overline{d})(k^C-k^H)}{\overline{k}''} - \frac{(T^L-T^H)h(\delta)(k^L-(1-\overline{d})k^H)}{\overline{k}''} \end{aligned} \tag{31}$$

Finally, we contemplate high-barrier countries under the assumption that $\delta < \frac{\rho}{\alpha}$. We note that under this assumption, no firms optimally choose a simple finance structure, hence marginal changes in t^W has no impact on g and y. We find the (inverse) marginal cost of raising public funds with t^P:

$$\begin{aligned} -(\frac{dg}{dy}|t^P) &= (1+\overline{\varepsilon}''') - \frac{\overline{dt}^{WL}}{\overline{dt}^{WL}+(1-\overline{d})t^C}\frac{H(\frac{\rho}{\alpha})(1-\overline{d})k^C}{\overline{k}'''}\varepsilon^C - \\ & \frac{(T^L-T^C)h(\frac{\rho}{\alpha})(k^L-(1-\overline{d})k^C)}{\overline{k}'''} \end{aligned} \tag{32}$$

where

$$\overline{k}''' \equiv (1-H(\frac{\rho}{\alpha}))k^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C$$

$$\overline{\varepsilon}''' = \frac{(1-H(\frac{\rho}{\alpha}))k^L\varepsilon^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C\varepsilon^C}{(1-H(\frac{\rho}{\alpha}))k^L + H(\frac{\rho}{\alpha})(1-\overline{d})k^C}$$

Equation (32) is similar (31) except for the fact that since no firms choose a simple finance structure, changes in t^P affect firms' choice between a conduite finance structure and no finance structure. In particular, since the corporate tax base of firms with no finance structure k^L is larger than that of firms with a simple finance structure $(1-\overline{d})k^C$, an increase in t^P reduces π^L more than π^C and thus induces some firms without a finance structure to acquire a conduite finance structure, which has an adverse effect on government revenue proportional to (T^L-T^C).

Equations (28),(31) and (32) are important ingredients in the solution to the optimal tax problem in a high-barrier country. Due to the discontinuity at $\delta = \frac{\rho}{\alpha}$, we cannot guarantee an interior solution to the tax problem. However, in case the solution is in the range where $\delta > \frac{\rho}{\alpha}$, the following condition needs to hold:

$$-(\frac{dg}{dy}|t^P) = -(\frac{dg}{dy}|t^W) = \mu$$

since otherwise the government could raise a given revenue at a lower price in terms of private consumption. Similarly, in case the solution is at $\delta < \frac{\rho}{\alpha}$, the following condition must hold:

$$-(\frac{dg}{dy}|t^P) = \mu$$

In any case, the solution to the optimal tax problem of high-barrier countries is the same regardless of their size. In the following, we let (t^{W*}, t^{C*}) denote the optimal tax policy vector for a high-barrier country.

5.4 Low-barrier countries

We now turn to the first-order condition for optimal tax policy of a low-barrier country. Due to the sharp continuity of Y^F and G^F, (24) and (25) are not diffentiable functions of t^W in a low-barrier country. Moreover, we note that the (inverse) marginal cost of raising public funds with t^C in a low-barrier country is given by (22) and the mechanisms are exactly as laid out in section 4.3.[18] In the case of low-barrier countries, the (inverse) marginal cost of raising public funds with t^C exhibits no discontinuity and we can thus guarantee an interior solution to the tax problem where:

$$-(\frac{dg}{dy}|t^P) = \mu$$

The solution to the optimal tax problem of low-barrier countries is the same regardless of their size and we let (t^{WL}, t^{C**}) denote the optimal tax policy for a low-barrier country.

5.5 Withholding taxes

We are now prepared to show our first result in this section, which is related to existence of equilibrium:

Proposition 4 *Assume that $b_i = \alpha c_i$. We consider a world economy consisting of a common capital market and a tax haven where we assume that $N \geq 3$ and that $\lambda_2 \to 0$ so that at least two countries are of insignificant size relative to the*

[18] For the sake of completeness, the superscript "F" in (22) should be replaced by superscript "H" when applied in this context since firms in low-barrier countries do not use conduit structures.

total common capital market. There exists at least one equilibrium tax vector $\mathbf{t}$. *In any equilibrium,* $t^W = 0$ *for at least one country and* $t^W > 0$ *for at least one other country.*

Firstly, we note that all high-barrier countries achieve the same level of welfare W^* which does not depend on the number of high-barrier and low-barrier countries. The welfare of low-barrier countries, however, depends positively on the combined size of high-tax countries (since this determines the total amount of profits earned by providers of tax planning services), negatively on the number of low-barrier countries (since profits are shared equally among this number of countries) and negatively on the size of the country itself (since a given amount of profits have a larger weight in welfare function of a small country).

Secondly, we show that if all other countries set $t^W > 0$, tax competition drives t_1^W an t_2^W down to zero. We note that given positive withholding tax rates in all other countries, the best response of country 1 to $t_2^W = 0$ is $t_1^W = 0$ and *vice versa* because profits earned by providers of tax planning services Y^F are infinitely large relative to Y^D and G^D in small low-barrier countries so that . Moreover, due to the sharp discontinuity of Y_1^F and Y_2^F at $t_1^W = t_2^W$ no positive values of t_1^W and t_2^W are consistent with equilibrium.[19] This shows that, in any equilibrium, at least one country sets $t^W = 0$.

Thirdly, we consider optimal tax policy of a country facing an enviroment where all other countries set $t^W = 0$. Evaluating (28) and (31) at $t^W = 0$ and using that $T^C = T^H$ and that $\overline{\varepsilon} < \varepsilon^H$ it is easy to see that the marginal cost of public funds raised with t^W is unambiguously lower than the marginal cost of public funds raised with t^C.[20] It follows that at least one country sets $t^W > 0$.

We can now construct an equilibrium in the following way: We consider an initial situation where countries 1 and 2 are low-barrier countries applying tax policies $(0, t^{P**})$ and countries 3 through country N are high-barrier countries applying tax policies (t^{W*}, t^{P*}). We have already argued that, in this situation, countries 1 and 2 cannot increase their welfare by becoming high-barrier countries. It is possible, however, that one of the high-barrier countries, in particular country 3, could raise its welfare by becoming a low-barrier country. If that is the case, we consider a situation where countries 1 through 3 are low-barrier countries and countries 4 through country N are high-barrier countries. We continue this procedure until the smallest high-barrier country would not increase its welfare by becoming a low-barrier country. It follows from our previous arguments that this happens at the latest when countries 1 through $N-1$ are low-barrier countries and country N is a high-barrier country. By construction, neither low-barrier countries nor high-barrier countries can improve their welfare by changing tax policies given the tax policies of the other countries, hence we have identified an equilibrium.

[19] Negative values of t_l^W and t_k^W are not feasible because firms could set up a purely artificial structure whereby local firms make loans to tax haven entities that lend the exact same amount back to the firm. Firms would earn a zero profit on the financing activities but would receive subsidies proportional to the size of the loans, i.e. in principle infinitely large.

[20] We note that (31) is necessarily the relevant expression for the marginal cost of raising public funds with t^C since $t^C > t^W = 0$ implies that $\delta > \rho = 0$.

It is easy to see that there may exist multiple equilibria. Consider an equilibrium where countries 1 through n are low-barrier countries and countries $n+1$ through N are high-barrier countries. If countries n and $n+1$ are sufficiently similar in size, there exists another equilibrium where countries 1 through $n-1$ and $n+1$ are low-barrier countries whereas countries n and $n+2$ through N are high-barrier countries. This completes the proof.

We have thus established that in equilibrium, there are countries with no fiscal barriers to tax havens and countries with positive fiscal barriers to tax havens. Contrary to the situation where $b_i = 0$, fiscal barriers to tax havens do provide effective protection against profit shifting although the protection is partly eroded by conduit structures. Also contrary to our results in section 4, we establish a link between the size of a country and the withholding tax rate it applies in equilibrium. In particular, the incentive to employ low fiscal barriers is larger for small countries because a given amount of profits earned by providers of tax planning services has a larger weight in small countries than in large countries. Although, we cannot conclude that the smallest countries necessarily belong to the group of low-barrier countries, our model seems to suggest at least some correlation between country size and withholding taxes.

5.6 Corporate taxes

In this section, we compare optimal corporate tax rates in high-barrier and low-barrier countries. Generally, this comparison depends on the properties of $H(c_i)$. In order to rule out the possibility that implausible distributional properties of c_i drive our results, we impose the following assumption:

Assumption 2: *The cost parameter c_i is uniformly distributed over $[0; c]$*

which implies that $h(c_i)$ equals a constant over the entire interval $[0; c]$. We are now prepared to state our final proposition:

Proposition 5 *Assume that $b_i = \alpha c_i$. In equilibrium, the corporate tax rate t^P may be higher or lower in high-barrier countries (i.e. $t^W > 0$) than in low-barrier countries ($t^W = 0$).*

To prove proposition 4, we compare the (inverse) marginal cost of raising public funds with t^P in a high-barrier country and a low-barrier country. The former is given by either (31) or (32) depending on the relative size of δ and $\frac{\rho}{\alpha}$ whereas the latter is given by (22). We first note that at any given corporate tax rate $\overline{\varepsilon}'$ is numerically smaller than $\overline{\varepsilon}'''$ since there is a smaller weight on ε^L in the former expression than in the latter. Similarly, $\overline{\varepsilon}'$ is numerically smaller than $\overline{\varepsilon}''$ because there is a smaller weight on ε^L and a positive wight on ε^H in the former expression. This implies that the marginal deadweight loss on the real investment side is unambiguously smaller in a low-barrier country than in a high-barrier country, which is related to the fact that low-barrier countries are more exposed to profit shifting than high-barrier countries. Conversely,

comparing (22) to (31) and (32) and using that at any given corporate tax rate $\overline{k}'$ is smaller than both $\overline{k}''$ and $\overline{k}'''$, we note that the marginal deadweight loss on the financial side is unambiguously larger in a low-barrier country than in a high-barrier country. On balance, it is therefore ambiguous whether the marginal deadweight loss of rasing revenue with t^C is largest in low-barrier countries or high-barrier countries, hence it is indeterminate where the corporate tax rate is higher.

6 Conclusion

The most important lesson to draw from our analysis is that although abolishing withholding taxes on capital flows between a group of countries generates economic gains in terms of cross-border market integration, it is also likely to have a cost in terms of increased exposure to profit shifting. This is because free capital flows between a group of countries allows MNCs to establish complex holding and finance structures serving to circumvent fiscal barriers to tax havens.

While we make the latter point in the particular context of profit shifting by means of debt finance, we expect it to carry over to other related contexts. For instance, some MNCs have a tax haven entity as the ultimate holding company. Following a line of argument similar to the one presented in section 3, we would expect any single country to protect its domestic tax base by setting a prohibitive withholding tax rate on dividend flows to tax havens. When a group of countries create a CCM by abolishing withholding taxes on dividend payments within the CCM, we would expect MNCs to set up more elaborate holding structures where the intermediate holding company, which is paying dividends to the ultimate holding company, is located in the country within the CCM employing the lowest withholding tax rate on dividends paid to tax havens.[21] Like in our model in section 4 and 5, this would trigger a tax competition dynamics where countries compete the fiscal barriers to tax havens down to sub-optimal levels.

Our model seems to have a straightforward policy implication: When a group of countries create a CCM, they would be better off setting a common external fiscal barrier applying to all capital flows from firms within the CCM to tax havens rather than letting each individual country set its own external fiscal barrier. This would prevent the downward pressure on fiscal barriers to tax havens implied by propositions 2 and 4. There are, however, at least two important qualifications to this argument.

Firstly, our analysis ignores the role of countries outside the CCM. If the CCM seeks to achieve some degree of economic integration with certain partner countries by employing moderate or low withholding taxes on interest flows, there is a risk that such partner countries would seek a role as conduit country for firms located within the CCM. One may imagine that the CCM would only concede the partner status to countries agreeing to maintain high fiscal

[21] Council Directive of 23 July 1990 (90/435/EEC) eliminated withholding taxes on dividend flows between related companies resident within the EU.

barriers to tax havens thus suppressing the obvious possibility of triangular conduite finance structures but firms may still set up quadrangular conduite finance structure whereby interest payments are directed to tax havens through a partner country and a fourth country with low fiscal barriers to tax havens. Generally, we believe that any system of differentiated fiscal barriers to capital flows is prone to the tax competition dynamics decribed in this paper.

Secondly, even if it were possible to enforce high effective fiscal barriers to tax havens, which would benefit the CCM as a whole, it would not necessarily be in the interest of all countries. It follows from the model set up in section 5 that the benefits of profit shifting reaped by small countries in the form of profits earned by providers of tax planning services may far outweigh the cost of having a distortive zero withholding tax rate on cross-border debt.[22] Whether larger countries are able to impose a socially superior coordinated policy against the interest of smaller countries largely depends on the political and institutional framework and such an analysis falls outside the scope of this paper.[23]

7 Literature

Bucovetsky, S. (1991): "Asymmetric tax competition", *Journal of Urban Economics* 30 vol. 2, p. 167-181

Bucovetsky, S. (2007): "Honor among Tax Havens", unpublished manuscript, York University

Desai, M., Foley, F. and Hines, J. (2004): "A Multinational Perspective on Capital Structure Choice and Internal Capital Markets", *The Journal of Finance*, Vol LIX, No.6,

Dharmapala and Hines (2006): "Which Countries Become Tax Havens?", NBER 12802

Eijffinger, S.C.W. and Wagner, W. (2001): "Taxation if Capital is Not Perfectly Mobile: Tax Competition versus Tax Exportation", CEPR 3084

Haufler, A. and Schjelderup, G. (2000): "Corporate Tax Systems and Cross Country Profit Shifting", *Oxford Economic Papers* 52; p. 306-325

Hines, J. (1999): "Lessons from Behavioural Responses to International Taxation", *National Tax Journal*, vol. 52, 2; p. 305-322

Hong, Q. and Smart, M. (2007): "In praise of Tax Havens: International Tax Planning and Foreign Direct Investment", CESifo 1942

Huizinga, H., Laeven, L. and Nicodeme, G. (2007): "Capital Structure and International Debt-Shifting", IMF WP/07/39

Huizinga, H. and Nielsen, S.B. (1997): "Capital income and profit taxation with foreign ownership of firms", *Journal of International Economics* 42, p.149-165

[22] This is similar to the result due to Bucovetsky (1991) that tax competition for real investment may improve the welfare of sufficiently small countries.

[23] In the EU, for instance, decisions regarding direct taxes are taken by unanimity.

Johannesen, N. (2008): "Tax Competition for Profits, Asymmetric Equilibrium and Beneficial Tax Havens", unpublished manuscript, University of Copenhagen

Keen, M. (2001): "Preferential tax regimes can make tax competition less harmful", *National Tax Journal*, Vol LIV, No.4, p. 757-762

Mintz (2004): "Conduit Entities: Implications of Indirect Tax-Efficient Financing Structures for Real Investment", *International Tax and Public Finance* 11, p. 419-434.

Mintz, J. and Smart, M. (2004): "Income Shifting, Investment and Tax Competition: Theory and Empirical Evidence from Provincial Taxation in Canada", *Journal of Public Economics* 88; p. 1149-1168

Schön, W. (2005): "Playing different games? Regulatory competition in tax and company law compared", *Common Market Law Review* 42; p. 331-365

Wilson, J., Wildasin, D. (2004): "Capital tax competition: bane or boon", *Journal of Public Economics* 88, p.1065-1091.

Table 1: Capital tax rates, May 2008

	Corporate tax rate	Withholding taxes employed by countries (rows) on interest payments to corporations in countries (columns)																				
		NT*	AUS	AUT	BEL	CAN	DEN	FIN	FRA	GER	IRE	ITA	JAP	LUX	NED	NZ	NOR	POR	SPA	SWE	CHE	UK	USA
AUS	30	10	X	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
AUT	25	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BEL	34	15	10	0	X	10	0	0	0	0	0	0	10	0	0	10	15	0	0	0	0	0	15
CAN	34	25	10	10	10	X	10	10	10	10	10	10	10	10	10	15	10	10	15	10	10	10	0
DEN	25	30	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FIN	26	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRA	33	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GER	36**	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0
GRE	25	25	25	10	10	25	8	10	10	10	5	10	25	8	10	25	10	10	8	10	10	0	25
IRE	12	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0
ITA	27	12,5	10	0	0	12,5	0	0	0	0	0	X	10	0	0	10	15	0	0	0	0	0	0
JAP	NA	20	10	10	10	10	10	10	10	10	10	10	X	10	10	20	10	20	10	10	10	10	10
LUX	30	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0
NED	25	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0
NZ	30	15	10	10	10	15	10	10	10	10	10	10	15	15	10	X	10	15	10	10	10	10	10
NOR	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0
POR	26	20	20	10	10	10	10	10	10	10	10	10	20	10	10	10	15	X	10	10	10	10	10
SPA	30	18	10	0	0	15	0	0	0	0	0	0	10	0	0	10	10	0	X	0	0	0	10
SWE	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHE	24**	35	10	0	0	10	0	0	0	0	0	0	10	0	0	10	0	0	0	0	X	0	0
UK	28	20	10	0	0	10	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	X	0
USA	35	30	10	0	15	10	0	0	0	0	0	15	10	0	0	10	0	10	10	0	0	0	X

Source: PriceWaterhouseCoopers, Global Tax Summaries, Data extract on 6 May 2008

Notes: Rules are generally complex and the rates presented here are the rates that would - according to our judgment and the information contained in the PwC database - apply to a finance structure as described in the paper.

* Countries with no bilateral tax treaty, e.g. tax havens.

** The rate may vary depending on the physical location of the enterprise