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Corporate tax regime and international allocation of ownership[1]

by

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Abstract

Would the introduction of a corporate tax system with consolidated tax base and formula apportionment lead to socially wasteful mergers and acquisitions across borders? This paper analyzes a two-country model with an international investor considering acquisitions of already existing target firms in a high-tax country and a low-tax country. The investor is able to shift profits from one location to another for tax saving purposes. Two systems of corporate taxation are compared, a system with separate accounting and a system with tax base consolidation and formula apportionment. It is shown that, under separate accounting, the number of acquisitions is inefficiently high in both the high tax and the low tax country. Under formula apportionment, the number of acquisitions is inefficiently high in the low tax country and inefficiently low in the high tax country. Under tax competition, a novel externality arises that worsens the efficiency properties of equilibrium tax rates under separate accounting, but may play an efficiency enhancing role under formula apportionment.

JEL Codes: H25, F23

Keywords: Corporate Taxation, Separate Accounting, Formula Apportionment

1 Introduction

There is a certain tension between the free mobility of goods, production factors and firms in the European common market and the fact that business taxation is still uncoordinatedly determined at the national level. From the viewpoint of multinational firms, decentralized tax policy has its benefits and drawbacks. On the upside, multinationals may benefit from national tax differences by shifting income to low-tax locations and, thus, minimizing their overall tax liability. On the downside, these firms have to cope with different national tax laws, different rules for determining business income etc. However, both of these features of decentralized tax policy are costly from a social point of view. This is why the European Commission (2007a,b) has proposed to replace the current system by a new system with a common consolidated corporate tax base and formula apportionment of business profits to the individual affiliates within a multinational firm. Such a system is supposed to substantially decrease compliance cost and suppress any opportunity of tax-minimizing profit shifting. In the wake of these proposals, there has been an extensive literature on the relative merits of separate accounting (SA) and formula apportionment (FA). This literature generally shows that replacing a system of SA by FA effectively means replacing one set of distortions by another.

Recent interest in mergers and acquisitions (M&A) has renewed the question of which system of corporate income taxation performs better. In fact, although the larger part of cross-border investment takes the form of M&A, almost the entire previous literature on the comparison of SA and FA is based on models where capital is newly invested (greenfield investment). In this paper, we analyze how these two regimes of corporate income taxation affect a multinational's decision to acquire or to merge with other firms and the implications of this decision of corporate income tax competition between countries.

At first glance, it seems evident that the FA system distorts M&A decisions whereas the SA system is potentially efficient. Under SA, taxes are location-specific, i.e. before and after the merger, the same tax rate applies. Thus, both the willingness to acquire and the willingness to sell are equally reduced by the tax which, under plausible assumptions, implies that the M&A decision is not distorted under SA. In contrast, the FA system implies that effective tax rates are

investor-specific, i.e. the effective tax burden depends on where the multinational investor has other production locations and whether they are located in high-tax or low-tax countries. Hence, if positive tax rate differentials exist there are incentives to sell firms from high-tax countries to investors from low-tax countries and vice versa, even though there is no real economic gain from such a transaction.[1] The ownership structure of multinational firms is therefore expected to be distorted by tax rate differentials under FA, but not under SA.[2]

We show that this first glance view may be misleading. Precisely, we demonstrate that the M&A decision of multinationals is also distorted under SA and that this distortion may even be more severe than under FA. We consider a multinational which acquires already existing target firms in two countries. Acquisitions have a real economic effect taking the form of a change in cash-flow (synergy). As a benchmark, we show that, in the absence of profit shifting opportunities, the allocation of ownership is efficient under SA. However, if profit shifting within the multinational is possible, the number of acquisitions is inefficiently high in both countries, i.e. the marginal synergy is negative. The reason is that the multinational balances the negative synergy with the improved profit shifting opportunities of an additional firm. Under FA, in contrast, the number of acquisitions is inefficiently high in the low-tax country and inefficiently low in the high-tax country. The reason is that acquiring firms in the high-tax country increases the effective tax burden and acquiring firms in the low-tax country does the opposite. As a consequence, the multinational balances the synergy effect with the tax consequences of an additional firm and, thus, chooses a negative marginal synergy in the low-tax country and a positive marginal synergy in the high-tax country.

In a second step, we endogenize corporate tax rates by assuming that the two countries engage in tax competition. In the symmetric tax competition equilibrium, the marginal synergy levels are efficient, but the countries' tax rate choices are distorted by fiscal externalities. Under both SA and FA, there is a positive tax base externality. If one country increases its tax rate, the other country's tax

[1] This is always true as long as (after-merger) profits are not perfectly equal across firms and locations.

[2] In a recent contribution, Hines (2010) seems to follow this line of argument concluding that *"the adoption of formula apportionment creates incentives for new forms of tax avoidance through mergers and divestitures."* (p. 117/118)

base increases, under SA because of profit shifting, under FA due to the multinational's incentive to minimize the tax burden via changes in the apportionment shares. In addition, we identify and characterize an M&A externality. Tax rate changes in one country affect the proceeds of selling firms to the multinational in the other country. Under SA, the M&A externality is positive since an increase in one country's tax rate increases the value of an acquired firm in the other country by improved profit shifting opportunities. In contrast, under FA the M&A externality is negative because the tax rate increase in one country reduces the value of the acquired firms in the other country by a rise in the effective tax burden. Taken both fiscal externalities together, we conclude that tax rates are inefficiently low under SA, whereas under FA the negative sign of the M&A externality may render corporate tax rates efficient or inefficiently high.

In the presence of M&A, both corporate tax regimes FA and SA distort the multinational's investment decision and the countries' choice of corporate tax rates. In the end, it is an empirical question under which tax regime the distortions are more severe. In our model, we show that SA is more distortive if concealment costs are sufficiently low so that the multinational's profit shifting incentive is strong. The empirical literature provides a lot of evidence for profit shifting by multinationals,[3] thereby suggesting that tax planning via shifting of paper profits under SA is usually easier for multinational firms than a reallocation of physical capital, the latter of which is source of distortions under FA. Such a view is further supported by evidence reported in Mintz and Smart (2004) who show that under the corporate income tax of Canadian provinces SA generates larger distortions than FA.

Our analysis is related to two strands of literature. The first strand is the steadily growing literature on the comparison of SA and FA, see e.g. McLure (1980), Gordon and Wilson (1986), Mintz (1999), Eggert and Schjelderup (2003), Devereux (2004), Nielsen et al. (2003, 2010), Sørensen (2004), Kind et al. (2005), Fuest et al. (2007), Pethig and Wagener (2007), Riedel and Runkel (2007), Devereux and Loretz (2008), Eichner and Runkel (2008, 2010) and Becker and Fuest (forthcoming). None of these studies considers M&A but they establish some important

[3]For evidence on profit shifting and an overview of recent contributions in this field, see Huizinga and Laeven (2008).

results which relate to ours. On the one hand, they identify a tax base externality, though without referring to M&A. On the other hand, they show that FA may yield inefficient overtaxation and that this inefficiency is less severe than undertaxation under SA if concealment costs are low. However, previous studies do not identify the M&A externality, and this externality is important for two reasons. First, it provides a further, so far neglected, reason for inefficiently high tax rates under FA. Second, as the M&A externality is of opposite sign under the two principles, it worsens efficiency of tax rates under SA, but may play an efficiency-enhancing role under FA. Put differently, taking into account M&A strengthens the argument in favor of a reform that replaces SA by FA.

The second line of literature related to our analysis investigates the tax effects on M&A activities of multinational firms, see e.g. Swenson (1994), Auerbach and Slemrod (1997), Andrade et al. (2001), Desai and Hines (2004), Haufler and Schulte (2009), Becker and Fuest (2007, 2010) and Huizinga and Voget (2010). Becker and Fuest (2009) consider the efficiency properties of source and residence based taxation in a model where investment takes the form of M&A. It is shown that source based taxation is efficient from a global point of view if residence based taxes are ruled out, as reflected in the benchmark result of our analysis. However, they do not consider profit shifting, nor do they analyze a system with FA.

The remainder of the paper is organized as follows. Section 2 presents the basic assumptions. In Section 3 we consider the benchmark of SA without profit shifting. Sections 4 and 5 then consider M&A under SA with profit shifting and under FA, respectively. Section 6 investigates tax competition and Section 7 concludes.

2 Basic model assumptions

Consider a world with two identical countries labeled a and b. In each country there are immobile firms owned by the residents of this country. We refer to these firms as national firms, as opposed to multinational firms which will be introduced below. Without loss of generality, the mass of immobile firms is normalized to one in both countries. Each national firm earns a before-tax profit $\pi > 0$, which is taken as given. The after-tax profit earned by each national firm in country $i \in \{a, b\}$ amounts to $(1 - t_i)\pi$, where t_i is the statutory tax rate of the corporate

income tax imposed by the government of country i.

Next to the national firm sector, there is a sector of multinational firms. The number of multinationals is normalized to unity. The multinational considers acquisitions of national firms in the two countries.[4] If a firm is acquired, the change of ownership is not accompanied by a relocation of real capital. However, the ownership change does have a real economic effect. It changes the cash flow of the target firm in country i by a synergy Δ_i, which is drawn from a uniform distribution over the interval $[\underline{\Delta}, \overline{\Delta}]$ with $\underline{\Delta} < 0 < \overline{\Delta}$. A positive value of the synergy may be interpreted as the result of cost savings due to superior technology or an increase in output value due to access to a brand name or better distribution systems. The synergy may be negative if, e.g., the national firm is forced to adopt standards of the multinational that do not reflect the local conditions properly.

The acquisition price paid by the multinational to the owner of the national firm with synergy Δ_i is denoted by $P(\Delta_i)$. This price crucially depends on the market conditions and the nature of the synergy. Assume, for instance, that the multinational firm just needs a distribution network in the market where the target firms are located. Each target firm could provide this service. In this case, the acquirer would keep the whole surplus. A contrary example is that the synergy is generated by market specific knowledge of the target firm which is worth more if the multinational investor can use it. Then, multinational investors may bid for the target firm and the whole surplus is received by the seller. In order to capture such different cases in a tractable way we denote the surplus generated by acquiring firm Δ_i in country i by $Z(\Delta_i)$ and assume that both parties, seller and acquirer, get a fraction of this surplus. Denoting the acquirer's fraction of the surplus by $\gamma \in [0, 1]$, the price of acquiring firm Δ_i amounts to

$$P(\Delta_i) = (1 - t_i)\pi + (1 - \gamma)Z(\Delta_i). \tag{1}$$

The acquisition price is the sum of the seller's reservation price, equal to the after-tax profit if the firm stays national, and the seller's fraction of the surplus. The

[4] We assume that the acquisition targets are only the national firms. We thus abstract from the possibility that a change in firm ownership occurs between multinational firms. Moreover, there is no choice of organization form, i.e. of becoming a multinational or staying a national firm, like in Bucovetsky and Haufler (2008).

surplus depends on the mode of taxation and is specified below.

3 Benchmark: Mergers and acquisitions under separate accounting without profit shifting

As a benchmark we consider the multinational's M&A decision when it is taxed according to SA and when it does not have the opportunity to shift profit between the countries. SA means that the tax burden of the firms is location-specific. The after-tax profit of firm Δ_i if it is acquired by the multinational thus reads $(1-t_i)(\pi+\Delta_i)$. Subtracting the after-tax profit if the firm stays national gives the surplus of acquiring firm Δ_i in country i, i.e.

$$Z(\Delta_i) = (1-t_i)(\pi+\Delta_i) - (1-t_i)\pi = (1-t_i)\Delta_i. \tag{2}$$

Under SA and in the absence of profit shifting opportunities, the surplus equals the synergy less the tax payments on this synergy.

The multinational decides which of the national firms to acquire. It first purchases the firm with the highest synergy and then successively takes a look at firms with lower synergy. Formally, in country i the multinational determines a cut-off level Δ_i^u such that all firms with $\Delta_i \geq \Delta_i^u$ are acquired, while all firms with $\Delta_i < \Delta_i^u$ are not acquired. The multinational's total after-tax profit thus reads

$$\Pi = \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} \Big[(1-t_i)(\pi+\Delta_i) - P(\Delta_i)\Big] \mathrm{d}\Delta_i. \tag{3}$$

Inserting (1) and (2) into (3) and rearranging gives

$$\Pi = \gamma \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} (1-t_i)\Delta_i \mathrm{d}\Delta_i. \tag{4}$$

The multinational maximizes the after-tax profit (4) with respect to the cut-off

levels Δ_i^u for $i \in \{a, b\}$. The first-order conditions are given by

$$\frac{\partial \Pi}{\partial \Delta_i^u} = -\gamma(1 - t_i)\Delta_i^u = 0, \tag{5}$$

for $i \in \{a, b\}$. It immediately follows

Proposition 1. *Under separate accounting and in the absence of profit shifting opportunities, corporate income taxes do not distort the allocation of ownership across locations and firms, that is* $\Delta_i^u = 0$ *for* $i \in \{a, b\}$.

Proposition 1 implies that all acquisitions yielding a positive synergy are realized, a result earlier derived by Becker and Fuest (2009). The intuition is that corporate income taxes are purely source-based and, thus, perfectly capitalized in share prices. From a different perspective, source-based taxes ensure capital import neutrality and therefore do not distort the ownership structure of multinationals.

It is this benchmark against which Hines (2010), at least implicitly, evaluates the allocative properties of a system with FA. However, this argument neglects why FA is to be introduced in the first place. At least in the context of the European Union, FA is designed to get rid of profit shifting opportunities for multinational firms. But profit shifting opportunities may themselves cause distortions in the pattern of ownership and investment. This will be analyzed in the next section.

4 Mergers and acquisitions under separate accounting with profit shifting

Profit shifting is modeled in the simplest possible way. We introduce a variable s_i which reflects profit shifted to a firm acquired in country i (if $s_i > 0$) or away from a firm acquired in country i (if $s_i < 0$).[5] Usual channels of profit shifting are the manipulation of transfer prices of goods and services traded between the firms within the multinational and the use of internal debt contracts. Profit shifting does not change the multinational's overall before-tax profit. Hence, shifting

[5] Actually, s_i represents profit shifting of the firm characterized by Δ_i, so we have to write $s_i(\Delta_i)$ instead of s_i. However, as profit shifting is the same for all firms in country i and thus independent of Δ_i, as demonstrated below, we omit the firm index Δ_i for notational ease.

from one firm is associated with an equal shifting to another firm. Formally, the multinational faces the shifting restriction

$$\sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} s_i \mathrm{d}\Delta_i = 0. \tag{6}$$

Profit shifting comes at a cost that reflects, e.g., payments for tax consultants or the risk of being detected and penalty payments when shifting breaks tax law. Formally, the concealment cost is given by $C(s_i) = \beta s_i^2/2$ with $\beta > 0$. Hence, it is U-shaped with a minimum at the point where there is no profit shifting.

With profit shifting the after-tax profit of firm Δ_i, if acquired by the multinational, changes to $(1-t_i)(\pi + \Delta_i + s_i) - C(s_i)$.[6] Subtracting again the after-tax profit if the firm is not acquired gives the surplus

$$Z(\Delta_i) = (1-t_i)(\pi + \Delta_i + s_i) - C(s_i) - (1-t_i)\pi = (1-t_i)(\Delta_i + s_i) - C(s_i). \tag{7}$$

The surplus generated by the acquisition thus equals the synergy plus profit shifting, less tax payments on synergy and profit shifting and less concealment cost.

The multinational's after-tax profit in the presence of profit shifting reads

$$\Pi = \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} \Big[(1-t_i)(\pi + \Delta_i + s_i) - C(s_i) - P(\Delta_i)\Big] \mathrm{d}\Delta_i. \tag{8}$$

Employing (1) and (7), equation (8) can be rewritten as

$$\Pi = \gamma \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} \Big[(1-t_i)(\Delta_i + s_i) - C(s_i)\Big] \mathrm{d}\Delta_i. \tag{9}$$

The multinational maximizes the after-tax profit (9) with respect to the cut-off levels Δ_i^u for $i \in \{a, b\}$ and profit shifting s_i for all acquired firms $\Delta_i \geq \Delta_i^u$. In doing so, it takes into account the shifting restriction (6). Denoting the Lagrangian multiplier associated with this restriction by λ and the Lagrangian by L, the first-

[6] We assume that concealment costs are not deductible from the corporate tax base. Changing this assumption does not alter our results, though.

order conditions of the multinational's profit maximization are

$$\frac{\partial L}{\partial \Delta_i^u} = -\gamma \left[(1-t_i)(\Delta_i^u + s_i) - \frac{\beta s_i^2}{2} \right] - \lambda s_i = 0, \tag{10}$$

$$\frac{\partial L}{\partial s_i} = \gamma(1 - t_i - \beta s_i) + \lambda = 0, \tag{11}$$

for $i \in \{a, b\}$. According to equation (11), optimal profit shifting s_i is the same for all firms $\Delta_i \geq \Delta_i^u$ acquired in country i.

From the first-order condition (11) together with the shifting restriction (6), it is straightforward to calculate the multinational's optimal profit shifting as

$$s_i = \frac{t_j - t_i}{\beta} \frac{n_j}{N}, \tag{12}$$

for $i, j \in \{a, b\}$ and $i \neq j$, where $n_i = \overline{\Delta} - \Delta_i^u$ is the number of firms acquired in country i and where $N = n_i + n_j$ represents to total number of firms acquired by the multinational. As can be seen from (12), the multinational shifts profit from the high-tax to the low-tax country. If country i's tax rate is larger than country j's tax rate ($t_i > t_j$), shifting is from country i to country j ($s_i < 0 < s_j$). Moreover, shifting per firm in country i is independent of the firm specific synergy Δ_i and is decreasing in the number of firms acquired in country i, relative to the number of firms acquired in country j.

Inserting (12) in (10) gives the optimal cut-off level for synergy in country i,

$$\Delta_i^u = -\frac{(t_j - t_i)^2}{2\beta(1 - t_i)} \left(\frac{n_j}{N} \right)^2, \tag{13}$$

for $i, j \in \{a, b\}$ and $i \neq j$. From (13) we can prove

Proposition 2. *Under separate accounting and in the presence of profit shifting opportunities and a non-zero tax rate differential $t_i - t_j$, the number of acquired firms is inefficiently high in both countries, i.e. $\Delta_i^u < 0$ for $i \in \{a, b\}$. This distortion is larger in the high-tax country, that is $t_i > t_j$ implies $\Delta_i^u < \Delta_j^u < 0$.*

Proof. Overinvestment $\Delta_i^u < 0$ follows immediately from (13). The relation $\Delta_i^u < \Delta_j^u$ for $t_i > t_j$ is proven by contradiction. Suppose $t_i > t_j$ implies $\Delta_i^u > \Delta_j^u$.

Then (13) and $t_i > t_j$ yield $n_j^2/n_i^2 < (1-t_i)/(1-t_j) < 1$. It follows $n_j < n_i$ and $\Delta_i^u < \Delta_j^u$, a contradiction. ■

Proposition 2 stands in stark contrast to the benchmark result in Proposition 1. If the multinational faces profit shifting opportunities under SA, it overinvests in the sense that it acquires not only those national firms with positive synergy, but also firms which yield a loss of cash flow once they are integrated in the multinational group. This result captures an idea that has been floating around in the public debate for a long time. A multinational firm acquires a domestic firm and destroys part of its value, i.e. decreases its profit. In our model, this happens because the acquisition of an additional firm has a greater value for the multinational than profits and synergy alone. It facilitates profit shifting in the whole enterprise. The multinational therefore balances the negative synergy effect with the improved profit shifting opportunities and overinvests in both countries. Moreover, Proposition 2 shows that overinvestment is more severe in the high-tax country. The intuition for this result is that negative synergies are subsidized by the tax system (i.e. $-t_i\Delta_i > 0$ if $\Delta_i < 0$) and this subsidy is larger in the high-tax country. Hence, the incentive to acquire firms with negative synergy is stronger in the high-tax country than in the low-tax country.

A comparative static analysis will further clarify the intuition of these results. By totally differentiating (13) for $i \in \{a, b\}$, it can be shown that

$$\frac{\partial \Delta_i^u}{\partial t_i} = \frac{n_j(t_j - t_i)}{\beta N^3(1-t_i)J}\left\{\frac{n_j(N-2\Delta_j^u)(2-t_i-t_j)}{2(1-t_i)} - 2n_i\Delta_j^u\right\}, \tag{14}$$

$$\frac{\partial \Delta_i^u}{\partial t_j} = \frac{n_j(t_j - t_i)}{\beta N^3(1-t_i)J}\left\{\frac{2n_i\Delta_j^u(2-t_i-t_j)}{2(1-t_j)} - n_j(N-2\Delta_j^u)\right\}, \tag{15}$$

for $i, j \in \{a, b\}$ and $i \neq j$, where $J > 0$ is the Jacobian determinant of (13) which has to be positive due to second-order conditions. From (14) and (15) we obtain

Proposition 3. *Under separate accounting and in the presence of profit shifting opportunities and a positive tax rate differential $t_i - t_j > 0$, an increase in t_i increases the number of acquisitions in both countries, i.e. $\partial\Delta_i^u/\partial t_i$, $\partial\Delta_j^u/\partial t_i < 0$, whereas an increase in t_j does the opposite, i.e. $\partial\Delta_i^u/\partial t_j$, $\partial\Delta_j^u/\partial t_j > 0$.*

Proposition 3 highlights the role of the tax rate differential $t_i - t_j$ for the

distortion of the multinational's M&A decision under SA with profit shifting. If country i is the high-tax country and if this country further raises its tax rate, then the multinational acquires more national firms in both countries, since the tax rate differential and, thus, the marginal gain from profit shifting in each acquired firm increases. The opposite effect is obtained if the low-tax country j chooses a higher tax rate because of the fall in the tax rate differential.

5 Mergers and acquisitions under formula apportionment

Under FA, taxable profit of the multinational enterprise is first consolidated and then allocated to each country according to some formula. Due to consolidation the multinational loses its incentive for profit shifting. The consolidated tax base of the multinational can be written as

$$b = \sum_{i \in \{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} (\pi + \Delta_i) \mathrm{d}\Delta_i. \tag{16}$$

The factors entering the apportionment formula usually include indicators of real economic activity such as payroll, property or sales. In our stylized model, we assume that each national firm employs exactly one unit of capital and that the formula uses capital as the only apportionment factor. Hence, the fraction n_i/N of the consolidated tax base b is allocated to country i and taxed at the statutory tax rate t_i. The consolidated tax base of the multinational enterprise is therefore taxed at an effective tax rate given by

$$\tau = \frac{n_i t_i + n_j t_j}{N}. \tag{17}$$

The effective tax rate equals the weighted average of the countries' statutory tax rates, the weights being equal to the apportionment shares in the two countries.

The after-tax profit attributable to firm Δ_i if acquired by the multinational equals $(1-\tau)(\pi+\Delta_i)$. Note that under FA profit is taxed at the effective tax rate τ instead of the statutory tax rate t_i. Subtracting the after-tax profit in case the

firm is not acquired gives the surplus of firm Δ_i. This surplus reads

$$Z(\Delta_i) = (1-\tau)(\pi + \Delta_i) - (1-t_i)\pi = (1-\tau)\Delta_i + (t_i - \tau)\pi. \tag{18}$$

The surplus equals the net-of-tax synergy of firm Δ_i plus the difference of national tax payments to tax payments under FA.

In order to obtain the multinational's after-tax profit under FA, we have to subtract from the consolidated tax base the tax payments and the M&A payments to the owners of the acquired firms. This gives

$$\Pi = (1-\tau)b - \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} P(\Delta_i)\mathrm{d}\Delta_i. \tag{19}$$

By using (1) and (18), equation (19) can be rewritten as

$$\Pi = \gamma\Bigg\{(1-\tau)b - \pi \sum_{i\in\{a,b\}} (1-t_i)n_i\Bigg\}. \tag{20}$$

The multinational maximizes after-tax profit (20) with respect to the synergy cut-off levels Δ_i^u for $i \in \{a, b\}$. The first-order conditions read

$$\frac{\partial \Pi}{\partial \Delta_i^u} = \gamma\left\{(1-\tau)\frac{\partial b}{\partial \Delta_i^u} - b\frac{\partial \tau}{\partial \Delta_i^u} + (1-t_i)\pi\right\} = 0. \tag{21}$$

Taking into account $\partial b/\partial\Delta_i^u = -(\pi+\Delta_i^u)$, $\partial\tau/\partial\Delta_i^u = n_j(t_j - t_i)/N^2$ and $b = \pi N + \tilde{b}$ with $\tilde{b} := \sum_{i\in\{a,b\}} \int_{\Delta_i^u}^{\overline{\Delta}} \Delta_i \mathrm{d}\Delta_i > 0$, condition (21) yields the optimal cut-off levels

$$\Delta_i^u = \frac{(t_i - t_j)n_j\tilde{b}}{(1-\tau)N^2}. \tag{22}$$

This expression immediately yields

Proposition 4. *Under formula apportionment and a non-zero tax rate differential $t_i - t_j$, the number of acquired firms is inefficiently high in the low-tax country and inefficiently low in the high-tax country, that is $t_i > t_j$ implies $\Delta_j^u < 0 < \Delta_i^u$.*

FA prevents firms from tax minimization through profit shifting but introduces

another distortion. The multinational firm hesitates to invest in the high-tax country since this investment would *ceteris paribus* increase the share of the consolidated tax base allocated to the high-tax country and, thus, lead to an increase in the effective tax rate. Hence, the multinational balances the synergy effect against the higher tax payment and acquires not all firms with positive synergy in the high-tax country. Analogously, the multinational prefers purchasing firms in the low-tax country in order to increase the share of the consolidated tax base allocated to this country and, thus, lower the effective tax rate. Hence, the multinational compares the synergy effect with the saved tax payments and takes over some firms with negative synergy in the low-tax country. In sum, we obtain underinvestment in the high-tax country and overinvestment in the low-tax country.

In order to conduct a comparative static analysis, we need the derivatives $\partial\tau/\partial\Delta_i^u = n_j(t_j - t_i)/N^2$, $\partial\tau/\partial t_i = n_i/N$ and $\partial\tilde{b}/\partial\Delta_i^u = -\Delta_i^u$ for $i, j \in \{a, b\}$ and $i \neq j$. By totally differentiating (22), it can then be shown that

$$\frac{\partial\Delta_i^u}{\partial t_i} = \frac{\tilde{b}(1 - t_j)(n_j - \Delta_j^u)}{N^2 J}, \tag{23}$$

$$\frac{\partial\Delta_i^u}{\partial t_j} = \frac{\tilde{b}(1 - t_i)(\Delta_j^u - n_j)}{N^2 J}, \tag{24}$$

for $i, j \in \{a, b\}$ and $i \neq j$, where $J > 0$ is the Jacobian determinant of (22) which is positive due to second-order conditions. Equations (23) and (24) imply

Proposition 5. *Under formula apportionment and a non-negative tax rate differential $t_i - t_j$, an increase in t_i reduces the number of acquisitions in country i and increases the number of acquisitions in country j, i.e. $\partial\Delta_i^u/\partial t_i > 0$ and $\partial\Delta_j^u/\partial t_i < 0$, whereas an increase in t_j does the opposite, i.e. $\partial\Delta_i^u/\partial t_j < 0$, $\partial\Delta_j^u/\partial t_j > 0$.*

Proposition 5 shows the decisive role of tax rate differences for the distortion of the M&A decision under FA. If country i is the high-tax country and if it increases its statutory tax rate, then the tax rate differential further increases and so gives the multinational enterprise a stronger incentive for underinvestment in the high-tax country and overinvestment in the low-tax country. A rise in the statutory tax

rate of the low-tax country has the opposite effect. Put differently, the higher the tax rate differential between the two countries the larger is the distortion of the multinational's M&A decision under FA.

So far, we can conclude that under both tax regimes the ownership structure of multinational enterprises is distorted by differences in statutory tax rates. While under SA this distortion is caused by profit shifting opportunities, under FA the distortion is due to a tax-minimizing choice of the apportionment shares. The difference in the quality of distortions is most obvious for the high-tax country. Whereas acquisitions are inefficiently high under the SA regime, the FA taxation system would reduce the number of acquisitions up to a point at which there are positive synergies which remain unexploited.

6 Tax competition

So far we focused on the multinational's M&A decision and assumed tax rates to be exogenously given. In the following, the analysis is extended to the case where the countries engage in tax competition. In doing so, we suppose each country sets its corporate income tax rate in order to maximize welfare of its residents.

Country i is inhabited by a large number of identical households from which we consider the representative one. Welfare of this household is reflected by the quasi-concave utility function $U(c_i, g_i)$ where c_i is the consumption of a private good and g_i represents consumption of a local public good provided by the government of country i. Private consumption is financed by private income which consists of profit income from national firms that stay national and revenues from selling national firms to the multinational.[7] Public consumption in country i is financed by the revenues from the corporate income tax. These revenues comprise the tax payments of the firms that stay national and the tax payments of the multinational.

[7]This definition ignores profit income which the household receives if it owns part of the multinational firm, which is equivalent to assuming that the multinational is owned by residents of a third country not explicitly modeled. Assuming partial ownership of the multinational firm would introduce the well established tax exporting effect firstly identified by Huizinga and Nielsen (1997). This effect slightly complicates the analysis but does not change its main conclusions (provided that the tax exporting effect is not too large). For an analysis of the tax exporting effect in the context of SA versus FA, see e.g. Nielsen et al. (2010) and Riedel and Runkel (2007).

The exact calculation of both the income from selling firms to the multinational and the corporate tax revenues depend on the tax principle used.

To start with SA, the private budget constraint of the household in country i equates private consumption and private income. With (1) and (7) we obtain

$$\begin{aligned} c_i &= (1-n_i)(1-t_i)\pi + \int_{\Delta_i^u}^{\overline{\Delta}} P(\Delta_i)\mathrm{d}\Delta_i \\ &= (1-t_i)\pi + (1-\gamma)\int_{\Delta_i^u}^{\overline{\Delta}} \Big[(1-t_i)(\Delta_i+s_i) - C(s_i)\Big]\mathrm{d}\Delta_i. \end{aligned} \tag{25}$$

The public budget constraint in country i equates the expenditures for the local public good and the corporate tax revenues. It reads

$$g_i = (1-n_i)t_i\pi + t_i\int_{\Delta_i^u}^{\overline{\Delta}} (\pi+\Delta_i+s_i)\mathrm{d}\Delta_i. \tag{26}$$

Country i chooses its tax rate t_i in order to maximize $u_i = U(c_i, g_i)$ subject to (25) and (26). In doing so, it takes as given the tax rate of country $j \neq i$. Hence, we consider a Nash tax competition game between the two countries. The equilibrium is determined by $\partial u_i/\partial t_i = 0$ for $i \in \{a, b\}$. We follow most previous studies and consider the symmetric equilibrium with $t_i = t$, implying that $\Delta_i^u = 0$ and $n_i = n$ for $i \in \{a, b\}$. Hence, in the equilibrium of the tax competition game the ownership structure is efficient. This does not imply, however, that the corporate tax rates are efficient, too. The efficiency properties of the equilibrium tax rate t can be determined by fiscal externalities which give the effect of one country's tax rate on the other country's welfare. If the externality is positive (negative), the equilibrium tax rate is inefficiently low (high).

Under SA, we obtain the fiscal externalities by differentiating $u_i = U(c_i, g_i)$ with respect to t_j, taking into account (12), (25), (26) and $\partial\Delta_i^u/\partial t_j = 0$ for $i, j \in \{a, b\}$ from (14) and (15). The result is

$$\frac{\partial u_i}{\partial t_j} = \mathrm{ME}_{\mathrm{SA}} + \mathrm{TE}_{\mathrm{SA}}, \tag{27}$$

with

$$\mathrm{ME_{SA}} = U_c \frac{\partial c_i}{\partial s_i}\frac{\partial s_i}{\partial t_j} = U_c \frac{n(1-\gamma)(1-t)}{2\beta} > 0,\ \mathrm{TE_{SA}} = U_g \frac{\partial g_i}{\partial s_i}\frac{\partial s_i}{\partial t_j} = U_g \frac{tn}{2\beta} > 0. \tag{28}$$

According to (27) and (28), the total cross country externality of a tax rate increase can be decomposed into two sub-externalities. First, if country j raises its tax rate, the multinational shifts more profit to country i. This improves the tax base and welfare in country i and constitutes the positive tax base externality $\mathrm{TE_{SA}}$ which points to inefficient undertaxation. Second, the increase in country j's tax rate and the associated increase in profit shifting to country i raise the value of a national firm in country i. Hence, for a given negotiation power γ, the initial owner of a firm in country i is able to get a higher price when the firm is acquired by the multinational. This raises private income in country i and constitutes the positive M&A externality $\mathrm{ME_{SA}}$ which is positive, too, and aggravates undertaxation. While the tax base externality is known from previous studies, the M&A externality is novel. Previous studies do not obtain this externality since they ignore M&A activities and, thus, also the revenues of initial owners from selling their firms to multinational enterprises.

Let us now turn to FA. Using (1) and (18), the private budget constraint of the household in country i can be written as

$$\begin{aligned} c_i &= (1-n_i)(1-t_i)\pi + \int_{\Delta_i^u}^{\overline{\Delta}} P(\Delta_i)\mathrm{d}\Delta_i \\ &= (1-t_i)\pi + (1-\gamma)\int_{\Delta_i^u}^{\overline{\Delta}} \Big[(1-\tau)\Delta_i + (t_i-\tau)\pi\Big]\mathrm{d}\Delta_i. \end{aligned} \tag{29}$$

The public budget constraint in country i reads

$$g_i = (1-n_i)t_i\pi + t_i\frac{n_i b}{N} = t_i\pi + t_i\frac{n_i\tilde{b}}{N}. \tag{30}$$

Country i maximizes welfare $u_i = U(c_i.g_i)$ with respect to the tax rate t_i, taking into account the budget constraints (29) and (30). The Nash equilibrium of this tax competition game is determined by $\partial u_i/\partial t_i = 0$ for $i \in \{a, b\}$. The focus is

again on the symmetric equilibrium with $t_i = t$ implying $\tau = t$, $\Delta_i^u = 0$ and $n_i = n$.

The symmetry property implies $\partial\tau/\partial\Delta_i^u = \partial\tau/\partial\Delta_j^u = 0$ and, thus, $\partial c_i/\partial\Delta_i^u = \partial c_i/\partial\Delta_j^u = 0$ by (29). Moreover, from (30) and symmetry we obtain $\partial g_i/\partial\Delta_i^u = -\partial g_i/\partial\Delta_j^u = -t\tilde{b}/4n$. The comparative static results in (23) and (24) simplify to $\partial\Delta_i^u/\partial t_i = -\partial\Delta_i^u/\partial t_j = \tilde{b}/4n(1-t)$, where we take into account $J = (1-t)^2$. The fiscal externalities under FA can then be computed as

$$\frac{\partial u_i}{\partial t_j} = \mathrm{ME}_{\mathrm{FA}} + \mathrm{TE}_{\mathrm{FA}}, \tag{31}$$

with

$$\mathrm{ME}_{\mathrm{FA}} = U_c \frac{\partial c_i}{\partial t_j} = -U_c \frac{1-\gamma}{2} \int_0^{\overline{\Delta}} (\Delta_i + \pi) \mathrm{d}\Delta_i < 0, \tag{32}$$

$$\mathrm{TE}_{\mathrm{FA}} = U_g \left[\frac{\partial g_i}{\partial \Delta_i^u} \frac{\partial \Delta_i^u}{\partial t_j} + \frac{\partial g_i}{\partial \Delta_j^u} \frac{\partial \Delta_j^u}{\partial t_j} \right] = U_g \frac{t\tilde{b}^2}{8(1-tn^2)} > 0. \tag{33}$$

Equations (31)–(33) show that the total cross-country externality of a tax rate increase can again be decomposed into two sub-externalities. First, if country j raises its tax rate, the multinational reduces M&A in country j and increases it in country i. This increases the share of the multinational's consolidated tax base assigned to country i and, thus, tax revenues of country i. We obtain a positive tax base externality $\mathrm{TE}_{\mathrm{FA}}$ that renders tax rates inefficiently low. Second, the increase in country j's tax rate raises the effective tax rate of the multinational. This reduces the surplus of a national firm if it is integrated into the multinational. The acquisition price for a firm in country i falls, so private income in country i is reduced. The result is a negative M&A externality $\mathrm{ME}_{\mathrm{FA}}$ that points into the opposite direction than the tax base externality and may even cause inefficient overtaxation. Again, the tax base externality is already known from previous studies, but the M&A externality is novel since the previous literature does not discuss the impact of FA on M&A decisions of multinational firms.

From (27), (28) and (31)–(33) we immediately obtain

Proposition 6. *Suppose the tax competition game between the two countries attains a symmetric equilibrium. Then the equilibrium tax rate is* (*i*) *inefficiently low*

under separate accounting, (ii) inefficiently low or high under formula apportionment and (iii) more efficient under formula apportionment than under separate accounting if the concealment cost parameter β is not too high.

Under SA, the tax base externality and the M&A externality are both positive. The countries therefore choose tax rates that are lower than the efficient ones. In contrast, under FA the tax base externality is positive, while the newly derived M&A externality is negative. If the latter externality overcompensates the former, the countries end up with inefficiently high tax rates. In addition, for low values of the concealment cost parameter β the multinational's incentive to shift profit between the two countries is high. In such a case, both the tax base externality and the M&A externality are large under SA and the sum of the two externalities is (absolutely) larger under SA than under FA. The consequence is that replacing SA by FA shifts the tax rates closer to their efficient level.

The novelty of Proposition 6 is twofold. First, it derives a new reason why corporate tax rates under FA may be inefficiently high. Previous studies have already proven the possibility of overtaxation, see e.g. Nielsen et al. (2010) and Eichner and Runkel (2008). But they do not take into account M&A and therefore cannot identify the M&A externality as a possible reason for inefficiently high tax rates. Second, previous studies also have already proven the result that for low concealment cost FA is superior to SA.[8] But again, they ignore M&A activities of multinationals and, thus, the M&A externality. As this externality is of opposite sign under the two tax principles, it worsens efficiency of tax rates under SA, but plays an efficiency-enhancing role under FA. Put differently, taking into account M&A strengthens the argument in favor of a switch from SA to FA.

7 Conclusion

In this paper we have investigated how taxes affect the decisions of multinational firms to acquire other firms. We have compared two different regimes of corporate taxation, a system with SA and a system with a consolidated corporate tax base

[8] Eichner and Runkel (2010) even identify empirically relevant cases where the superiority of FA holds independent of the size of the concealment cost.

and FA. Our results imply that both tax regimes distort the international allocation of ownership. Under SA, the multinational firm acquires too many firms in low-tax and high-tax countries due to additional profit shifting opportunities related to the acquisition of firms. Under FA, the number of acquisitions is too high in low-tax countries and too low in high-tax countries since these distortions allow the multinational to lower its effective tax burden by changes in the apportionment shares. Under tax competition, a novel M&A externality of corporate taxation arises which aggravates inefficient undertaxation under SA, but may increase efficiency of tax rates under FA. Overall, we may conclude that, contrary to recent claims expressed, for instance, by Hines (2010), SA distorts the allocation of ownership and that this distortion may even be more severe than under FA.

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