

# Multinationals, Minority Ownership and Tax-Efficient Financing Structures \*

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## Abstract

We model how multinationals structure their borrowing and lending transactions and find that affiliates in high-tax countries have higher internal and overall debt ratios and lower rental rates of physical capital than comparable domestic firms. We also show that affiliates with minority owners have less debt than wholly owned affiliates.

**Keywords:** Multinational enterprises, tax-efficient financing structures, minority ownership

**JEL classification:** H25, F23

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# 1 Introduction

Many multinational companies use an internal banking and coordination center. One example is Statoil, one of the largest oil companies in the world, whose internal bank and coordination center is located in the small town of Mechelen in Belgium. The center serves approximately 130 affiliates worldwide, and made a profit of 300 million euro in 2005.<sup>1</sup> One reason why Belgium is so popular among multinationals may be the Belgian coordination regime, which provides widespread tax benefits for multinationals with group finance centers in Belgium. Under this system the tax base of the internal bank consists of costs minus wages and financial costs. After these deductions, the tax base is increased by 8 percent and subject to a tax rate of 34 percent.<sup>2</sup>

It is well known that multinationals can use internal debt to save tax payments by utilizing differences in national tax rates. Less understood is how minority ownership affects tax-efficient financing structures in multinationals. Multinationals often have the option to own 100%, the majority, or be in a minority position in newly created foreign entities. We set up a simple model of how a multinational structures its financial transactions and show that multinationals with tax-efficient financing structures have higher internal and overall debt ratios and lower rental rates of physical capital than comparable domestic firms. We also find that affiliates with minority owners use less internal debt than comparable affiliates without minority owners and thus engage less in tax avoidance strategies. This result is in stark contrast to the literature on transfer pricing where it has been shown that minority ownership increases profit shifting by transfer pricing since multinationals

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<sup>1</sup>A feature article on this bank was provided in Dagens Næringsliv 7 May 2007, pages 16-17. See also: <http://www.atel.lu/atel/fr/conferences/reunions/20010620/Statoil%20Internal%20Bank%20presentation%20ATEL.pdf>

<sup>2</sup>This system is under pressure from the EU, but it will at least be in place for the year 2010 if not longer. A new system called the Notational Deduction (NID) system has already been set up as an alternative for multinationals seeking tax-effective finance company arrangements.

want to avoid sharing profits with minority owners (see Kant, 1988).

The reason why affiliates with minority owners have less internal debt is due to a positive externality. Minority owners benefit in full from tax planning, but do not wholly contribute to the set up of a tax-efficient financing structure. The implication is that the multinational firm cannot internalize the benefits of tax planning in affiliates with minority owners. Consequently, such affiliates have less tax-efficient financing structures and less internal debt. Our result suggests that whole ownership should be most common in affiliates that benefit the most from a tax-efficient financing structure, and that these affiliates should be located in high-tax countries. Furthermore, affiliates with minority owners should have higher tax payments than wholly owned affiliates, other things being equal.

Our model is related to a small but growing literature on multinationals and their tax-efficient structures. Mintz and Smart (2004) show how multinationals may use direct financial techniques, such as lending among affiliates, to reduce tax payments. They then test their model on Canadian data finding support for the hypothesis that this type of income shifting has pronounced effects on provincial tax bases. Mintz (2004) investigates how a multinational parent can use conduit companies to create a chain of companies to shift funds and obtain at least two deductions of interest.<sup>3</sup> Finally, Weichenrieder (2008) studies profit shifting using a theoretical model with minority ownership. His model is focused on traditional transfer pricing and FDI rather than on tax-efficient financing structures. Using German data on inbound and outbound FDI, he finds a strong empirical correlation between the home country tax rate of the parent and the net profitability of its German affiliate that is consistent with profit shifting behavior.

There is also an empirical literature on tax-efficient financing structures that confirms the results we derive in our model. A discussion of this lit-

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<sup>3</sup>See also Mintz and Weichenrieder (2007) for a more elaborate model of holding companies and ownership chains. Less related but in the same vein are Fuest and Hemmelgarn (2005) who study profit shifting through thin capitalization in a setting of tax competition.

erature is deferred to Section 4. Below, Section 2 outlines the basic model, while Section 3 analyzes the optimal tax avoidance strategies of a multinational that uses debt to reduce tax payments. Section 4 discusses and relates our results to existing empirical studies, whilst Section 5 offers some concluding remarks.

## 2 The Model

Consider a national firm which can invest in  $n$  countries. The price-taking firm employs  $K_i$  units of capital and  $L_i$  units of labor in order to produce  $F(K_i, L_i)$  units of an output good whose price is normalized to one. The production function  $F(K_i, L_i)$  exhibits positive and decreasing returns to each input, i.e.  $F_x > 0$  and  $F_{xx} < 0$  for  $x \in \{K_i, L_i\}$ . Capital is assumed to be perfectly mobile and the rental cost of capital per unit is  $r > 0$  and is assumed to be fixed (i.e., the usual small country assumption). When the firm invests in another country, it becomes a multinational firm (MNC). We assume that the MNC owns at least the majority of each affiliate and the sum of minority shares in affiliate  $i$  is  $J_i < 50\% \forall i$ . The MNC seeks to maximize its share in overall profits after corporate taxation, aggregated over all affiliates.

The focal point here is to investigate how the firm can save tax payments by a strategy of borrowing and lending among affiliates incorporated in different countries. We do not model a preferential tax for financial centers (such as the Belgian). Rather the purpose of our model is to investigate how differences in national tax rates and minority ownership affect tax-efficient financial structures. In undertaking this analysis we shall assume without any consequence for our results that debt is fully tax deductible in any country.

The firm finances its investments in country  $i$  by equity (and retained earnings)  $E_i$  or debt  $D_i$ . Debt  $D_i$  can be further classified as external debt ( $D_i^E$ ) or internal debt ( $D_i^I$ ), where internal debt is obtained by borrowing

from related affiliates. We define  $K_i$  as the total capital employed by affiliate  $i$ , and let  $\alpha_i = D_i^E/K_i$  be the external debt to capital ratio, and  $\sigma_i = D_i^I/K_i$  the internal debt to capital ratio. The overall leverage ratio of the firm can be expressed as  $b_i = \alpha_i + \sigma_i = (D_i^E + D_i^I)/K_i$ . Within the multinational firm it must be the case that the sum of interest payments on internal borrowing and lending is zero across all affiliates, that is,

$$\sum_i r \cdot D_i^I = \sum_i \sigma_i \cdot r \cdot K_i = 0$$

We follow most of the literature on debt structure by assuming that there are costs per unit capital associated with borrowing that are given by the function  $C = C(\alpha_i, \sigma_i)$ .<sup>4</sup> For internal debt, these costs may be due to the use of lawyers and accountants to avoid that such transactions are restricted by thin capitalization or controlled foreign company rules.<sup>5</sup> For external debt these costs may pertain to informational asymmetries between investors and managers of the firm. There is an optimal leverage ratio  $\bar{\alpha}_i$  for external debt in the absence of taxes.<sup>6</sup> The reason is that external debt is useful in order to discipline local managers from lax management and “empire-building” strategies. However, if the leverage ratio goes up, the risk of bankruptcy increases and may cause bankruptcy costs or induce the local managers to become too risk-averse. Increasing external debt from a leverage ratio  $\alpha_i < \bar{\alpha}_i$  will then decrease leverage costs, whereas any increase for  $\alpha_i \geq \bar{\alpha}_i$  will cause positive marginal costs of (external) leverage.

It follows from the discussion above that the costs and benefits of internal

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<sup>4</sup>See for example Mintz and Smart (2004) and Fuest and Hemmelgarn (2005).

<sup>5</sup>Thin capitalization rules are in place in many countries. For a recent survey on US rules see Haufler and Runkel (2008); and Weichenrieder and Windischbauer (2008) on the German tax code. Gouthière (2005) and Dourado and de la Feria (2008) describe thin capitalization rules for most OECD and EU countries. Controlled foreign company rules are in place, e.g., in the US and Germany and they deny tax-exemption of passive income in the home country of the MNC, provided that tax avoidance is suspected (see Ruf and Weichenrieder, 2008).

<sup>6</sup>See, e.g., Fuest and Hemmelgarn (2005), p. 513, or Huizinga et al (2008), p. 94.

and external debt are very different. Internal debt should rather be seen as tax-favored equity, as it does neither affect, e.g., the risk of bankruptcy nor reduce any informational asymmetry or tighten hands of managers.<sup>7</sup> In line with this reasoning we assume that the cost function is additively separable, that is  $C(\alpha_i, \sigma_i) = C_\alpha + C_\sigma$ , as long as external credit markets are perfect. We shall also assume that the cost function is convex in  $\alpha$  and in  $\sigma$ . The convexity related to internal debt ( $\sigma$ ) is due to the fact that additional effort needs to be made to conceal the true nature of the transaction from the tax authorities, whilst the convexity for external debt can be associated with a higher premium due to informational asymmetries. Formally the properties applied to the cost function can be summarized as

**Assumption 1** *External credit markets are assumed to be perfect. The cost function related to borrowing external and internal debt is additively separable,  $C(\alpha_i, \sigma_i) = C_\alpha + C_\sigma$ , and exhibits*

$$\begin{array}{ll}
C_\alpha(\alpha_i) > 0 & \text{with} \quad C'_\alpha(\alpha_i) > 0, \quad C''_\alpha(\alpha_i) > 0, \quad \text{if} \quad \alpha_i \geq \bar{\alpha}_i \\
& & C'_\alpha(\alpha_i) < 0, \quad C''_\alpha(\alpha_i) > 0, \quad \text{if} \quad \alpha_i < \bar{\alpha}_i \\
C_\sigma(\sigma_i) > 0 & \text{with} \quad C'_\sigma(\sigma_i) > 0, \quad C''_\sigma(\sigma_i) > 0, \quad \text{if} \quad \sigma_i > 0 \\
C_\sigma(\sigma_i) = 0 & \text{with} \quad C'_\sigma(\sigma_i) = 0, \quad \text{if} \quad \sigma_i \leq 0.
\end{array}$$

It follows from Assumption 1 that if an affiliate lends money to a related affiliate, there are no costs associated with lending.

### 3 Optimal Investments

The multinational firm consists of  $n$  entities (subsidiary firms). Each subsidiary is either fully owned ( $J_i = 0$ ), or has minority owners ( $J_i < 50\%$ ).

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<sup>7</sup>In line with this Chowdhry and Coval (1998) p. 87f, and Stonehill and Stitzel (1969) also argue that internal debt should be seen as tax-favored equity.

The MNC maximizes its net after-tax global profits,

$$\Pi = \sum_{i=1}^n (1 - J_i) (\pi_i - t_i \pi_i^t), \quad (1)$$

where  $\pi_i$  is economic profit in subsidiary  $i$ ,  $\pi_i^t$  is taxable profit, and  $t_i$  is the corporate tax rate in country  $i$ . Many countries as well as the European Union uses the tax-exemption principle whereby repatriated dividends to a parent firm are exempted from home taxation. We shall therefore assume this to be the case throughout the analysis.<sup>8</sup>

True economic profit is given by revenue from the sale of an output good minus labor costs and the user costs of capital,

$$\pi_i = F(K_i, L_i) - w_i \cdot L_i - [r + C_\alpha(\alpha_i) + C_\sigma(\sigma_i)] \cdot K_i, \quad (2)$$

where  $w_i$  is the wage rate,  $r$  is the world market interest rate, and  $L_i$  is labor employed. Taxable profit differs from true economic profit in that only labor expenses and borrowing costs are tax deductible,

$$\pi_i^t = F(K_i, L_i) - w_i \cdot L_i - r \cdot (D_i^E + D_i^I) - [C_\alpha(\alpha_i) + C_\sigma(\sigma_i)] \cdot K_i.$$

In defining taxable profit we have assumed that costs per unit of capital associated with both external and internal borrowing are tax deductible. Such costs may in part be associated with informational asymmetries between investors and managers or with acts in violations of the tax code, and it could be argued that such costs should not be tax deductible. It is straightforward to show by examination of the equations to follow that the inclusion of these as tax deductible does not affect our results. Rearranging taxable profit we

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<sup>8</sup>The tax exemption principle is given by the Parent-Subsidiary Directive in the European Union. Altshuler and Grubert (2002) study the effects of repatriation taxes and the strategies used to avoid them using US data.

obtain

$$\pi_i^t = F(K_i, L_i) - w_i \cdot L_i - [r \cdot (\alpha_i + \sigma_i) + C_\alpha(\alpha_i) + C_\sigma(\sigma_i)] \cdot K_i, \quad (3)$$

where capital invested in country  $i$  is financed either by debt  $D_i = D_i^I + D_i^E$  or by equity  $E_i$ ,

$$K_i = D_i^I + D_i^E + E_i.$$

In line with most countries' tax code we shall assume that equity  $E_i$  is not tax deductible. In the next subsections the objective is to characterize the optimal financial structure and production decision of the multinational firm. Our focal point, however, will be on how the multinational firm can legally save tax through tax planning and the use of an internal banking system. We start by considering the profit maximizing financial structure and then proceed by examining optimal supply of the final good.

We shall maximize the value of the multinational firm after corporate taxes, neglecting any effect that personal taxes may have. This is in line with most of the literature on multinationals and is reasonable since multinationals are either owned by many institutional investors or shareholders located in different countries.<sup>9</sup>

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<sup>9</sup>It can be shown that from the viewpoint of a shareholder in a multinational firm, maximizing profits of the MNC after global corporate taxation and maximizing the net pay-off on equity investment after opportunity costs and personal (income) taxes, yield identical results under mild assumptions. For example, if corporate taxes cannot be deducted against personal income tax and if the personal tax rate on dividends and interest income is the same, it is straightforward to show that maximizing the value of the firm to the owner and maximizing corporate profits coincidence. These restrictions are fulfilled for a wide range of real world tax codes: the classical corporate taxation system (e.g., in the US), the new German system starting in 2009 ("Abgeltungssteuer"), where interest income, dividends and capital gains are taxed at 25% and deductions for corporate taxes are not possible, and the Norwegian shareholder tax, introduced in 2006.

### 3.1 Profit maximizing financial structure

The maximization procedure of the firm can be seen as a two-tier process whereby the financial structure is first optimized and then the firm decides on how much of the final good to produce in each country. Thus, taking real investment  $K_i$  as fixed initially the firm's optimal financial structure is found by maximizing equation (1). Inserting for  $\pi_i$  and  $\pi_i^t$  and collecting terms, the maximization problem is given by

$$\begin{aligned} \max_{\alpha_i, \sigma_i} \sum_i (1 - J_i) \cdot \{ & (1 - t_i) \cdot [F(K_i, L_i) - w_i \cdot L_i] \\ & - K_i [r(1 - t_i \cdot [\alpha_i + \sigma_i]) + (1 - t_i) \cdot (C_\alpha(\alpha_i) + C_\sigma(\sigma_i))] \} \quad (4) \\ \text{s.t. } \sum_i \sigma_i \cdot r \cdot K_i & = 0 \end{aligned}$$

It is seen from equation (4) that minority ownership in country  $i$  reduces the profit in country  $i$  and thus global after-tax profit as well. It does not, however, affect the constraint that all interest payments between affiliates must sum up to zero.

The first order conditions to the maximization problem above are given by:

$$C'_\alpha(\alpha_i) = \frac{t_i}{1 - t_i} \cdot r > 0 \quad \forall i \quad (5)$$

$$C'_\sigma(\sigma_i) = \left( \frac{t_i \cdot r}{1 - t_i} - \frac{\lambda \cdot r}{(1 - J_i)(1 - t_i)} \right) = \frac{[(1 - J_i) t_i - \lambda] \cdot r}{(1 - J_i)(1 - t_i)} \geq 0 \quad \forall i \quad (6)$$

These first order conditions state that the firm will use both types of debt until the marginal costs associated with each type of debt are equal to the respective marginal tax savings. The effect of taxation is to reduce the cost of external borrowing as is evident from equation (5). All affiliates, therefore, have a tax-induced optimal leverage ratio of  $\alpha^*$ , which is higher than the optimal external debt ratio in the absence of taxation defined as  $\bar{\alpha}$

(so  $\alpha^* > \bar{\alpha}$ ).

As for internal debt, the Lagrangian multiplier  $\lambda$  in equation (6) can be shown to be equal to the minimum effective tax costs  $t^e = (1 - J) \cdot t$ , and hence  $\lambda = \min_i[(1 - J_i) \cdot t_i]$ . We shall assume that there is at least one country, here called country 1, which is a low tax country in the sense that the effective tax payments for the MNC are lower in this country than in others. Thus,  $t_1^e = (1 - J_1) t_1 < (1 - J_i) t_i = t_i^e \forall i \neq 1$  so that  $\lambda = t_1^e$ . The existence of a low tax country means that the affiliate located in this country has the lowest funding costs and thus receives additional equity from the multinational parent, say, equal to  $E^I = -D_1^I = \sum_{i \neq 1} \sigma_i \cdot K_i > 0$ . The implication is that the multinational firm reduces its equity in all affiliates  $i > 1$ , and concentrates its equity  $E_1^I$  in country 1. This country will then conduct the lending operations of the multinational firm.

In order to see how the multinational benefits from utilizing the low-tax country, notice that by endowing its affiliate in the low-tax country with equity and lending money back to affiliates in high-tax countries, the tax savings in high-tax countries exceed tax payments in the low-tax country. It should be pointed out that the lending activities in the low-tax country are loss-making for two reasons:<sup>10</sup> First, we assume that the affiliate in country 1 cannot engage in transfer pricing by charging borrowing affiliates a higher interest rate than its own rate of funding. This is a reasonable assumption since interest rates are easily observed by tax authorities in financial markets. Second, since equity is not tax deductible, lending transactions yield an economic loss due to incomplete tax deductibility.<sup>11</sup> The loss in the affiliate in country 1 from internal lending equals  $-E_1^I \cdot t_1 r$ , which is the opportunity

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<sup>10</sup>That is  $(\pi_1 - t_1 \pi_1^t) < 0$ .

<sup>11</sup>Note, however, that based on accounting values, the low tax affiliate is running a surplus ( $\pi_1^t > 0$ ), since the return to equity is not deducted as a cost. There is indeed evidence (the case of Statoil being one) suggesting that financial centers derive a surplus as well. In addition to interest income, surpluses may also be due to the fact that financial centers can charge service fees.

cost of equity multiplied by the tax rate.<sup>12</sup> However, borrowing affiliates can deduct the cost of internal debt against a higher tax rate than the tax rate in the low tax country. For the multinational firm as a whole, then, the loss by the lending affiliate is more than offset by tax savings in borrowing affiliates.

In order to see how tax policy affects debt structure we find by implicit differentiation for all  $i = 2, \dots, n$ , that

$$\frac{d\alpha_i}{dt_i} = \frac{r}{(1-t_i)^2 \cdot C''_{\alpha}(\alpha_i)} > 0, \quad (7)$$

$$\frac{d\sigma_i}{dt_i} = \frac{(1-J_i) \cdot (1-t_i) + [(1-J_i) \cdot t_i - t_1^e]}{(1-J_i) \cdot (1-t_i)^2 \cdot C''_{\sigma}(\sigma_i)} \cdot r > 0, \quad (8)$$

$$\frac{d\sigma_i}{dt_1^e} = -\frac{r}{(1-J_i) \cdot (1-t_i) \cdot C''_{\sigma}(\sigma_i)} < 0, \quad (9)$$

where  $(1-J_i) \cdot t_i - t_1^e > 0$  due to  $t_1^e = \min_i[(1-J_i) \cdot t_i]$ .

As seen from (7) and (8), an increase in the domestic tax rate  $t_i$  increases marginal tax savings from tax-deductible debt in country  $i$  and leads the firm to increase its leverage ratio of both types of debt (i.e., higher  $\alpha_i$  and  $\sigma_i$ ). In contrast, an increase in the tax rate of the low-tax country ( $t_1^e$ ) makes tax avoidance through internal debt more expensive, because the shifted interest payments now bear a higher tax burden in the tax haven. Consequently, the use of internal debt should decrease in all affiliates – resulting in equation (9).<sup>13</sup>

It follows from conditions (7) to (9) that affiliates in high-tax jurisdictions have higher internal debt ratios than affiliates in low-tax jurisdictions. Furthermore, since purely domestic firms cannot engage in cross country tax planning their internal debt ratio should be zero. Notice that external debt ratios are the same for all firms within the same country as long as As-

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<sup>12</sup>Omitting sales and leverage costs ( $C_{\alpha}$ ) for the purpose of showing this, economic profit from lending by the financial center is  $\pi_1 - t_1\pi_1^t = [\mathcal{L}_1 r - r(D_1^E + E_1^I)] - t_1[\mathcal{L}_1 - rD_1^E]$ , where  $\mathcal{L}_1 = D_1^E + E_1^I$  is lending. Simplifying this expression yields  $\pi_1 - t_1\pi_1^t = -E_1^I \cdot t_1 r$ .

<sup>13</sup>Note that the effective tax rate  $t_1^e$  does not affect external debt as long as external and internal debt are separable in the debt cost function (see Assumption 1).

sumption 1 holds. Consequently, multinationals with tax-efficient financial structures should have higher overall debt ratios than domestic firms in the same industry.

The issue of how minority ownership affects multinational behavior has received substantial attention in the literature on transfer pricing, and it is well known that minority ownership increases the incentive to shift profits (see e.g., Kant, 1988). The reason is that foreign ownership acts as an additional tax on profits, which increases the effective tax rate. Thus, the higher the minority ownership share (and therefore the effective tax rate), the greater is the incentive for the multinational to shift profit away from affiliates with minority owners.

We show a new result. Minority ownership dampens the incentive to shift profit by way of setting up a tax-efficient financing structure. The reason is that tax savings by affiliate  $i > 1$  benefit all owners equally. However, since minority owners do not pay for the cost of equity or debt in the low-tax affiliate, the multinational firm bears the full financing costs, but it cannot internalize the full gain. It is this externality that explains why minority ownership dampens the incentives to use debt in affiliates with minority owners. Formally,

$$\frac{d\sigma_i}{dJ_i} = -\frac{\lambda \cdot r}{C''_{\sigma}(\sigma) \cdot (1 - J_i)^2 \cdot (1 - t_i)} < 0, \quad i > 1. \quad (10)$$

Equation (10) shows that the internal debt ratio falls more rapidly the greater the minority ownership share in affiliate  $i$  ( $J_i$  increases). In contrast, equation (9) shows that if the minority ownership rate rises in the low-tax affiliate, tax planning by debt goes up in all borrowing affiliates. The reason is that the loss incurred by the lending affiliate is then to a larger extent borne by its minority owners making it less costly to fund tax planning by debt.<sup>14</sup>

The optimal internal debt ratio can be deduced by inverting the first

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<sup>14</sup>It should be noted that minority ownership does not affect external debt leverage, because the incentive for external debt is independent of the ownership structure.

order condition (6),

$$\sigma_i^* = C'_\sigma{}^{-1} \left( \left[ \frac{t_i}{1-t_i} - \frac{t_1^e}{(1-J_i) \cdot (1-t_i)} \right] \cdot r \right), \quad (11)$$

and the net gain of tax planning per unit invested in country  $i$  can be written as

$$\psi_i(t_i, t_1^e, J_i) = \left( t_i - \frac{t_1^e}{1-J_i} \right) \cdot r \cdot \sigma_i^* - (1-t_i) \cdot C_\sigma(\sigma_i^*). \quad (12)$$

For  $t_i > \frac{t_1^e}{1-J_i}$  we have  $\sigma_i^* > 0$  and  $\psi_i(t_i, t_1^e, J_i) > 0$ , whereby the latter stems from  $C_\sigma$  being strictly convex for all  $\sigma^* > 0$ . Applying analogous arguments, we get from equation (5) that the optimal external debt ratio in affiliate  $i$  is equal to

$$\alpha_i^* = C'_\alpha{}^{-1} \left( \frac{t_i \cdot r}{1-t_i} \right), \quad (13)$$

and the maximum net gain from external debt per unit capital invested becomes

$$\gamma_i(t_i) = t_i \cdot r \cdot \alpha_i^* - (1-t_i) \cdot C_\alpha(\alpha_i^*) > 0. \quad (14)$$

### 3.2 Optimal real investment and production

Given optimal values  $\alpha_i^*$  and  $\sigma_i^*$ , and therefore optimal net gain functions for external and internal debt ( $\gamma_i$  and  $\psi_i$ ), the effective capital cost ( $\tilde{r}$ ) after taxation in affiliate  $i$  is given by

$$\tilde{r}_i = r - t_i \cdot r \cdot \alpha_i^* + (1-t_i) \cdot C_\alpha(\alpha_i^*) - \left( t_i - \frac{t_1^e}{1-J_i} \right) \cdot r \cdot \sigma_i^* + (1-t_i) \cdot C_\sigma(\sigma_i^*)$$

It is straightforward to simplify this expression as follows

$$\tilde{r}_i = r - \gamma_i(t_i) - \psi_i(t_i, t_1^e, J_i).$$

Using the optimal financial strategies and effective capital costs in the

profit function of the multinational, the maximization problem for the choice of capital and labor is

$$\max_{L_i, K_i} \sum_i (1 - J_i) \cdot \{ (1 - t_i) [F(K_i, L_i) - w_i \cdot L_i] - [r - \gamma(t_i) - \psi_i(t_i, t_1^e, J_i)] \cdot K_i \}.$$

The first order conditions are given by

$$F_L^i = w_i, \quad (15)$$

$$F_K^i = \frac{r}{1 - t_i} - \frac{\gamma_i(t_i)}{1 - t_i} - \frac{\psi_i(t_i, t_1^e, J_i)}{1 - t_i}, \quad (16)$$

where the two last terms on the right hand side of equation (16) are the tax savings due to the use of external and internal debt. It is seen that these tax savings reduce the user cost of capital. We can therefore conclude that affiliates of multinationals with tax-efficient financial structures have lower costs of capital and thus invest more in capital than comparable domestic firms (within the same industry). Furthermore, the higher the corporate tax rate, the larger is the subsidy from debt on the user cost of capital.

Equations (15) and (16) also enable us to derive the marginal rate of technical substitution (MRTS) between capital and labor as follows

$$-\frac{dK_i}{dL_i} = \frac{F_L}{F_K} = \frac{w_i}{r - \frac{\gamma_i(t_i^*)}{1 - t_i} - \frac{\psi_i(t_i, t_1^e, J_i)}{1 - t_i}}. \quad (17)$$

Equation (17) suggests that if the wage rate is the same across all firms, multinationals have a higher MRTS than domestic firms. As argued by Lipsey (2002), there is an extensive literature showing that multinationals on average pay higher wages than at least privately owned local firms. This suggests that the wage rate may be higher in multinationals and that the relative size of MRTS across national and multinational firms may be ambiguous. Only if the influence on the cost of capital in the denominator exceeds the higher

wage being paid, will MRTS be larger. Empirical evidence from a number of countries suggests that this is the case and that accordingly multinationals have a higher capital to employee ratio than national firms.<sup>15</sup> Part of this may then be explained by lower borrowing costs.

It is worth pointing out that the effects described in equations (16), and (17) should be weaker in case of minority ownership (higher  $J_i$ ) and in joint ventures, since internal debt is less attractive and capital costs are higher in such firms compared to fully-owned subsidiaries ( $J_i = 0$ ) within the same sector. This is an issue that we will discuss in the next section.

## 4 Empirical Evidence

One of the main findings of our model is the prediction that both internal and external debt can be used to save tax payments. There are several empirical studies showing that debt, and especially internal debt, is used for tax planning purposes. These studies show that the effect of tax rate differences is (highly) significant, but mostly rather small. Findings consistent with this observation are found in Desai et al (2004a) relying on US data, Mintz and Smart (2004), using data from Canada, Huizinga et al (2008), exploiting the European Amadeus data base, and Büttner et al (2006b), who replicate Desai et al using German data.

The issue of minority ownership and its effect on tax planning is investigated in several papers. Desai et al (2004b) analyze the determinants of partial ownership of the foreign affiliates of U.S. multinational firms and in particular the marked decline in the use of joint ventures over a 20-year period. Their analysis is purely empirical and suggests that there is an increased appetite for control by multinational parents. They attribute this to three different coordination costs. First, costs pertaining to minority ownership

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<sup>15</sup>For a survey of empirical evidence related to capital to labor ratios and factor markets see Navaretti and Venables (2004, ch. 7).

and transfer pricing conflicts; second the risk of technology being appropriated by local partners; third, the desire to structure production worldwide and the potential for conflict this creates with minority owners. Our analysis shows that there is a fourth cost element at play as well. There is a fiscal externality related to minority ownership that makes it less profitable for the multinational firm to set up tax-efficient financing structures in such affiliates.

The issue of minority ownership and tax avoidance strategies is dealt with in particular by Mintz and Weichenrieder (2005), and Büttner and Wamser (2007). Both these studies use the German MiDi (Bundesbank) data base. They show, in line with the predictions that follow from our model, that minority ownership exerts a negative effect on the use of internal debt. In particular, Büttner and Wamser (2007, p. 22) find that the leverage ratio of internal debt is 5 (respectively 2) percentage points higher in wholly-owned (respectively partially-owned) subsidiaries compared to non-majority owned ones.

It should be pointed out that Mintz and Weichenrieder (2005) do not have a model to back their regression results, and Büttner and Wamser (2007) do not model minority ownership. Both studies, however, explain the higher internal debt content in fully owned affiliates by arguing along the lines of Desai et al (2004b): the argument being that minority ownership exerts a negative effect on the use of internal debt due to increased coordination costs in shared ownership. Mintz and Weichenrieder (2005, p. 11) also argue that minority owners would not be in favor of tax planning and profit shifting. They state: *“Coordinating several owners may be difficult if these owners face different financing and tax conditions – after all, minority shareholders of a subsidiary do not benefit in the same manner from world-wide tax minimization strategies desired by the parent.”*

In contrast, we show that minority owners benefit from tax planning, but that they do not pay the full costs associated with facilitating tax avoidance.

This creates an externality which reduces the profitability of using internal debt in these affiliates. Put differently, the main reason why there is less internal debt in affiliates of multinationals with minority owners is not due to increased coordination costs, but to a *positive* externality. The use of internal debt implies that economic after-tax profit rises for all shareholders, but since minority owners do not contribute to paying for the subsequent rise in tax payments by the MNC's financial coordination center, the majority owner pays too much of the "investment cost" and does not reap the full benefit of his investment.

Our results and intuition also seem to fit to Japanese data on tax-motivated profit-shifting between affiliates in Japanese keiretsus. Gramlich et al (2004) study how pre-tax profits in such affiliates are affected, compared to independent firms, and they define a keiretsu as a (diversified) industrial grouping sharing the same financial institutions or being organized around the same main bank. Though not dealing with internal debt in detail, Gramlich et al (2004) show that a higher leverage significantly decreases taxable income (table 4). Moreover, pre-tax income decreases more sharply the closer the affiliation to a keiretsu (p. 221). They do not find support for compensatory dividends between keiretsu members (table 6). The results by Gramlich et al (2004) are not backed by a theoretical model and are sometimes lacking explanations, e.g., they confess on page 223, that "*there may be other vehicles beyond dividends for compensating income shifting among the keiretsu member firms.*"

If their dummy variable  $K2$  for president's council members is interpreted as proxy for decreasing minority ownership, the effect of closer affiliation to the keiretsu on pre-tax income might be explained in line with our modeling of higher internal debt due to less minority ownership. Moreover, we have shown that compensating dividends from the lending to the borrowing affiliate are not necessary, as the tax-savings, and therefore the return on tax-avoidance accrues in the *borrowing* affiliate. Thus, the more profit-shifting in

the keiretsu that is done by internal debt, the weaker and the more insignificant should the results on compensating dividends in Gramlich et al (2004) be expected to be.

In our modeling, we have neglected thin capitalization rules which introduce a cap on the amount of tax deductible (internal) debt. Such rules could either be interpreted as increasing the costs of internal debt or as explicit caps on the use of internal debt. Either type of rule would reduce the leverage ratio of internal debt and lead to higher effective capital costs. Other things being equal this would reduce real investment. Including such rules in our analysis would, however, not change our results qualitatively as long as the multinational firm has some leeway in terms of manipulating its leverage ratio. This view is backed by empirical results in Büttner et al (2006a) and Weichenrieder and Windischbauer (2008). They find that thin capitalization rules decrease (intercompany) loans, but increase equity. However, they also find that these effects are so small that they probably do not affect real investment. Their explanation for this result is that firms can fairly easily circumvent thin capitalization rules by setting up a holding company structure. Moreover, the relevance of strict thin capitalization rules is theoretically challenged by the fact that weakening these rules is a dominant strategy in corporate tax competition (see Haufler and Runkel, 2008).

Another instrument used as an attempt to prevent profit-shifting via internal debt is controlled foreign company (CFC) rules. If these rules apply, income from subsidiaries is taxed in the home country of the MNC and the exemption principle does not apply. Taxation under CFC-rules mostly requires that there is passive income and low taxation.<sup>16</sup> Relying on German Bundesbank MiDi data, Ruf and Weichenrieder (2008) find in an empirical study that German CFC-rules are effective in reducing passive investments (i.e., setting up financial centers) in off-shore tax havens (such as the Cay-

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<sup>16</sup>See Ruf and Weichenrieder (2008), section 2, on how the German tax code defines passive and active income.

man Islands and Barbados). However, they do not affect investments in the Benelux countries, since these are not deemed to be low-tax countries. Thus, the CFC-rules do not apply in these countries despite the fact that they in many cases have more favorable tax rules than most low-tax countries.<sup>17</sup> Indeed, as a result of this a lot of MNCs have located their financial centers in the Benelux (see Mintz, 2004, section 2, and Weichenrieder and Mintz, 2008, section 2.1).

## 5 Conclusions

We show that multinational firms can save tax by setting up tax-efficient financial structures and that both internal and external debt can be used as instruments for tax avoidance. A main finding in our analysis is that affiliates of multinationals with minority owners have less internal debt and thus less developed tax-efficient financial structures than multinationals' affiliates that do not have minority ownership. The reason is that a multinational firm cannot reap the full benefit of tax planning when the value of tax savings must be shared with minority owners that do not contribute to funding tax planning activities.

Our study has not investigated financial centers and their explicit set up. Such centers are often located in countries where the tax base is tailor made to internal banking, and where the tax base is narrow and often excludes financial transactions (as in the case of Belgium). Analyzing financial centers would require a model where financial centers charge transaction fees that potentially could be used to shift income. Such a set up would then embed both tax evasion and tax avoidance. This is left for future research.

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<sup>17</sup>Luxembourg and the Netherlands have very similar tax rules concerning financial centers as Belgium.

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