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Investment and Financing Strategy of a
Multinational Enterprise under
Alternative Tax Designs

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Investment and Financing Strategy of a Multinational Enterprise under Alternative Tax Designs

Abstract

This paper investigates the consequences of a series of alternative international tax designs on the strategy of a multinational enterprise regarding the cross border distribution of its investment and the choice of its financing behavior. We start with a world where no international tax rules are at work. Then we successively introduce (i) the rules provided by the OECD Model Tax Convention, (ii) the EU Parent-Subsidiary Directive of July 23, 1990; and (iii) a combination of Allowance for Corporate Equity (ACE) and Comprehensive Business Income Tax (CBIT). Finally, we leave systems based on Separate Accounting (SA) aside and turn to Consolidation and Formulary Apportionment (C&FA) adopted either by all the jurisdictions at work in the model, or by a sole subset of them within the framework of an Enhanced Cooperation Agreement (ECA).

JEL-Code: F230, H250, K340.

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1 Introduction and Motivation

As shown by the corporate finance literature, corporate taxation distorts a company's financial decision making in a twofold way. First, the unequal tax treatment of debt and equity, applied by most tax systems, influences a company's capital structure. Based on Modigliani and Miller (1958,1963)'s work, Stiglitz (1973) and King (1974) formalized the incidence of the tax discrimination between debt and equity on the cost of capital and the value of a single firm. Their work triggered an important number of empirical studies quantifying the impact of the distortions due to this tax discrimination (a.o. Kaplan (1989), Fama and French (1998), Desai et (2004)). Second, the corporate tax differences between countries impact the functioning of multinational enterprises (MNEs). A company active in a multinational setting faces a wide range of tax regulations, characterized by diversity in the definition of the tax base and in tax rates. The existence of as many tax codes as countries, therefore, is at the root of many strategic behaviors of MNEs. International tax divergences enhance cross-border tax arbitrage and as a result impact the level of foreign direct investment (a.o. Hartman (1985), Weichenrieder (1996)), the choice of legal form (a.o. De Mooij and Nicodème (2008)) and the location decision (a.o. Hines (1996), Devereux and Griffith (1998)) of companies regarding real investment as well as taxable income. A MNE, however, is also confronted with a lot of barriers impeding the development of cross-border activities. One considerable hurdle hampering international business is the administrative burden related to the diversity of national tax codes. Another major obstacle is double (or even multiple) taxation, i.e. the double (or multiple) taxation of the same multinational regarding the same revenue during the same time period.

In order to tackle these distortions, several institutional bodies, aiming at the development of international trade, tend to eliminate barriers to cross-border activities by providing a set of rules, guidelines and suggestions. For MNEs taxed in the European Union, two institutional bodies have played a major role in shaping international rules for tax purposes. A first institutional body, is the Organisation for Economic Cooperation and Development (OECD), regrouping the governments of around thirty countries. It suggested in 1958 a "Model Tax Convention" as framework for the negotiation of international tax treaties. Those tax treaties, concluded between two countries, aim at avoiding double taxation of income or capital by providing a tax relief system. A second institutional body is the European Commission, aiming at the achievement of the Single Market. In the past it issued two direct tax Directives, abolishing withholding taxes on dividend, interest and royalty payments between associated companies of different Member States (Parent-Subsidiary Directive (90/435/EEC) and Interests and Royalties Directive (2003/49/EC)). In order to take hold of the administrative burden related to international taxation, the European Commission introduced in 2011 a Directive proposal to adopt a Common Consolidated Corporate Tax Base (CCCTB), taxing a MNE on its consolidated tax base instead of taxing each entity separately (EU Commission (2011)).

The topic of profit-shifting and the strategic behavior of MNEs was addressed

in several studies (Allingham (1972), Grubert (1991), Hines (1994), Mintz and Smart (2004)). Moreover, various authors theoretically studied how the tax environment determines the behavior of the firm. In particular, the shift from separate taxation to consolidated taxation has been analyzed extensively (a.o. McLure (1980), Weiner (1994), Mintz (2000)). Gérard (2007) and Gérard (2010) showed how the use of anti-abuse measures can counter the adverse results obtained if only a subgroup of countries shift to consolidated taxation.

Three features differentiate this paper from previous research. First, we simultaneously investigate a real variable, i.e. the international distribution of investment, and a financial variable, i.e. the amount of internal debt. We determine how each tax design alters the investment and financing decisions of a MNE and especially focus on how it creates incentives to use internal debt. This is the main originality of this paper. Another feature that differentiates this study from the previous ones is that we follow the development of MNE taxation from the issuing of the OECD Model Tax Convention (1958) to the EU Directive proposal regarding a Common Consolidated Corporate Tax Base (2011). Hence, we focus on those tax designs related to the evolution of MNE taxation in the European Union. Finally, we analyze alternative tracks for MNE taxation and determine how they would alter a MNE's tax strategies. As such, we contribute to the evaluation of the existing tax environments, by comparing them with alternative tax environments serving the same objectives. At a moment where a proposal for a European common tax approach issued, this study is particularly relevant. It would not be surprising to see the proposal rejected by some EU Member States.

Our analysis leads to several results. First, the differences between the initial and optimal levels of investment and internal debt, illustrate the large set of profit-shifting opportunities, which various tax environments offer to MNEs. Second, we find that alternative environments, like a combined ACE-CBIT system, provide relevant results as it reduces profit-shifting strategies at best.

In section 2, we present the framework of our study and we model a world where no international tax rules are at work. We consider both the case where the profits are reported in the country in which they are generated and the case where a lucrative detour is used. In section 3, we analyze a MNE's profit-shifting behavior under separate taxation. We start with the rules provided by the OECD Model Tax Convention and we then successively introduce the rules provided by the EU direct tax Directives related to MNE taxation. In section 4, we leave systems based on separate taxation aside and turn to MNE taxation based on a consolidated tax base. We analyze the setting where this type of taxation is adopted by all EU Member States, as well as the setting where it is adopted by a sole subset of them (Enhanced Cooperation Agreement). Section 5 concludes.

2 The Model

In order to analyze the impact of the tax environment on a MNE's profit-shifting behavior, a theoretical model is developed. In that model, we progressively incorporate the international tax rules proper to each of the tax environments. First, we present the framework against which the theoretical model is developed. Then, we model the tax situation of a MNE in an institutional environment, free of any international tax rules and subject to double (or multiple) taxation of the same income.

2.1 Framework

In the model, we consider a MNE which is present in three countries p , i and j . Countries p and i have the resources to host a production activity and they have the consumers to host an economic market on which the products of the MNE can be distributed; country j does not. Country p hosts the parent company of the MNE (which is a production and commercial company), country i a fully-owned commercial subsidiary and country j a service subsidiary.

Additionally, we suppose that the size of the country is expressed according to the size of the economic market. As we assume that the fraction of sales of the MNE in country p , denoted by q , exceeds that in country i , denoted by $(1 - q)$ (i.e. $q > 1 - q$), country p is larger than country i , which in turn is larger than country j . We assume that this relation also holds for the fraction of real investment, i.e. real investment in country p (α) exceeds that in country i ($1 - \alpha$) (i.e. $\alpha > 1 - \alpha$). Total sales and total investment amount each to unity. Moreover, we consider that the distribution of investment α is controlled by the MNE, but that the distribution of sales q is given. In other words, capital is mobile but final demand is not. Focusing on those variables we deliberately seem to leave aside other important aspects like transfer pricing. Transfer pricing is, however, as much as the internal debt, an illustration of profit-shifting activities and paper profit generation. Finally, we require that both q and α are between 0 and 1.

For the purposes of the model, we assume that p^r is the retail price (discounted on an infinite horizon), which is exogenously determined by the final market and obtained by selling the product on that market. Moreover, p^w is the wholesale price, also exogenously determined by the wholesale market and paid by one entity of the MNE to another entity for acquiring its production. Such intra-MNE trade occurs because we assume sales to be performed by the local entity, either the subsidiary located in i or the parent company located in p .

Regarding the funding of the MNE, suppose the subsidiary in country j is entirely financed through shares. The subsidiary in country i is funded partially through a loan granted by the parent company and partially through shares. Hence, an amount x represents the present value of interest payments (discounted over an infinite horizon)¹ made by the subsidiary to its parent com-

¹In this model, nothing opposes x to be negative; that corresponds to a situation where

pany and corresponds to the value of the internal debt. Interest payments are a deductible expense for the paying entity but a taxable item for the receiving one.

Two types of taxes are at work in the model, the corporate income tax (τ) and withholding taxes (w). Regarding the first type of taxes, i.e. the corporate income tax, we assume that the profits generated by a subsidiary are subject to the corporate tax of its host country i or j , and possibly to the corporate tax of the parent's country (MNE's home country). The second type of taxes, withholding taxes, are levied at source on interest and dividend payments. Since we assume that each subsidiary distributes its entire after-tax profits as dividend to its parent, the host country of the subsidiary levies a withholding tax w on this dividend. In our model, we designate those withholding taxes as w_i^d and w_j^d , where the superscripts refer to the type of income (interest i or dividend d) and the subscripts to the countries (i or j). Furthermore, if one of the entities needs to pay interest to another entity, the country of the paying entity levies a withholding tax w_i^i or w_j^i on the interest paid. We do not explicitly investigate the determination of the tax rates by the respective countries at stake. The relative values of the tax rates stem from the assumptions that we issue regarding the relative size of the countries. Consistent with the theory that large countries are less subject to tax competition than small countries, we assume that corporate tax rates τ are given and that they increase with the size of the country ($0 \leq \tau_j < \tau_i < \tau_p < 1$)². Finally, we suppose that the corporate tax rates τ are considerably higher than the withholding tax rates w , an assumption in line with most frequent observations.

2.2 Absence of International Tax Rules

In a first stage, we consider the taxation of a MNE in an institutional environment without any international tax rule. As such, the MNE is subject to the tax rules of all countries in which it has economic activities. Hence, both the host country of the subsidiary and the home country of the MNE claim the right to tax the profits generated by the subsidiary and paid out to the parent company as dividend. Consequently, we assume maximal taxation and suppose that each cross-border income is taxed three times: τ_{host} , w_{host} and τ_{home} . We first consider a case without a lucrative detour, then we introduce the profit-shifting strategy of making a lucrative detour through country j .

2.2.1 Without lucrative detour

Suppose that the MNE is not engaged in profit-shifting activities and reports the profits where they are generated. Hence, only countries p and i collect taxes

the entity makes a loan to its parent for profit-shifting purposes.

²This is in line with the literature on tax competition and might be shown with a simple model. That result has been established a.o. by Kanbur (1993) for commodity taxation and extensively used since then.

from the MNE, as we assumed that country j does not have the resources to host an economic activity.

Assume that B_p is the pre-tax profit of the MNE generated in country p . It consists of the revenues of selling q to consumers in country p , the revenues of selling production $(\alpha - q)$ to the group entity in country i , and the amount of interest x received from the entity in country i .

$$B_p = p^r q + p^w (\alpha - q) + x \quad (1)$$

Similarly, assume that B_i is the pre-tax profit of the MNE generated in country i . It consists of the sales $(1 - q)$ to consumers in country i from which the cost of acquiring a fraction of the parent's production, as well as the interest payments x are subtracted.

$$B_i = p^r (1 - q) - p^w (\alpha - q) - x \quad (2)$$

As no international tax relief rules exist, we assume that cross-border income is subject to triple taxation. First, the host country i levies corporate income tax (τ_i) on the subsidiary's profits. Then, as the subsidiary in country i pays out interests to its parent company, withholding tax w_i^i is levied by country i on those interest payments x . The subsidiary in country i distributing its entire after-tax profit as dividend to its parent, a second tax applies, i.e. a withholding tax w_i^d levied by country i on this dividend. From his side, the home country of the MNE claims the right to tax the profit generated by the subsidiary and levies corporate income tax τ_p on both benefits, B_i and B_p . Hence, B_i is taxed for a third time.

Moreover, adjusting its investment and internal debt levels triggers some additional costs for the MNE. According to the existing literature, we assume a quadratic cost function. Let $\frac{c}{2}(x - x_0)^2$ be the cost of adjusting the amount of interest from its initial amount x_0 to optimal amount x and $\frac{\gamma}{2}(\alpha - \alpha_0)^2$ the cost of modifying investment from its initial distribution α_0 to optimal distribution α . We request $0 \leq \alpha \leq 1$.

Assume the present value $V(\alpha, x)$ of the MNE is computed as its after-tax profits. Since the MNE seeks to maximize its present value $V(\alpha, x)$ with respect to investment α and interest payments x , its objective function becomes

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p + (1 - w_i^d)[(1 - \tau_i)B_i - xw_i^i] \\ &\quad - \tau_p B_i - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (3)$$

where the first term is the after-tax profits of the parent company, the second term the profit of the subsidiary after being taxed by its host country, the third term the tax levied by the home country and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the MNE's objective function with respect to the fraction of real investment α and to interest payments x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = [1 - (1 - w_i^d)(1 - \tau_i)] p^w - \gamma(\alpha - \alpha_0) = 0 \quad (4)$$

$$\frac{dV(\alpha, x)}{dx} = 1 - (1 - w_i^d)(-\tau_i + w_i^i) - c(x - x_0) = 0 \quad (5)$$

and second order conditions:

$$\frac{d^2V(\alpha, x)}{d\alpha^2} = -\gamma < 0 \quad (6)$$

$$\frac{d^2V(\alpha, x)}{dx^2} = -c < 0 \quad (7)$$

Based on the first order conditions, the equilibrium values of α and x in country p can be expressed as

$$\alpha^{NIR} = \alpha_0 + \frac{\tau_i - (1 - \tau_i)w_i^d}{\gamma} p^w \quad (8)$$

$$= \alpha_0 + \frac{ETR_{i,NIR}^d}{\gamma} p^w \quad (9)$$

$$x^{NIR} = x_0 + \frac{\tau_i + (1 - \tau_i)w_i^d - (1 - w_i^d)w_i^i}{c} \quad (10)$$

$$= x_0 + \frac{ETR_{i,NIR}^d - ETR_{i,NIR}^i}{c} \quad (11)$$

In the equations above $ETR_{i,NIR}^d$ stands for the effective tax rate on dividends paid out in country i in an environment without international tax rules and without lucrative detour. Similarly, $ETR_{i,NIR}^i$ stands for the effective tax rate on interests paid in country i .

Given a tax environment without lucrative detour, it turns out that the optimal level of real investment α^{NIR} increases when the effective tax rate on dividends paid by the subsidiary increases. Hence, the investment in country p increases with taxation of dividends in country i . As total investment amounts to unity, investment in country i is discouraged when the effective tax rate on dividends raises. Note that the corporate tax rate in country p does not influence the effective tax rate on dividends. Indeed profits are taxed similarly in country p wherever they have been generated.

Regarding the optimal amount of internal debt, it increases with the effective tax rate differential between dividends and interests. In particular, if the effective tax rate on dividends exceeds that on interests, the MNE has an incentive to circulate the profits as interest payments rather than as dividends, and vice versa. Also for interests, the corporate tax rate in country p does not influence the effective tax rate. In addition, when $ETR_{i,NIR}^d = ETR_{i,NIR}^i$, $x = x_0$ and financial neutrality or the famous "irrelevance of corporate finance" is at work.

2.2.2 With lucrative detour

We now consider the case where the MNE, in order to optimize its after-tax profit, will try to locate part of its profits in the country with the lowest tax

rate. Country j corresponds to this criterion. However, country j only hosts a service subsidiary of the MNE, since it offers no opportunity for production or consumption. Hence, the MNE will not make real investments in country j . One option for the MNE to benefit from country j 's favorable tax rate, is to make a detour through country j to invest indirectly in country i . Instead of the parent company directly granting a loan to the subsidiary in country i , it now makes a lucrative detour through the entity in country j , which then grants a loan to the subsidiary in country i .

As a result, the pre-tax profit B_p consists of the revenues of selling q in country p and of the revenues of selling $(\alpha - q)$ to the group entity in country i .

$$B_p = p^r q + p^w (\alpha - q) \quad (12)$$

Pre-tax profit B_i consists of the revenues of selling $(1 - q)$ in country i from which the interest payments x , as well as the cost of acquiring a fraction of p 's production is subtracted.

$$B_i = p^r (1 - q) - p^w (\alpha - q) - x \quad (13)$$

Hosting a service subsidiary granting loans to other group members, the pre-tax profit B_j consists of the interests paid by the subsidiary in country i .

$$B_j = x \quad (14)$$

As no tax relief rules exist, cross-border dividends and interests are subject to triple taxation. First, the profits B_i and B_j are subject to their host country's corporate tax (τ_i and τ_j respectively). Second, since both subsidiaries distribute their entire after-tax income as dividend to their parent and since the subsidiary in country i pays out interests to the subsidiary in country j , these outgoing dividends and interest are subject to a withholding tax (w_i^d , w_j^d and w_i^i respectively). Finally, the profits of all group entities are subject to the home country's corporate income tax τ_p . This leads to expressing the MNE's objective function as

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p) B_p + (1 - w_i^d) [(1 - \tau_i) B_i - x w_i^i] \\ &\quad + (1 - w_j^d) (1 - \tau_j) B_j - \tau_p (B_i + B_j) \\ &\quad - \frac{\gamma}{2} (\alpha - \alpha_0)^2 - \frac{c}{2} (x - x_0)^2 \end{aligned} \quad (15)$$

where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its host country, the fourth term the tax levied by the home country and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the MNE's objective function with respect to the fraction of real investment α and to the amount of interest payments x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = [1 - (1 - w_i^d)(1 - \tau_i)] p^w - \gamma(\alpha - \alpha_0) = 0 \quad (16)$$

$$\frac{dV(\alpha, x)}{dx} = -(1 - w_i^d)(1 - \tau_i + w_i^i) + (1 - w_j^d)(1 - \tau_j) - c(x - x_0) = 0 \quad (17)$$

and the same second order conditions as under section 2.2.2.1. The equilibrium values of α and x in country p can be expressed as

$$\begin{aligned} \alpha^{NIRD} &= \alpha_0 + \frac{\tau_i + (1 - \tau_i) w_i^d}{\gamma} p^w \\ &= \alpha_0 + \frac{ETR_{i,NIRD}^d}{\gamma} p^w \\ &= \alpha^{NIR} \end{aligned} \quad (18)$$

$$\begin{aligned} x^{NIRD} &= x_0 + \frac{[\tau_i + (1 - \tau_i) w_i^d] - [(1 - w_i^d) w_i^i] - [\tau_j + w_j^d(1 - \tau_j)]}{c} \\ &= x_0 + \frac{ETR_{i,NIRD}^d - ETR_{i,NIRD}^i - ETR_{j,NIRD}^d}{c} \\ &= x^{NIR} - \frac{ETR_{j,NIRD}^d}{c} \end{aligned} \quad (19)$$

where the effective tax rate on dividends and interests in country i are unchanged.

When comparing these equilibrium values with those related to an environment without lucrative detour, we observe that a detour through country j does not alter the optimal investment level. The optimal amount of internal debt, however, is smaller when shifting income using a lucrative detour, what might seem surprising. Since country p taxes x in any case, making a detour through j instead of going directly from i to p simply introduces an extra tax burden.

Finally, in order to determine whether using a detour is really lucrative, we need to compute the additional value of the MNE when moving through country j . Substituting for the variables α and x their equilibrium values in equations (3) and (15), enables to generate the value of the MNE under both environments.

So far, we have considered a world without international tax rules. Therefore, companies are entirely free to organize their transactions according to their economic needs. As shown by the model, some of their profit is, however, subject to multiple taxation. When relaxing the assumption that no international tax rules exist, the model changes considerably. Starting from the last tax environment (section 2.2.2), several tax environments are compared. For each of them, we compute the optimal investment level and interest level, and we compare them with the results found before.

3 EU Taxation under Separate Accounting

In this section, we analyze the tax situation of a MNE active in the current European Union (EU) setting. Several tax relief systems are available, both preventing double corporate taxation and withholding taxes. We first extend the model

to an environment comprising the rules provided by the OECD Model Tax Convention. Then, we suppose the EU Parent-Subsidiary Directive (90/435/EEC) and Interests and Royalties Directive (2003/49/EC) at work. Finally, we model in that framework the introduction of a combined ACE-CBIT system.

3.1 OECD Model Tax Convention

A first institutional body, which has shaped international double tax relief rules, is the Organisation for Economic Cooperation (OECD). This organization, regrouping the governments of around thirty countries, suggested in 1958 a "Model Tax Convention" as framework for the negotiation of international tax treaties. Those tax treaties, concluded between two countries, aim at avoiding double taxation of income or capital by providing a tax relief system. When entering into a double tax treaty according to the OECD Model Tax Convention, countries need to choose between two methods of double tax relief, the credit method and the exemption system. Under a credit method, the country of the beneficiary may tax cross-border income provided that the taxes paid abroad are deductible at home. Under an exemption system, the country of the beneficiary may tax at most a fraction δ of cross-border income.

In the model below, we assume again that the MNE organizes its financial structure in order to benefit from the lowest tax rate, which country j offers to corporate profits. Hence, a lucrative detour through country j is used and the profits are defined as under section 2.2.2.

3.1.1 Credit method for dividends

One method to avoid the double taxation of dividends is to request from the taxing country to credit foreign withholding tax. Under a credit method as defined by the OECD Model Tax Convention (also called 'direct credit'), the country of the beneficiary may only tax cross-border income provided that withholding taxes paid abroad are deductible at home up to the amount of taxes owed to the country of the beneficiary. This means that the host country, on top of corporate income tax, will levy a withholding tax on cross-border dividends and that the home country p credits this tax on its corporate income tax (up to the amount that country p would have collected). Hence, the cross-border dividends will be taxed at the highest of following tax rates: the corporate income tax levied by country p and the withholding tax levied by country i .

Note that this definition of the credit method differs from the one given by the EU Parent-Subsidiary Directive (90/435/EEC), which will be modeled in the following subsection. For interests, we assume that the country of the company paying the interests (country i) levies a withholding tax on that amount. Knowing that pretax profits are defined as under section 2.2.2.2, the MNE will

define its objective function as follows,

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p + (1 - \max\{\tau_p, w_i^d\})[(1 - \tau_i)B_i - xw_i^i] \\ &\quad + (1 - \max\{\tau_p, w_j^d\})(1 - \tau_j)B_j \\ &\quad - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (20)$$

where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its host country, and the last two terms the adjusting costs of moving to optimal values of α and x . Since we assumed that corporate tax rates are higher than withholding tax rates, the home country will only levy that fraction of its corporate income tax which exceeds the withholding tax levied by the host country. Hence, $\max(\tau_p, w_i^d) = \max(\tau_p, w_j^d) = \tau_p$.

When maximizing the value of the firm with respect to the fraction of real investment α and to the amount of interest x , we obtain the following first order conditions,

$$\frac{dV(\alpha, x)}{d\alpha} = [(1 - \tau_p) - (1 - \tau_p)(1 - \tau_i)]p^w - \gamma(\alpha - \alpha_0) = 0 \quad (21)$$

$$\frac{dV(\alpha, x)}{dx} = -(1 - \tau_p)(1 - \tau_i + w_i^i) + (1 - \tau_p)(1 - \tau_j + w_j^i) - c(x - x_0) = 0 \quad (22)$$

and the same second order conditions as under section 2.2.2.1. It turns out that the equilibrium values of α and x in country p are,

$$\begin{aligned} \alpha^{OCRE} &= \alpha_0 + \frac{\tau_i(1 - \tau_p)}{\gamma}p^w \\ &= \alpha_0 + \frac{ETR_{i,OCRE}^d}{\gamma}p^w \end{aligned} \quad (23)$$

and

$$\begin{aligned} x^{OCRE} &= x_0 + \frac{\tau_i(1 - \tau_p) - w_i^i(1 - \tau_p) - \tau_j(1 - \tau_p)}{c} \\ &= x_0 + \frac{ETR_{i,OCRE}^d - ETR_{i,OCRE}^i - ETR_{j,OCRE}^d}{c} \end{aligned} \quad (24)$$

We observe that the effective tax rates on dividends and interests are now influenced by the corporate tax rate in country p . Moreover, comparing these optimal values with the values found in the previous section reveals that investment in country p increases when double taxation is eliminated. The optimal amount of internal debt depends of the corporate tax rate of the three countries involved, as well as on the withholding tax rate of country i . The higher the effective tax rate of dividends with respect to interests, the higher the incentive to shift income by using internal debt.

3.1.2 Exemption method for dividends

Another method to avoid the double taxation of dividends is to exempt the cross-border dividend from corporate taxation in the country of the beneficiary. The OECD Model Tax Convention stipulates that the country of the beneficiary may tax at most a fraction δ of the cross-border dividends.

Hence, the host countries will levy corporate tax and withholding tax on the dividends distributed by the subsidiaries to the parent company. Only a fraction δ of those dividends is subject to the corporate tax of country p . For cross-border interests, we assume that only the country of the paying company may levy a withholding tax on that amount. Hence, the interests paid out by the subsidiary in country i to the subsidiary in country j is subject to a withholding tax w_i^i . As a result, the MNE's objective function becomes

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p + (1 - \delta\tau_p)(1 - w_i^d)[(1 - \tau_i)B_i - xw_i^i] \\ &\quad + (1 - \delta\tau_p)(1 - w_j^d)(1 - \tau_j)B_j \\ &\quad - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (25)$$

where the pretax profits are defined as under section 2.2.2 and where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its respective host country, and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the MNE's objective function with respect to α and x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = [(1 - \tau_p) - (1 - \delta\tau_p)(1 - w_i^d)(1 - \tau_i)]p^w - \gamma(\alpha - \alpha_0) = 0 \quad (26)$$

$$\begin{aligned} \frac{dV(\alpha, x)}{dx} &= -(1 - \delta\tau_p)(1 - w_i^d)(1 - \tau_i + w_i^i) \\ &\quad + (1 - \delta\tau_p)(1 - w_j^d)(1 - \tau_j) - c(x - x_0) = 0 \end{aligned} \quad (27)$$

and the same second order conditions as under section 2.2.1. The equilibrium values of α and x in country p are given by

$$\begin{aligned} \alpha^{OEXE} &= \alpha_0 + \frac{(1 - \tau_p) - (1 - \delta\tau_p)(1 - w_i^d)(1 - \tau_i)}{\gamma} p^w \\ &= \alpha_0 + \frac{ETR_{i,OEXE}^d - \tau_p}{\gamma} p^w \end{aligned} \quad (28)$$

and

$$\begin{aligned} x^{OEXE} &= x_0 + \frac{(1 - \delta\tau_p)[(1 - w_i^d)(1 - \tau_i) - (1 - w_i^d)w_i^i - (1 - w_j^d)(1 - \tau_j)]}{c} \\ &= x_0 + \frac{-ETR_{i,OEXE}^d - ETR_{i,OEXE}^i + ETR_{j,OEXE}^d}{c} \end{aligned} \quad (29)$$

Once more, we observe that real investment in country p increases with the effective tax rate on dividends paid in country i . The tax relief system provided by the OECD Model Tax Convention, therefore, encourages foreign investment. Moreover, as under the credit method, the corporate tax rate of country p influences the fraction of investment, as well as the amount of interest x^{OEXE} shifted. The higher the corporate tax rate of country p , the lower the optimal amount of interest shifted to country j . Hence, the OECD tax relief system discourages interest shifting.

3.2 EU Direct Tax Directives

In a second setting, the rules of the OECD Model Tax Convention are supplemented by the EU treaties, regulations, and directives. They set out the principles and rules for the creation of the Single Market, ensuring the free movement of goods, services, capital, and labor among the 27 EU Member States. Although tax sovereignty still applies in the EU, Member States can unanimously decide to give up part of their national sovereignty to enhance the development of common tax measures. With respect to direct taxation, two Directives are of major importance, i.e. the Parent-Subsidiary Directive (90/435/EEC) and the Interests and Royalties Directive (2003/49/EC), eliminating withholding taxes on dividend, interest and royalty payments between related companies. In order for those Directives to apply, companies need to be subject to corporate tax in the EU, be tax resident in an EU Member State, and be of a type listed in the Directives. We assume that the three countries of our model are Member States of the European Union and that the companies in those countries may apply the mentioned Directives.

Furthermore, in order to benefit from the withholding tax exemption for dividends, the EU parent company should hold at least 10% of the shares in its foreign EU subsidiary. In our model, we assume that those conditions are verified for all companies, including the entity in country j . Consequently, withholding taxes will no longer appear in our model.

3.2.1 Credit method for dividends

As the OECD Model Tax Convention, the EU Parent-Subsidiary Directive provides for two methods to avoid the double taxation of dividends. One of those is the credit method (full credit method), which slightly differs, however, from the one used in the OECD Model Tax Convention (direct credit method). Under full crediting, the country of the beneficiary may only tax cross-border income provided that all taxes paid abroad are deductible at home up to the amount of taxes owed to the country of the beneficiary. This means that the host country will levy corporate tax and that the home country credits this tax on its corporate tax up to the amount that it would have collected. As the EU direct tax Directives apply, all withholding taxes are eliminated and the cross-border dividends will be taxed at the highest of both corporate tax rates. This leads

the MNE to define its objective function as follows,

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) = & (1 - \tau_p)B_p + (1 - \max\{\tau_p, \tau_i\})B_i + (1 - \max\{\tau_p, \tau_j\})B_j \\ & - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (30)$$

As we assumed that $\tau_j < \tau_i < \tau_p$, this objective function can be rewritten as:

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) = & (1 - \tau_p)B_p + (1 - \tau_p)B_i + (1 - \tau_p)B_j \\ & - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (31)$$

where the profits are defined as under section 2.2.2 and where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its respective host country, and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the value of the firm with respect to α and x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = -\gamma(\alpha - \alpha_0) = 0 \quad (32)$$

$$\frac{dV(\alpha, x)}{dx} = -c(x - x_0) = 0 \quad (33)$$

and the same second order conditions as under section 2.2.1. The equilibrium values of α and x in country p can be written

$$\alpha^{ECRE} = \alpha_0 \quad (34)$$

$$x^{ECRE} = x_0 \quad (35)$$

We observe that the optimal values are independent of tax parameters, meaning that the tax environment is neutral with respect to both the investment and finance decision of the MNE. The credit method under the EU Parent-Subsidiary Directive can, therefore, be considered as an economically efficient tax environment. Gérard and Traversa (2010) suggest to move to the credit system. A move to crediting, though, should imply - see section 3.2.1 above - that dividends from country j be taxed in a similar way as profits from countries p and i , thus in a similar way as profits not subject to a lucrative detour. Such a move, however, seems to be in contradiction with the trend among countries. Indeed, a country like the UK which was for long characterized by crediting has moved to exemption. The main reason, presumably, is that the credit method may create discrimination among domestic and other European resident shareholders, since credits hardly cross the national borders. Moreover, moving to a credit system does not prevent lucrative detours when the profit remains in the country of the subsidiary and is from there used to finance further investments of the MNE.

3.2.2 Exemption method for dividends

A second tax relief method provided for by the EU Parent-Subsidiary Directive, is to apply an exemption method. As under the OECD Model Tax Convention, the exemption method consists of exempting all but a fraction δ of the cross-border dividends from corporate taxation in the country of the beneficiary. Hence, after being subject to the corporate tax of their host country, a fraction δ of the dividends paid out by the subsidiaries is taxed according to the home country's corporate tax rate (τ_p). As the EU tax Directives apply, withholding taxes are eliminated both on dividends as on interests. This leads to the following objective function:

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p + (1 - \delta\tau_p)(1 - \tau_i)B_i + (1 - \delta\tau_p)(1 - \tau_j)B_j \\ &\quad - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (36)$$

where the benefits are defined as under section 2.2.2 and where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its respective host country, and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the MNE's objective function with respect to α and x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = [(1 - \tau_p) - (1 - \delta\tau_p)(1 - \tau_i)]p^w - \gamma(\alpha - \alpha_0) = 0 \quad (37)$$

$$\frac{dV(\alpha, x)}{dx} = -(1 - \delta\tau_p)(1 - \tau_i) + (1 - \delta\tau_p)(1 - \tau_j) - c(x - x_0) = 0 \quad (38)$$

and the same second order conditions as under section 2.2.1. The equilibrium values of α and x in country p become

$$\alpha^{EXXE} = \alpha_0 + \frac{(1 - \tau_p) - (1 - \delta\tau_p)(1 - \tau_i)}{\gamma}p^w \quad (39)$$

and

$$x^{EXXE} = x_0 + \frac{(\tau_i - \tau_j)(1 - \delta\tau_p)}{c} \quad (40)$$

Notice that in many countries, $\delta = 0$. In that latter case,

$$\alpha^{EXXE} = \alpha_0 + \frac{\tau_i - \tau_p}{\gamma}p^w \quad (41)$$

and

$$x^{EXXE} = x_0 + \frac{\tau_i - \tau_j}{c} \quad (42)$$

We observe that neutrality of the tax system with respect to the investment and finance decision of the MNE further requires the equality among corporate tax rates.

3.2.3 Combination of ACE and CBIT

A suggestion to reduce the corporate tax distortion between sources of financing is the introduction of a system combining an Allowance for Corporate Equity (ACE) and a Comprehensive Business Income Tax (CBIT). Such proposition tackles the unequal tax treatment of debt and equity (and also retained earnings), by giving partial, but equal tax relief to both financing modes. Hence, the deductibility of interests is partially abolished and the deductibility of dividends is partially established. Suppose therefore that a fraction θ of the interests can no longer be deducted by the paying company, but that a tax shield is granted for a fraction $1 - \theta$ of the dividend payments.

The ACE-CBIT system leaves the benefits before tax unchanged and the pretax profits B_p , B_i and B_j , therefore, have their usual definition. The tax base of the subsidiary in country i , however, is altered since a fraction θ of interests is no longer tax deductible. Consequently, for corporate tax purposes, the fraction θx is added to the pretax profits of the subsidiary in country i .

Moreover, since a tax shield is granted for a fraction $1 - \theta$ of dividend payments, both subsidiaries can benefit from a tax advantage amounting to $\tau_{host}(1 - \theta)$ of their dividends. As we assumed that the subsidiaries distribute their entire after-tax income as dividend to their parent company, the amount of dividends equals the subsidiary's after-tax profits. Assuming an exemption system for the taxation of dividends in line with the EU Parent-Subsidiary Directive, the company's objective function now is,

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p + (1 - \delta\tau_p)[B_i - \tau_i(B_i + \theta x) + \tau_i(1 - \theta)(B_i + \theta x)] \\ &\quad + (1 - \delta\tau_p)[(B_j - \tau_j B_j + \tau_j(1 - \theta)B_j] \\ &\quad - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (43)$$

where the first term is the after-tax profits of the parent company, the two following terms the profits of the subsidiary after being taxed by its respective host country, and the last two terms the adjusting costs of moving to optimal values of α and x .

When maximizing the MNE's objective function with respect to α and x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = [(1 - \tau_p) - (1 - \delta\tau_p)]p^w(1 - \theta\tau_i) - \gamma(\alpha - \alpha_0) = 0 \quad (44)$$

$$\frac{dV(\alpha, x)}{dx} = (1 - \delta\tau_p)\theta\tau_i(1 - \theta) - (1 - \delta\tau_p)\theta\tau_j c - c(x - x_0) = 0 \quad (45)$$

and the same second order conditions as under section 2.2.1. The equilibrium values of α and x in country p can be expressed as,

$$\alpha^{ACBIT} = \alpha_0 + \frac{(1 - \tau_p) - (1 - \delta\tau_p)(1 - \theta\tau_i)}{\gamma} p^w \quad (46)$$

$$x^{ACBIT} = x_0 + \frac{(1 - \delta\tau_p)\theta\tau_i(1 - \theta) - (1 - \delta\tau_p)\theta\tau_j}{c} \quad (47)$$

Especially if $\delta = 0$ and $\theta = 1/2$,

$$\alpha^{ACBIT} = \alpha_0 + \frac{\frac{\tau_i}{2} - \tau_p}{\gamma} p^w \quad (48)$$

$$x^{ACBIT} = x_0 + \frac{\tau_i - 2\tau_j}{4c} \quad (49)$$

We observe that the ACE-CBIT system has lowered the impact of the corporate tax rate in country i in the distribution of investment compared to the exemption system (section 3.2.2). Moreover, it sharply decreased the optimal amount of internal debt and thus the importance of a profit-shifting strategy. Hence, the ACE-CBIT system provides for an interesting alternative, as it brings the amount of interest close to its efficient level.

4 EU Tax Environment under Consolidation

The analysis of an ACE-CBIT system shows that tax efficiency can be approached by other tax environments than the credit method. This system, however, does not entirely eliminate profit-shifting and does not tackle the compliance cost issue. This is mainly due to the fact that each entity is taxed separately, based on its individual accounts, without considering the group as a whole (Separate Accounting (SA) approach). In order to address this issue, countries like the United States and Canada decided, for state taxation purposes, to move to a system of consolidated taxation (called Consolidation and Formulary Apportionment (C&FA)). In this system, one consolidated tax base is computed, which is distributed amongst the affected countries according to a given apportionment formula. Also the European Union considers to move to such a system, suggesting a Common Consolidated Corporate Tax Base (CCCTB).

Because the unanimity principle for tax issues makes multinational decision-making difficult in the EU, the mechanism of an Enhanced Cooperation Agreement (ECA) may well be used for this purpose. This alternative decision-making method, adopted in the Treaty of Nice (2002), allows a minimum of eight EU Member States to integrate more or faster than other Member States. It was introduced as a means of tackling the problem of the growing diversity in the European Union and allowing the further integration and development of the European project.

In this section, we consider two situations. In the first one, all EU Member States unanimously decide to introduce the CCCTB taxation system; under the second one, only the countries p and i adopt the reform (under an Enhanced Cooperation Agreement) and country j stays out of the consolidation area.

4.1 Unanimity

Under a Common Consolidated Corporate Tax Base (CCCTB), one consolidated tax base is computed in which the intra-group payments of dividends,

interests, and royalties are ignored. The pretax profits of all group companies are consolidated regardless of whether these companies are residents or non-residents of the MNE's home country. The consolidated tax base is then distributed amongst the countries using a formula. We assume that this formula is a weighted linear combination of real investment (with weight λ) and final sales (with weight $1 - \lambda$). Each country taxes its tax base fraction according to its own tax rate.

Given that all intra-group income is ignored when consolidating, the consolidated tax base B consists solely of the revenues of selling to consumers. Since total sales amount to unity, B is expressed as:

$$B = p^r \quad (50)$$

The fraction of the consolidated profits B_p^{FA} , attributed to country p , consists of a fraction of B , proportional to investment and sales. As a result, the apportioned profits for country p and country i are:

$$B_p^{FA} = [\lambda\alpha + (1 - \lambda)q]B \quad (51)$$

$$B_i^{FA} = [\lambda(1 - \alpha) + (1 - \lambda)(1 - q)]B \quad (52)$$

Hence, the objective function of the MNE becomes:

$$\max_{\alpha, x} V(\alpha, x) = (1 - \tau_p)B_p^{FA} + (1 - \tau_i)B_i^{FA} - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \quad (53)$$

where the first term is the profit attributed to country p after being taxed by the home country, the second term the profits attributed to country i after being taxed by the host country and the last two terms the adjusting costs of moving to optimal values of α and x .

There is no longer room for interest-shifting under this tax environment, since intra-MNE movements vanish. Accordingly no tax base is allocated to country j . We then maximize the MNE's objective function with respect to the sole fraction of real investment α , keeping x possibly equal to x_0 in order to avoid the extra cost to set x equal to any other value. We obtain the first order condition

$$\frac{dV(\alpha, x)}{d\alpha} = (1 - \tau_p)\lambda p^r - (1 - \tau_i)\lambda p^r - \gamma(\alpha - \alpha_0) = 0 \quad (54)$$

and the equilibrium values of α and x are,

$$\alpha^{FA} = \alpha_0 + \frac{\tau_i - \tau_p}{\gamma}\lambda p^r \quad (55)$$

$$x^{FA} = x_0 \quad (56)$$

Two observations deserve attention at this point. First, as the irrelevance of the determination of x shows, there is no longer room for profit-shifting strategies with respect to the source of finance, the transfer price or any other instrument.

Second, the move from separate accounting to consolidation might reduce tax competition and allow corporate tax rates to go up when determined as the outcome of a non-cooperative game between countries. The condition therefore is that

$$\lambda p^r < p^w \quad (57)$$

Since we know that $p^r > p^w$ - the retail price exceeds the wholesale price - the condition requires that the weight of the formula be rather on the distribution of sales, the variable not or less under control of the MNE, or on the variable with respect to which the MNE is less elastic, than on the distribution of investment. That property has been demonstrated by Riedl and Runkel (2007) as well as by Gérard (2007).

Although that system exhibits interesting properties, it does not guarantee that every participating country will gain tax revenues. The case of j above is emblematic, since country j no longer has revenues to tax. It may therefore be difficult to convince all EU Member States to join the reform, and justifies that the adoption of the reform by a sole subset of Member States, through an Enhanced Cooperation Agreement, is investigated.

4.2 Enhanced Cooperation

The mechanism of an Enhanced Cooperation Agreement (ECA) allows a number of EU Member States to integrate more or faster than other Member States. Applied to the C&FA issue, this alternative decision-making method would cluster the EU Member States in two groups. One group of Member States would maintain their current separate accounting system in order for them to further attract corporations through their competitive tax system. The other group of Member States would implement the CCCTB, allowing them to lower corporate transaction costs.

Consider that only the active countries p and i adopt a common consolidated tax base and that country j decides to stay out of the consolidation area, maintaining its current environment. Hence, the use of profit-shifting strategies is relevant again and interests x will be shifted from the consolidation area to the service subsidiary outside of the area in country j .

The common tax base includes the tax bases of the active countries from which the flow of interest x shifted to country j is subtracted.

$$B = p^r - x \quad (58)$$

A separate tax base of the entity in country j coexists:

$$B_j = x \quad (59)$$

The objective function of the MNE remains:

$$\begin{aligned} \max_{\alpha, x} V(\alpha, x) &= (1 - \tau_p)B_p^{FA} + (1 - \tau_i)B_i^{FA} + (1 - \tau_j)B_j \\ &\quad - \frac{\gamma}{2}(\alpha - \alpha_0)^2 - \frac{c}{2}(x - x_0)^2 \end{aligned} \quad (60)$$

The apportioned tax bases are defined as in the former section 2.4.1.

When maximizing the MNE's objective function with respect to α and x , we obtain the following first order conditions:

$$\frac{dV(\alpha, x)}{d\alpha} = (1 - \tau_p)\lambda(p^r - x) - (1 - \tau_i)\lambda(p^r - x) - \gamma(\alpha - \alpha_0) = 0 \quad (61)$$

$$\begin{aligned} \frac{dV(\alpha, x)}{dx} = & -(1 - \tau_p)[q(1 - \lambda) + \lambda\alpha] - (1 - \tau_i)[(1 - q)(1 - \lambda) + \lambda(1 - \alpha)] \\ & + (1 - \tau_j) - c(x - x_0) = 0 \end{aligned} \quad (62)$$

The equilibrium values of α and x in country p can be expressed as:

$$\begin{aligned} \alpha^{ECA} &= \frac{c\gamma\alpha_0 - c\lambda(\tau_i - \tau_p)(x_0 - p^r) - (\tau_i - \tau_j) + (\tau_i - \tau_p)^2\lambda q(1 - \lambda)}{-(\tau_i - \tau_p)^2\lambda^2 + c\gamma} \quad (63) \\ x^{ECA} &= x_0 + \frac{(\tau_p - \tau_i)[q(1 - \lambda) + \lambda\alpha^{ECA}] + (\tau_i - \tau_j)}{c} \quad (64) \end{aligned}$$

Comparing those equilibrium values with the ones obtained under a unanimous introduction of the C&FA reform, we observe that optimal investment in the parent company is reduced and the optimal debt fraction is increased under enhanced cooperation. Hence, a detour through a non-consolidating country is still profitable. Not the cooperating countries, but the country staying out of the consolidation area benefits from the enhanced cooperation agreement, as an important number of tax planning strategies persist. We can therefore reasonably consider that the consolidating countries will attempt to counter this.

5 Policy Implications

Given the tax competition between Member States, it may be expected that some of them may not be willing to introduce a common consolidated tax base. Remote countries with attractive tax regimes like Ireland and Estonia may not be eager to give up their favorable tax features without having the guarantee of at least maintaining their current tax revenues. This is also the case for Member States which offer special depreciation schemes, R&D tax credits or other non-debt tax shields (like the Allowance for Corporate Equity in Belgium). As a result, it is highly probable that the introduction of a common consolidated tax base in the EU will only be possible through the use of an Enhanced Cooperation Agreement. The analysis above, however, has shown that the introduction of such a tax base by a limited number of Member States does not lead to efficient taxation and leaves room for income-shifting strategies.

In line with the existing theoretical literature (a.o. Gérard and Traversa (2010)), we find that the use of a credit method as tax relief for cross-border dividends leads to a financially efficient solution and the elimination of profit-shifting incentives. Nonetheless, as noticed earlier, the political trend is to

move away from crediting since it may create discrimination among domestic and other European shareholders. Therefore, Gérard and Traversa (2010) consider a second option to reduce profit-shifting strategies, the use of anti-abuse measures. Those rules aim at safeguarding the tax base of countries by making potentially lucrative detours no longer beneficial, even if profits are not repatriated. Those measures are known as Controlled Foreign Companies (CFC) rules. Such measures are familiar to US tax designers, but raise issues in the European Union, especially since, for some analysts, they are not compatible with EU law, in particular with the right of free establishment.

Although not entirely eliminating the incentive to use a lucrative detour, the above analysis finds that a combined ACE-CBIT system may offer a valuable alternative to the introduction of a common consolidated tax base. Giving partial but equal tax relief to both interest and dividend payments, it is the studied tax environment which reduces profit-shifting strategies at best. This environment has the advantage of not having to move to tax consolidation and to preserve national tax sovereignty to a larger extent.

6 Conclusions and Limitations

In this paper we have investigated the impact of tax environments on the behavior of a multinational enterprise. We focused on two key decisions of MNEs, i.e. the distribution of investment among countries and the use of internal debt. Investigating a real and a financial decision simultaneously is the main originality of this paper. It especially deserves interest at a moment when empirical literature reveals that the impact of corporate taxation is probably stronger on financial decisions than on real decisions - see a.o. Princen (2010). Our analysis leads to several results. First, the optimal investment and debt levels illustrate the large set of profit-shifting opportunities, which various tax environments offer to MNEs. Second, we find that alternative environments, like a combined ACE-CBIT system, provide relevant results to reduce profit-shifting strategies.

In this paper we have assumed and modeled a three country world and a single multinational firm. The real-world situation, however, is more complex and requires to take into account non-tax factors influencing a company's financial decision-making (a.o. industry, strategy, cash position). Moreover, subsidiaries are most often not restrained to sell goods in their host country, as it is assumed in the above model. Many variables are also considered to be exogenous even if this does not correspond to what is observed most commonly. Hence, several extensions of the model are possible for a more comprehensive study of the impact of tax environments on an MNE's behavior. Meanwhile, the obtained results give a first idea of the direction in which the analysis will go.

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