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Investment and Financing Strategy of a Multinational Entreprise under alternative tax designs

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Abstract

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Paper in progress

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1 Introduction

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, implied by most tax designs, influences a company's capital structure. Based on Modigliani and Miller (1958)'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 the firm and their work triggered an important number of empirical studies quantifying the impact of the distortions due to this unequal tax treatment (a.o. Kaplan (1989), Fama and French (1998), Desai et al. (2004)). Second, the existence of as many tax codes as countries enhances cross-border tax arbitrage, impacting the level of foreign direct investment (a.o. Hartman (1985), Weichenrieder (1996)), the choice of legal form (a.o. De Mooij and Nicodeme (1998)) and the location decision (a.o. Hines (1996), Devereux and Griffith (1998)) of companies.

These different tax distortions are at the root of many strategic opportunities and behaviors of multinational enterprises (MNEs) or, within a federal country, of multistate companies, especially from firms facing a wide range of tax regulations.

As a reaction, countries like the United States and Canada decided, for state taxation purposes, to move from a system of Separate Accounting (SA), where each entity is taxed separately in accordance with standard accounting principles, to a system of Consolidation and Formulary Apportionment (C&FA), where a multistate company is taxed based on its consolidated tax base and an apportionment formula is used to distribute the tax base amongst the affected jurisdictions. In 2001, the European Commission, aiming at the achievement of the Single Market, suggested a similar taxation system called Common Consolidated Corporate Tax Base (CCCTB) to tax MNEs active in several EU Member States (EU Commission (2001)).

The topic of moving from a Separate Accounting to Consolidation and Formulary Apportionment has been analyzed by various authors. Following the US reform in this respect, several studies were published on the impact of C&FA (a.o. McLure (1980), Weiner (1994), Mintz (1999)). Many other contributions analyze the effect of C&FA on tax competition (a.o. Eggert and Schjelderup (2003), Gerard and Weiner (2003), Riedl and Runkel (2007), Gerard (2007)).

Though CCCTB is still a project whose future is uncertain, the EU has already made some steps forward through the Directive of July 1993, preventing the use of withholding taxes in the relation between EU located affiliates of a MNE.

In this paper we aim at investigating the consequences of a series of alternative international tax designs, including those mentioned above, on the strategy of a multinational enterprise. We especially focus on two related aspects of that strategy, the international distribution of MNE investment on the one hand and the choice of its financing behavior, especially its debt level, on the other hand. Focusing on those variables we deliberately seem to leave aside other important aspects like transfer pricing. Transfer pricing is, however, as much

as the financing choice, an illustration of tax shifting activities and paper profit generation.

Investigating the impact of a series of tax designs on simultaneously a real variable - the international distribution of investment - and on a financial variable - the financing decision - is the main originality of this paper. Since the focus of the paper is on those two key decisions of a MNE we do not explicitly investigate the determination of the tax rates by the respective jurisdictions at stake; the relative values of the tax rates and their evolution stems from the assumptions that we issue regarding the relative size of the jurisdictions and from the changes in the sensitiveness of firms' decisions to tax parameters generated by tax reforms.

In section 3, we present the analytical model and theoretically show how the tax environment determines the optimal behavior of the firm. That section is the core of the paper: 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 European Union Directive from July 23, 1990, also called the Parent-Subsidiary Directive; 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).

Prior to that core section, section 2 describes the institutional background and the legal environment against which the institutional changes will take place. Section 4 concludes.

2 Institutional background

A company active in a multinational setting is confronted with a lot of barriers impeding the development of cross-border activities. A major obstacle, hampering international business, is double or even multiple taxation, i.e. the double or multiple taxation of the same MNE with respect to the same revenue during the same time period. Other hurdles like protectionist measures and administrative burdens further handicap multinational business. In order to tackle this issue, several types of rules with respect to tax and financial management tend to regulate international trading and eliminate barriers to cross-border activities.

First, the country in which the firm has its residence, often has concluded a set of double tax treaties with other countries in order to avoid double taxation of income or capital. The OECD, regrouping the governments of around thirty countries, suggested a "Model Tax Convention" as framework for the negotiation of tax treaties between countries. Although two tax treaties are rarely identical, the OECD Model Tax Convention is widely used as a reference point. In addition, the allocation of the right to tax dividends, interests, royalties, and capital gains between the state of source and the state of residence, requests from the contracting states to choose between two methods of double tax relief,

the exemption method and the credit method.

A second set of rules, which impacts the financial management of a company in Europe, are 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), abolishing withholding taxes on dividend payments between associated companies of different Member States, and the Interests and Royalties Directive (2003/49/EC), eliminating withholding taxes on interest and royalty payments of related companies. Moreover, EU law prevents countries from using anti-abuse measures to safeguard their tax revenues. Those measures tend to limit the relocation of business profits in countries, with whom no double tax treaties were concluded.

As the unanimity principle for tax purposes makes multinational decision-making difficult, the mechanism of Enhanced Cooperation Agreement (ECA) was adopted in the Treaty of Nice (2002). This alternative decision-making method 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. 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 implement C&FA, allowing them to lower the companies' transaction costs. The other group of Member States would maintain a SA system in order for them to further attract corporations through their competitive tax system.

3 The Model and its application

In order to analyze the consequences of a series of tax designs regarding the taxation of MNEs, a theoretical model is developed. In that model, we progressively incorporate the international tax rules provided by the successive environments investigated. First, we model the tax situation of a MNE in an institutional environment, free of any international tax rules, and thus subject to multiple taxation of the same income. Then, we extend the model to an environment comprising the rules provided by the OECD Model Tax Convention. Thirdly, we suppose the European Union (EU) Parent-Subsidiary Directive at work and we model in that framework the introduction of a combination of ACE and CBIT systems. Finally, we extend that EU Directive environment by analyzing the introduction of a Consolidation and Formulary Apportionment (C&FA) tax reform and we model the reform if it were adopted either by all or by a sole subset of the Member States within the framework of an Enhanced Cooperation Agreement.

Two taxes are at work in this model, the Corporate Income Tax (CIT) and Withholding Taxes (WT) levied at source on interest and dividend payments; the latter are removed when the EU Directives apply. The Table below illustrates the tax designs under investigation as well as the organization of the section.

	Double Corporate Tax Relief	Withholding Tax Relief
1.Absence of international tax rules		
-Two jurisdictions	-	-
-Lucrative detour	-	-
2.OECD environment		
-Exemption	√	-
-Crediting	√	-
3.EU environment under SA		
-Exemption	√	√
-Crediting	√	√
-ACE and CBIT system	√	√
4.EU and C&FA reform		
-Unanimity	√	√
-Enhanced Cooperation	√	√

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

Additionally, assume that country p is larger than country i which in turn is larger than country j. Hence, the fraction of sales of the multinational in country p, denoted by q, exceeds that in country i, denoted by $1-q$ (i.e. $q > 1-q$), and so does the initial fraction of real investment α_0 in country p with respect to that in country i, denoted by $1-\alpha_0$ (i.e. $\alpha_0 > 1-\alpha_0$). Total sales and total investment amount each to unity. Moreover, we assume that the distribution of investment is controlled by the MNE, but that the distribution of sales is given.

For the purposes of the model, assume that p^r is the retail price obtained by selling the product on the market and p^w is the wholesale price paid by an entity of the MNE to another entity of that MNE for acquiring its production; such intra-MNE trade occurs since we assume sales to be performed by the local entity, either that located in i or the parent company located in p. In our model, subscripts designate the countries and superscripts refer to the tax environment.

In an international tax setting, both the home and the host country of the MNE are willing to tax the MNE's revenue. We assume that the income generated by a subsidiary is subject to the corporate income tax of its host country i or j. Moreover, if a subsidiary distributes its after-tax income as dividend to its parent, the source country levies a withholding tax w_i^d or w_j^d on this dividend. Furthermore, if one of the subsidiaries needs to pay interest to its parent, it levies a withholding tax w_i^i or w_j^i on the interest paid. 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 ($\tau_j < \tau_i < \tau_p$). Finally, we suppose that the corporate tax rates τ are considerably higher than the withholding tax rates w.

3.1 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 and both the host country of the subsidiary, and the home country of the MNE will claim the right to tax the income generated by the subsidiary and paid out to the parent company. Hence, as no tax relief method exists, we assume maximal taxation and suppose that the income is taxed three times. Each cross-border income is subject to three different tax rates: τ_{host}, w_{host} and τ_{home}. We first consider a case with two jurisdictions, then we introduce a possible detour through country j.

3.1.1 Two jurisdictions

Suppose the subsidiary in country i is funded partially through a loan granted by the parent company and partially through shares. Hence, a fraction x of the subsidiary's pre-tax profits will correspond to interest payments and the remaining $1 - x$ will be paid-out after corporate taxation as dividend to the parent company. Interest payments are a deductible expense. Suppose that the MNE is not engaged in tax shifting activities and reports the profits where they are generated. Hence, only countries p and i will collect taxes from the MNE, as we assumed that country j does not have the resources to host an economic activity. Let B be the local tax base of the MNE in each country, $\frac{\gamma}{2}(\alpha - \alpha_0)^2$ the cost of modifying real investment from its initial distribution α_0 to optimal distribution α, and $\frac{c}{2}(x - x_0)^2$ the cost of adjusting the fraction of debt finance again from its initial distribution x_0 to optimal distribution x.

Since the MNE seeks to maximize its present value $V(\alpha, x)$ with respect to investment α and debt level x, its objective function becomes

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

where

$$B_p = p^r q + p^w(\alpha - q) + x \tag{2}$$

$$B_i = p^r(1 - q) - p^w(\alpha - q) - x \tag{3}$$

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

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

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

and second order conditions:

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

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

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

$$\alpha^{NIR2} = \alpha_0 + \frac{1 - C(1 - w_i^d)}{\gamma} p^w$$

$$x^{NIR2} = x_0 + \frac{1 - D(1 - w_i^d)}{c}$$

where $C = (1 - \tau_i)$ and $D = (1 - \tau_i + w_i^i)$. Replacing the variables α and x with their equilibrium values α^{NIR2} and x^{NIR2}, one generates the value of the MNE.

3.1.2 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 tax base in the country with the lowest tax rate. Country j corresponds to this criterion, but since that jurisdiction offers no opportunity for production or consumption, the MNE will use it as a financial center allowing it to make a lucrative detour and to benefit from its favorable tax rate. One option for the MNE is to invest indirectly in country i, by making a detour through j. The parent company now buy shares of the subsidiary in country i for an amount $1 - x$ and of the entity in country j for an amount x. The entity in country j then grants a loan to the production subsidiary in country i. Hence, both the subsidiary in country i as the entity in country j pay out dividends to the parent company. Moreover, the production subsidiary pays tax-deductible interests to the entity in country j, which are

taxed at the favorable corporate tax rate τ_j. However, as no tax relief rules exist, cross-border dividends and interests are subject to triple taxation.

$$\begin{aligned}\max_{\alpha,x} V(\alpha,x) &= (1-\tau_p)B_p - \tau_p(B_i+B_j) + (1-w_i^d)[(1-\tau_i)B_i - xw_i^i] \\ &\quad +(1-w_j^d)(1-\tau_j)B_j - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \qquad (4)\end{aligned}$$

where

$$B_p = p^r q + p^w(\alpha - q) \qquad (5)$$

$$B_i = p^r(1-q) - p^w(\alpha-q) - x \qquad (6)$$

$$B_j = x \qquad (7)$$

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

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

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

and the same second order conditions as under section 3.1.1. The equilibrium values of α and x in p can be expressed as:

$$\alpha^{NIRD} = \alpha_0 + \frac{1-C(1-w_i^d)}{\gamma}p^w$$

$$x^{NIRD} = x_0 + \frac{E-D(1-w_i^d)}{c}$$

where $C=(1-\tau_i)$, $D=(1-\tau_i+w_i^i)$ and $E=(1-w_j^d)(1-\tau_j)$.

Comparing these equilibrium values with the ones found in section 3.1.1 (see table below), we observe that a detour through jurisdiction j does not alter the optimal investment level. The optimal debt level, however, is smaller when using a lucrative detour, what might seem surprising. Since jurisdiction p taxes x anyway, making a detour through j instead of going directly from i to p simply introduces an extra tax burden.

	Optimal Investment	Optimal Debt Level
1.Absence of tax rules		
-Two jurisdictions	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma}p^w$	$x_0 + \frac{1-D(1-w_i^d)}{c}$
-Lucrative detour	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma}p^w$	$x_0 + \frac{E-D(1-w_i^d)}{c}$

Again, substituting for the variables α and x their equilibrium values α^{NIRD} and x^{NIRD}, enables to generate the value of the MNE. 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 jurisdiction j which is negative under the current tax design.

In addition, notice that financial neutrality or the famous "irrelevance of corporate finance" is at work when the last term of the equation determining x^{NIRD} vanishes.

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 income is, however, subject to multiple taxation. When relaxing the assumption that no international tax rules exist, the model changes considerably. Based on the standard model, three settings, corresponding to three different tax environments, will now be compared. For each of the tax environments, we compute the optimal investment level and debt level, and we compare them with the results found above.

3.2 OECD Model Tax Convention

Leaving the initial situation behind, we consider an environment in which countries adopt a set of rules governing the taxation of international transactions. Some rules, like those developed under the OECD Model Tax Convention, aim at avoiding the double taxation of a same income. When entering into a double tax treaty according to the OECD Model Tax Convention, jurisdictions need to choose between two methods of double tax relief, the exemption system and the crediting method. Under an exemption system, the resident country of the beneficiary may tax at most a fraction δ of cross-border income. Under a crediting method, the residence country of the beneficiary may tax cross-border income provided that the taxes paid abroad - often the sole withholding tax - may be deducted up to the amount owed to the former country.

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.

3.2.1 Exemption

One method to avoid the double taxation of dividends is to exempt the cross-border income from taxation in the residence country of the beneficiary. As we assume that the subsidiary is fully owned by its parent company, the OECD Model Tax Convention stipulates that the residence country of the beneficiary may tax at most a fraction δ of the cross-border income. For cross-border interests, we assume a crediting system at work, meaning that only the country of residence of the company paying the interests may tax that amount.

Hence, the MNE's objective function becomes

$$\begin{aligned}\max_{\alpha,x} V(\alpha,x) &= (1-\tau_p)B_p + (1-\delta\tau_p)(1-w_i^d)[(1-\tau_i)B_i - xw_i^i] \\ &\quad +(1-\delta\tau_p)(1-w_j^d)[(1-\tau_j)B_j + xw_i^i] \\ &\quad -\frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \qquad (8)\end{aligned}$$

where the tax bases are defined as under section 3.1.2.

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

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

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

and the same second order conditions as under section 3.1.1. The equilibrium values of α and x in p are given by

$$\alpha^{EXE} = \alpha_0 - \frac{C(1-w_i^d)-(1-\tau_p)}{\gamma}(1-\delta\tau_p)p^w$$

and

$$x^{EXE} = x_0 + \frac{E+(1-w_j^d)w_i^i - D(1-w_i^d)}{c}(1-\delta\tau_p)$$

where $C=(1-\tau_i)$, $D=(1-\tau_i+w_i^i)$ and $E=(1-w_j^d)(1-\tau_j)$.

A comparison with α and x of the previous situation reveals that the former variable has been pushed down by the removal of double taxation while the latter has been pushed up.

3.2.2 Crediting

Under a crediting method as defined by the OECD Model Tax Convention (also called Direct Crediting), the country of residence of the beneficiary may tax cross-border income provided that taxes paid abroad be deductable at home up to the amount of taxes owed to the former country. This definition of the crediting method differs from the one given by the EU Parent-Subsidiary Directive (90/435/EEC) (Indirect Crediting), which will be modeled in the following subsection. Remember that we assume that the corporate tax rates τ are considerably higher than the withholding tax rates w. Hence, the MNE will define its objective function as follows,

$$\begin{aligned}\max_{\alpha,x}\ V(\alpha,x) \quad = \quad & (1-\tau_p)B_p + (1-\max(\tau_p,w_i^d))[(1-\tau_i)B_i - xw_i^i] \\ & +(1-\max(\tau_p,w_j^d))[(1-\tau_j)B_j + xw_i^i] \\ & -\frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \qquad (9)\end{aligned}$$

where the tax bases are defined as under section 3.1.2. and $\max(\tau_p,w_i^d) = \max(\tau_p,w_j^d) = \tau_p$

When introducing these tax bases into the MNE's objective function and maximizing the value of the firm with respect to the fraction of real investment

α and to the fraction financed through debt x, we obtain the following first order conditions,

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

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

and the same second order conditions as under section 3.1.1. It turns out that the equilibrium values of α and x in p are,

$$\alpha^{CRE} = \alpha_0 + \frac{1-C}{\gamma}p^w(1-\tau_p)$$

and

$$\begin{aligned} x^{CRE} &= x_0 + \frac{(1-\tau_j+w_i^i)-D}{c}(1-\tau_p) \\ &= x_0 + \frac{\tau_i-\tau_j}{c}(1-\tau_p) \end{aligned}$$

Conducting the same comparison as in the exemption case also reveals that investment in country p goes down when double taxation has been removed. The optimal debt level of the MNE is no longer influenced by the values of the withholding taxes but clearly depends of the three corporate income tax rates. In particular, it depends of τ_i and τ_j, τ_p playing the role of a scale factor since all income is eventually taxed at that rate in that jurisdiction, irrespective of whether it is a dividend or an interest.

	Optimal Investment	Optimal Debt Level
1.Absence of tax rules		
-Two jurisdictions	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma}p^w$	$x_0 + \frac{1-D(1-w_i^d)}{c}$
-Lucrative detour	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma}p^w$	$x_0 + \frac{E-D(1-w_i^d)}{c}$
2.OECD environment		
-Exemption	$\alpha_0 + \frac{(1-\tau_p)-C(1-w_i^d)}{\gamma}(1-\delta\tau_p)p^w$	$x_0 + \frac{E+(1-w_j^d)w_i^i-D(1-w_i^d)}{c}(1-\delta\tau_p)$
-Crediting	$\alpha_0 + \frac{1-C}{\gamma}p^w(1-\tau_p)$	$x_0 + \frac{(1-\tau_j+w_i^i)-D}{c}(1-\tau_p)$

3.3 EU Tax Environment under Separate Accounting

In a third setting, the rules of the OECD Model Tax Convention are supplemented by the EU rules and principles. In this environment, 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 interrelated companies. In order for those Directives to apply, companies should 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. Consider now that the three jurisdictions of our model are Member States of the European Union and that the companies in those jurisdictions 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. Hence, withholding taxes will no longer appear in our model. Under current rules, each entity is taxed separately in accordance with standard accounting principles (Separate Accounting, SA) and double corporate tax relief is granted through exemption or crediting.

3.3.1 Exemption

Assuming the tax exemption of dividends, leads to the following objective function:

$$\begin{aligned}\max_{\alpha,x} V(\alpha,x) &= (1-\tau_p)B_p + (1-\delta\tau_p)(1-\tau_i)B_i \\ &\quad +(1-\delta\tau_p)(1-\tau_j)B_j - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \quad (10)\end{aligned}$$

where the tax bases are defined as under section 3.1.2. When maximizing the MNE's objective function with respect to the fraction of real investment α and to the fraction of assets financed through debt x, we obtain the following first order conditions:

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

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

and the same second order conditions as under section 3.1.1. The equilibrium values of α and x in p become

$$\alpha^{EXE} = \alpha_0 - \frac{C(1-\delta\tau_p)-(1-\tau_p)}{\gamma}p^w$$

and

$$x^{EXE} = x_0 - \frac{\tau_j-\tau_i}{c}(1-\delta\tau_p)$$

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

$$\alpha^{EXE} = \alpha_0 - \frac{\tau_p-\tau_i}{\gamma}p^w$$

and

$$x^{EXE} = x_0 - \frac{\tau_j-\tau_i}{c}$$

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.

3.3.2 Crediting

As mentioned earlier, the definition of crediting in the EU Parent-Subsidiary Directive (called Indirect Crediting) differs from the one used in the OECD Model Tax Convention (Direct Crediting). Under indirect crediting, the resident country of the beneficiary may tax cross-border income provided that taxes paid abroad, including the upstream corporate income tax, may be deducted up to the amount of taxes owed to the former country. Assuming an indirect crediting system, the cross-border income will be taxed at the highest of both tax rates. This will lead the MNE to define its objective function as follows,

$$\begin{aligned} \max_{\alpha,x} \; V(\alpha,x) &= (1-\tau_p)B_p + (1-max(\tau_p,\tau_i))B_i \\ &\quad +(1-max(\tau_p,\tau_j))B_j - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \quad (11) \end{aligned}$$

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

$$\begin{aligned} \max_{\alpha,x} \; V(\alpha,x) &= (1-\tau_p)B_p + (1-\tau_p)B_i \\ &\quad +(1-\tau_p)B_j - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \qquad (12) \end{aligned}$$

where the tax bases are defined as under section 3.1.2.

When introducing these tax bases into the MNE's objective function and maximizing the value of the firm with respect to the fraction of real investment α and to the fraction financed by debt x, we obtain the following first order conditions:

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

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

and the same second order conditions as under section 3.1.1. The equilibrium values of α and x in p can be written

$$\alpha^{CRE} = \alpha_0$$

$$x^{CRE} = x_0$$

and are independent of the tax parameters. The investigated design is then neutral with respect to both the investment and finance decision of the MNE.

3.3.3 Combination of ACE and CBIT

A suggestion to reduce the corporate tax distortion between sources of financing is the introduction of a system combining Allowance for Corporate Equity (ACE) and Comprehensive Business Income Tax (CBIT). Such proposition tackles the unequal tax treatment of debt and equity (and also retaining earnings), by giving partial, but equal tax relief for both financing modes. Hence, the deductibility of interests is partially abolished and the deductibility of dividends

is partially established. Suppose therefore that only a fraction θ of the interests can now be deducted by the paying company, but that a tax relief is granted for a fraction $1-\theta$ of the dividend payments. Assuming an exemption system for the taxation of dividends, the company's objective function now is,

$$\begin{aligned}\max_{\alpha,x} V(\alpha,x) &= (1-\tau_p)B_p + (1-\delta\tau_p)\left[(1-\tau_j)B_j + \tau_j\left(1-\theta\right)x\right] \\ &\quad +(1-\delta\tau_p)\left[(1-\tau_i)B_i + \tau_i\theta x + \tau_i\left(1-\theta\right)(1-x)\right] \\ &\quad -\frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \end{aligned} \tag{13}$$

where B_p, B_i and B_j have their usual definition.

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

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

$$\frac{dV(\alpha,x)}{dx} = (1-\delta\tau_p)\left[2\theta\tau_i - \tau_i - \theta\tau_j\right] - c(x-x_0) = 0$$

and the same second order conditions as under section 3.1.1. The equilibrium values of α and x in p can be expressed as,

$$\alpha^{EXE} = \alpha_0 - \frac{C(1-\delta\tau_p)-(1-\tau_p)}{\gamma}p^w$$

and

$$x^{EXE} = x_0 - \frac{\theta\tau_j - (2\theta-1)\,\tau_i}{c}(1-\delta\tau_p)$$

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

$$\alpha^{EXE} = \alpha_0 - \frac{\tau_p-\tau_i}{\gamma}p^w$$

and

$$x^{EXE} = x_0 - \frac{\tau_j}{2c}$$

We observe that the reform has left the distribution of investment unchanged (with respect to the application of the exemption mechanism in line with the Parent-Subsidiary Directive, see above) while the internal debt level of the MNE and thus the importance of the tax shifting strategy has sharply decreased.

	Optimal Investment	Optimal Debt Level
1.Absence of tax rules		
-Two jurisdictions	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma} p^w$	$x_0 + \frac{1-D(1-w_i^d)}{c}$
-Lucrative detour	$\alpha_0 + \frac{1-C(1-w_i^d)}{\gamma} p^w$	$x_0 + \frac{E-D(1-w_i^d)}{c}$
2.OECD environment		
-Exemption	$\alpha_0 + \frac{(1-\tau_p)-C(1-w_i^d)}{\gamma}(1-\delta\tau_p)p^w$	$x_0 + \frac{E+(1-w_j^d)w_i^i-D(1-w_i^d)}{c}(1-\delta\tau_p)$
-Crediting	$\alpha_0 + \frac{1-C}{\gamma} p^w(1-\tau_p)$	$x_0 + \frac{(1-\tau_j+w_i^i)-D}{c}(1-\tau_p)$
3.EU under SA		
-Exemption	$\alpha_0 - \frac{C(1-\delta\tau_p)-(1-\tau_p)}{\gamma} p^w$	$x_0 - \frac{\tau_j-\tau_i}{c}(1-\delta\tau_p)$
-Crediting	α_0	x_0
-ACE-CBIT system	$\alpha_0 - \frac{C(1-\delta\tau_p)-(1-\tau_p)}{\gamma} p^w$	$x_0 - \frac{\theta\tau_j-(2\theta-1)\tau_i}{c}(1-\delta\tau_p)$

3.4 EU Tax Environment under Consolidation and Formulary Apportionment

So far, the MNE was able to use strategic opportunities to optimize its after-tax income. In order to tackle these tax planning strategies, the European Commission considers to move from the system of Separate Accounting to a system of Consolidation and Formulary Apportionment, where a MNE is taxed based on its consolidated tax base and an apportionment formula is used to distribute the tax base amongst the affected Member States.

In this subsection, we consider two situations. In the first one, all EU Member States unanimously decide to introduce the C&FA taxation system; under the second one, only the jurisdictions p and i adopt the reform.

3.4.1 Unanimity

Under C&FA, one consolidated tax base is computed - called the Common Consolidated Corporate Tax Base, CCCTB) and apportioned amongst the jurisdictions according to a formula. In the consolidated tax base, the intra-group payments of dividends, interests, and royalties are ignored and the taxable incomes of all group companies are consolidated regardless of whether these companies are residents or non-residents of the parent company's country. The consolidated income is then distributed amongst the jurisdictions 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 jurisdiction taxes its tax base fraction according to its own tax rate. Considering the consolidated tax base B, the objective function becomes:

$$\max_{\alpha,x} V(\alpha,x) = (1-\tau_p)B_p^{FA} + (1-\tau_i)B_i^{FA} - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \quad (14)$$

where

$$B = p^r \quad (15)$$

$$B_p^{FA} = [q(1-\lambda) + \lambda\alpha]B \quad (16)$$

$$B_i^{FA} = [(1-q)(1-\lambda) + \lambda(1-\alpha)]B \tag{17}$$

Under this tax design there is no longer room for x since intra-MNE movements vanish, and accordingly no tax base allocated to country j. We, thenmaximize 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

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

and the equilibrium values of α and x are,

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

$$x^{FA} = x_0$$

Two observations deserve attention at this point. First, as the irrelevance of the determination of x shows, there is no longer room for lucrative detour and tax shifting strategies with respect to the source of finance, the transfer price or any other instrument. Second, the move from SA to C&FA 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

$$\lambda p^r < p^w$$

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 w.r.t. 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 Gerard (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. It could be compensated by a side payment but this is presumably not enough 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, be investigated.

3.4.2 Enhanced Cooperation

The mechanism of an Enhanced Cooperation Agreement (ECA) allows a minimum of eight 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 SA system in order for them to further attract corporations through their competitive tax system. The other group of Member States would implement C&FA, allowing them to lower the companies' transaction costs.

Consider that only the active jurisdictions p and i adopt a C&FA system and that jurisdiction j decides to stay out of the consolidation area, maintaining a SA design. The common tax base now only includes the tax bases of the active jurisdictions. A separate tax base of the entity in country j coexists. The objective function of the MNE remains:

$$\max_{\alpha,x} V(\alpha,x) = (1-\tau_p)B_p^{FA} + (1-\tau_i)B_i^{FA} + (1-\tau_j)B_j - \frac{\gamma}{2}(\alpha-\alpha_0)^2 - \frac{c}{2}(x-x_0)^2 \tag{18}$$

where

$$B = p^r - x \tag{19}$$

$$B_p^{FA} = [q(1-\lambda) + \lambda\alpha]B \tag{20}$$

$$B_i^{FA} = [(1-q)(1-\lambda) + \lambda(1-\alpha)]B \tag{21}$$

$$B_j = x \tag{22}$$

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

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

$$\begin{aligned}\frac{dV(\alpha,x)}{dx} &= -(1-\tau_p)[q(1-\lambda) + \lambda\alpha] - (1-\tau_i)[(1-q)(1-\lambda) + \lambda(1-\alpha)] \\ &\quad +(1-\tau_j) - c(x - x_0) = 0\end{aligned} \tag{23}$$

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

$$\begin{aligned}\alpha^{EC} &= \alpha_0 + \frac{\tau_i - \tau_p}{\gamma}\lambda p^r \\ &\quad -\frac{(\tau_i - \tau_p)}{\gamma}\lambda\left[\frac{cx_0 + \lambda - \tau_j + \tau_p\left[q(1-\lambda) + \lambda\alpha_0 + \frac{(\tau_i-\tau_p)}{\gamma}\lambda^2 p^r\right]}{c + (\tau_p - \tau_i)\frac{(\tau_i-\tau_p)}{\gamma}\lambda^2}\right] \\ &\quad +\frac{(\tau_i - \tau_p)}{\gamma}\lambda\left[\frac{\tau_i\left[(1-q)(1-\lambda) + \lambda - \lambda\alpha_0 - \frac{(\tau_i-\tau_p)}{\gamma}\lambda^2 p^r\right]}{c + (\tau_p - \tau_i)\frac{(\tau_i-\tau_p)}{\gamma}\lambda^2}\right]\end{aligned} \tag{24}$$

$$\begin{aligned}x^{EC} &= \frac{cx_0 + \lambda - \tau_j + \tau_p\left[q(1-\lambda) + \lambda\alpha_0 + \frac{(\tau_i-\tau_p)}{\gamma}\lambda^2 p^r\right]}{c + (\tau_p - \tau_i)\frac{(\tau_i-\tau_p)}{\gamma}\lambda^2} \\ &\quad +\frac{\tau_i\left[(1-q)(1-\lambda) + \lambda - \lambda\alpha_0 - \frac{(\tau_i-\tau_p)}{\gamma}\lambda^2 p^r\right]}{c + (\tau_p - \tau_i)\frac{(\tau_i-\tau_p)}{\gamma}\lambda^2}\end{aligned} \tag{25}$$

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 jurisdiction is still profitable. Not the cooperating jurisdictions, but the jurisdiction staying out of the consolidation area benefits from the enhanced cooperation agreement, as an important number of tax planning strategies persist. We can then reasonably consider that the consolidating countries will attempt to replicate; those replications are briefly examined below.

3.4.3 Attempts to eliminate tax shifting strategies

In the analysis conducted above, we observe that under an Enhanced Cooperation Agreement, using a detour through a non-participating jurisdiction remains profitable. In order to avoid optimization strategies with respect to the fraction of debt used x, the theoretical literature suggests and discusses several solutions.

Gerard and Traversa (2010) investigate two types of measures. First, they suggest to give up the exemption method in favor of the crediting system. However that move seems to be in contradiction with the trend among countries. Indeed, a country like UK which was for long characterized by crediting has moved to exemption. The main reason, presumably, is that crediting may create discrimination among domestic and other European resident shareholders, since credits hardly cross the national borders. A move to crediting, though, should imply - see subsection 3.3.2. above - that dividends from country j be taxed as profits from countries p and i, thus in a similar way as profits not subject to a lucrative detour. 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.

Second, those authors consider anti-abuse measures. Those rules aim at safeguarding the tax base of jurisdictions by making potentially lucrative detours no longer lucrative, even if profits are not repatriated. Those measures are known as CFC rules, CFC meaning Controlled Foreign Companies. Those such measures are familiar to American tax designers, they raise issues in Europe, especially since, for some analysts, they are not compatible with EU law, namely with the right of free establishment (see a.o. the Cadbury-Schweppes case).

4 Conclusion

In this paper we have investigated the consequences of a series of alternative tax designs for the behavior of multinational enterprises, focusing on two key decisions of MNE's, the distribution of investment among jurisdictions and the choice of the financing strategy. That latter illustrates a larger set of tax shifting opportunities provided to firm by various tax systems.

Investigating a real and a financial decision simultaneously is for sure the

main originality of this, yet tentative, paper. It especially deserves interest at a moment when empirical literature reveals that the impact of tax on firms is probably stronger on financial decisions than on real decisions - see a.o. Princen (2010).

In this paper we have assumed and modeled a three country world and a single multinational firm. In that model, we have successively introduced various international tax rules defining as various tax environments. First, we have modeled the of a MNE operating in an institutional environment free of any international tax rules, and thus subject to multiple taxation on a given tax base. Then, we have extended our model to an environment taking into account the rules provided by the OECD Model Tax Convention. Thirdly, we have supposed the European Union (EU) Parent-Subsidiary Tax Directives and, in that framework, we have modeled the introduction of a combination of ACE and CBIT systems. Finally, we have extend that environment moving from current Separate Accounting (SA) to Consolidation and Formulary Apportionment (C&FA) and the so called Common Consolidated Corporate Tax Base (CCCTB), assuming that reform adopted by all the jurisdictions considered or by a sole subset of them within an Enhanced Cooperation Agreement. That latter case raises the issue of the protection of the tax base of the consolidation area and therefore of the compatibility with EU law, including the freedom of establishment, of such anti-abuse measures as CFC provisions.

Properties of the respective designs investigated in the paper have been set forth along the pages.

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