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An Economic Rationale for Controlled-Foreign-Corporation Rules¹

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Abstract

By introducing controlled-foreign-corporation (CFC) rules, the parent country of a multinational firm reserves the right to tax the income of the firm's foreign affiliates, if the tax rate in the affiliate's host country is below a specified threshold. In this paper, we identify the conditions under which binding CFC rules are part of the optimal tax mix chosen by governments. We show that this is the case when the financial structure of the multinational firm responds elastically to the introduction of the CFC rule, outweighing the negative effects on the firm's investment decision in the parent country, and on the profits of the home-owned firm in the parent country's welfare objective. We also show that if the government is mostly interested in maximizing tax revenues, a tighter CFC rule is associated with a tighter thin capitalization rule in its policy optimum.

Keywords: Multinational corporations, profit shifting, controlled-foreign-company rules, thin-capitalization rules

JEL classification: H25, H73, F23

1 Introduction

Controlled-foreign-company (CFC) rules have become an increasingly important policy instrument for governments in their attempt to curb profit shifting by multinational companies and to protect national corporate tax bases. CFC rules apply to so-called ‘passive income’ like interest payments and royalties which can easily be placed in affiliates in tax havens without having a substantial physical presence there.¹ By classifying an affiliate whose primary activity is to provide equity or patent services to other affiliates in the same corporate group as a ‘controlled-foreign-corporation’, the tax authority in the parent country of the multinational thus reserves the right to tax the profits of the affiliate in the tax haven by adding the affiliate’s income in the tax haven to the profits declared in the parent country. CFC rules therefore override the tax-exemption principle that most countries now apply for the taxation of multinational firms.² Typically, CFC rules stipulate a minimum tax rate that must be levied in a host country, in order to avoid additional taxation in the parent country. In doing so, CFC rules reduce the tax gain for multinationals from placing valuable assets like equity or patents in a tax haven.

In recent years, there has been an active policy discussion surrounding CFC rules. In its so-called Cadbury-Schweppes decision, the European Court of Justice (ECJ) has tried to ban CFC rules for affiliates that operate within the European Economic Area and belong to multinationals that are headquartered in a European-Economic-Area country. At the same time, however, the OECD in its ‘Action Plan on Base Erosion and Profit Shifting’ calls for introducing and strengthening CFC rules in its member countries (OECD, 2013, action 3). Moreover, several recent empirical analysis (Ruf and Weichenrieder 2012; Egger and Wamser, 2011) have shown that CFC rules are effective in changing multinational firm’s decision.

In the theoretical literature, however, CFC rules have so far been left out of the analysis of how governments respond to profit shifting by multinational firms. Importantly, the theoretical case for CFC rules is by no means clear. CFC rules only apply for domestic multinationals (i.e., multinationals that are headquartered in the country introducing

¹See Dischinger and Riedel (2011) for evidence that patents are placed in low-tax countries and Reuters (2012) for a case study of tax avoidance in the United Kingdom.

²Under the tax-exemption method, the parent country does not tax the profits of foreign affiliates of a resident MNC. This scheme is applied by most OECD countries, with the prominent exception of the United States. See Becker and Fuest (2010) for a recent discussion and analysis.

the CFC rules), and they do not affect the activity of domestic affiliates of foreign-based multinationals. Hence, to protect the national tax base from both debt shifting and abusive transfer pricing, it should be better to enforce strict thin-capitalization rules. Thin capitalization rules restrict the amount of tax-deductible internal debt (i.e., borrowing from related affiliates) for domestic affiliates of both domestic and foreign multinationals and will therefore curb profit shifting in *all* multinational entities operating in the country. In contrast, CFC rules bind all affiliates worldwide of domestic multinationals only. Therefore, tight CFC rules reduce the foreign profits of domestic multinationals and provide (potentially) positive externalities on tax revenues in other countries. Hence, the question arises of why countries unilaterally implement such rules that seem to be inferior to thin-capitalization rules in protecting the national tax base, and which harm the foreign activities of domestic multinationals.

In this paper, we identify the conditions under which binding CFC rules are part of the optimal tax mix chosen by governments. For this purpose we set up a model of two small countries and a continuum of tax havens which differ in their (exogenous) tax rates. The model has three types of firms, domestic firms, domestic multinationals, and foreign multinationals, all choosing their investment levels in the home country. The domestic and foreign multinationals in addition choose the tax-optimized financial structure of their investment. This implies that investments in the home country are financed by internal loans from an affiliate in the tax haven, provided that the interest cost of these loans are tax-deductible in the home country. The home country's government can tax all firms by means of the statutory corporate tax rate and can additionally use both a thin-capitalization rule and a CFC rule to control the choices of multinational firms.

Our analysis delivers the following results. In the tax policy optimum, the home government permits multinational firms to engage in some debt shifting to a tax haven, in order to reduce the effective cost of capital and increase investment by multinationals in the home country. This implies that some tax discrimination in favor of multinational firms will take place in equilibrium.³ However, for any given level of internal debt permitted by the thin-capitalization rule, multinational firms will still have an incentive to engage in further, and costly, debt shifting to the tax haven. This incentive arises from the statutory tax rate differential between the home country and the tax haven,

³Note that, at least within the European Economic Area, thin-capitalization rules cannot be designed in a way to discriminate between domestic and foreign multinationals, see the Lankhorst-Hohorst ruling of the ECJ in 2002.

and cannot be affected by the thin-capitalization rules. Since lowering the statutory tax rate involves tax revenue losses from all firms, a binding CFC rule will be the preferred instrument to control this margin. A binding CFC rule will then result in the government's policy optimum, if the MNC's internal debt choice responds elastically to the introduction of the CFC rule, and if it outweighs the negative effects on the domestic MNC's investment decision and on the profits of its foreign affiliates.

We also analyze the relationship between the thin-capitalization rule and the CFC rule in the government's policy optimum. We show that a tighter CFC rule also leads to a tighter thin-capitalization rule, if governments are mostly interested in maximizing tax revenues. The reason is that CFC rules reduce the investment incentives created by more generous thin-capitalization rules, because they limit the tax gain obtained from higher levels of internal debt. At the same, however, the reduction of the corporate tax base, which represents the tax costs of a more lenient thin-capitalization rule, is independent of the chosen CFC rule. On average, therefore, a tighter CFC rule makes it less attractive for the government to use thin-capitalization rules as a way to induce more investment by mobile multinational firms.

The existing literature on CFC rules is largely empirical. Egger and Wamser (2011) and Ruf and Weichenrieder (2012) analyze the effects of the German thin-capitalization rule on the investment and financing decisions of German multinationals. Ruf and Weichenrieder (2013) examine whether, and how, these patterns have been affected by the Cadbury-Schweppes decision of the European Court of Justice. To the best of our knowledge, the only theoretical contribution is Weichenrieder (1996). He analyzes the effect of CFC rules on capital investment and shows that CFC rules increase capital costs and decrease (foreign) investment of domestic multinationals. His analysis does not model debt shifting (nor transfer pricing) explicitly, however, and it does not derive optimal tax policies towards multinationals.

In comparison to CFC rules, thin-capitalization rules have received some more attention in the recent literature. From a theoretical perspective, Hong and Smart (2010) and Haufler and Runkel (2012) show that thin-capitalization rules can be used as an instrument to differentiate between the effective taxation of domestic and multinational firms. In a tax competition equilibrium, thin-capitalization rules will then be set inefficiently lax, in order to attract investment by multinational firms.⁴ Mardan

⁴An analogous argument holds for a lax enforcement of the arm's-length-principle, which allows the MNC to shift profits to a low-tax haven. See Peralta and van Ypersele (2006).

(2013) compares the effects of alternative thin-capitalization rules. From an empirical perspective, there is ample evidence that thin-capitalization rules are effective in restricting internal borrowing and debt shifting, but still offer sufficient leeway to allow for some (excessive) internal leverage. Examples of this literature are Weichenrieder and Windischbauer (2008), Overesch and Wamser (2010), Büttner et al. (2012), and Blouin et al. (2014).

The remainder of this paper is organized as follows. In Section 2 we give some institutional background on CFC rules and describe the results in the recent empirical literature on this subject in more detail. Section 3 presents our model and derives the optimal financing and investment decisions of national and multinational firms. Section 4 turns to the optimal tax policy choices made by the small country’s government. We also analyze in detail the relationship between the thin-capitalization and CFC rules chosen in the government’s policy optimum. Section 5 discusses our results and outlines some possible extensions.

2 Institutional background and empirical results

CFC rules were first introduced as ‘Subpart F’ legislation in the United States in 1964. Germany followed in 1972 (‘Hinzurechnungsbesteuerung’ in §§7 to 14 in the Foreign Tax Act) using the US rules as a blue print. In 2013, more than 30 countries worldwide used CFC rules to limit profit shifting by multinational corporations.⁵ Table 1 collects the minimum tax rates that a host country must levy in order to avoid CFC taxation in the parent country of the multinational and compares this tax rate to the statutory corporate income tax rate in the parent country. The table also shows that most countries with CFC rules also employ thin-capitalization rules to limit debt-shifting by multinationals operating in their country.

The basic set-up of CFC rules is as follows. If a resident company (parent) has a significant, controlling influence (no matter whether direct or indirect shareholding) on an affiliate that is located abroad and faces a ‘low tax rate’, the host country of the parent will override the tax-exemption principle if the income is classified as ‘passive income’. Passive income (e.g., interest income, royalties) will then be taxed on accrual under the tax-credit method at the higher tax rate of the parent company.

⁵See KPMG (2008) for a brief survey of institutional details. Lang et al. (2004) offer a detailed discussion of CFC rules from a legal perspective.

Table 1: CFC Rules and thin-capitalization Rules in Selected Countries (2013)

	corporate income tax rate (CIT, in%)	CFC rule: minimum tax in host country (%)	thin capital- ization rule type ^a	ratio
Argentina	35	black-listed jurisdictions	debt/equity	2:1
Australia	30	30 ^b	debt/equity	3:1
Azerbaijan	20	10 (50% of CIT)	none	-
Brazil	34	20 (as of 2015)	debt/equity	2:1
Canada	26.5	26.5 ^b	debt/equity	2:1
China	25	12.5 (50% of CIT)	debt/equity	2:1
Denmark	25	25 ^b	debt/equity	4:1
Egypt	25	18.75 (75% of CIT)	debt/equity	4:1
Finland	24.5	18.38 (75% of CIT)	interest/EBITDA	30%
France	33.33	16.66 (50% of CIT)	debt/equity	1.5:1
Germany	29.55	25	interest/EBITDA	30%
Hungary	19	10	debt/equity	3:1
Iceland	20	13.33 (66% of CIT)	none	-
Indonesia	25	25 ^b	none	-
Israel	25	20	none	-
Italy	31.4	15.7 (50% of CIT)	interest/EBITDA	30%
Japan	38	20	debt/equity	3:1
Korea (Rep.)	24.2	15	debt/equity	3:1
Lithuania	15	11.25 (75% of CIT)	debt/equity	4:1
Mexico	30	22.5 (75% of CIT)	debt/equity	3:1
New Zealand	28	28 ^b	debt/equity	1.5:1
Norway	28	18.66	none	-
Peru	30	22.5 (75% of CIT)	debt/equity	3:1
Portugal	25	15 (60% of CIT)	interest/EBITDA	30%
South Africa	28	21 (75% of CIT)	debt/equity	3:1
Spain	30	22.5 (75% of CIT)	interest/EBITDA	30%
Sweden	22	12.1 (55% of CIT)	none	-
Turkey	20	10	debt/equity	3:1
Un. Kingdom	23	17.25 (75% of CIT)	debt/equity	1:1
United States	40	40 ^b	debt/equity	1.5:1
Uruguay	25	12	none	-
Venezuela	34	20	debt/equity	1:1

^a 'Safe haven' debt-to-equity ratio or share of interest income over gross profits (EBITDA) up to which interest payments are deductible from the corporate tax base.

^b Country adopts transaction approach: (only) the passive income of a CFC is added to the tax base in the residence country and taxed there, irrespective of the CFC's location.

Sources: European Tax Handbook (2013) and Global Corporate Tax Handbook (2013).
International Bureau of Fiscal Documentation, Amsterdam.

The German rules are exemplary. German CFC rules apply if a German company directly or indirectly holds 50% or more of the voting rights in a foreign affiliate and if this affiliate faces an effective tax rate of less than 25% (being calculated according to German tax base measures). If the foreign company earns passive income, that passive income is immediately included in the corporate tax base of the German parent company and taxed at the German tax rate – no matter where the passive income effectively accrued. Thereby, the German tax code negatively defines ‘passive income’ as not being listed as active incomes in §8(1) Foreign Tax Act. Essentially, passive income comprises revenues from nonproductive activities such as royalties and interest income in affiliates, earned on capital not raised from unrelated third parties.⁶

Due to the fact that the German central bank (i.e., Deutsche Bundesbank) provides a detailed data base (the so-called MiDi database) for analyzing debt-shifting, FDI flows and related issues, the German CFC rules are well-examined empirically. Ruf and Weichenrieder (2012) find that German CFC rules are very effective in curbing passive investments and have a strong impact on the location decision of internal banks and profit centers. Analyzing data from 1996 to 2006, the authors use a set of German tax reforms that occurred between 2001 and 2003.⁷ One of their findings is that a shelter from CFC taxation has strong effects on the location of internal banks, i.e., conduit entities with positive net lending. The existence of binding CFC rules reduces the likelihood to locate the internal bank in such a low-tax country by 45%. Consequently, binding CFC rules significantly reduce passive investment in tax havens, and even lead multinationals to abandon their presence in some tax havens altogether.

In a sequel paper, Ruf and Weichenrieder (2013) test whether the Cadbury-Schweppes ruling by the ECJ in 2006 and the resulting ban of CFC rules for low-taxed affiliates within the European Economic Area induced German multinationals to relocate their profit centers and internal banks to (implicit) tax havens within the European Economic Area (e.g., Ireland or the Benelux countries). Analyzing the years 1999 to 2010 in the MiDi database, Ruf and Weichenrieder find (almost) no effect of the ECJ’s decision. One explanation offered is that there is still sufficient uncertainty left whether

⁶For detailed overviews of the German CFC legislation, see Förster and Schmidtman (2004) and Ruf and Weichenrieder (2012).

⁷For example, there was a treaty override in 2003. Before 2003, passive income was sheltered from any taxation in Germany (and thus also from CFC legislation) in some double tax agreements, whereas other double tax agreements had explicit activity clauses providing tax shelter only for active income. In 2003, however, Germany decided to apply such activity clauses to *all* existing tax treaties.

CFC rules indeed no longer apply in countries of the European Economic Area. Another reason could be that the German multinationals had located their internal banks within the EU already before 2006.

Relying on the MiDi database as well, Egger and Wamser (2011) analyze the impact of German CFC rules on real investment (i.e., fixed assets) in foreign affiliates of German multinationals. These authors use the fact that the full set of German CFC rules (including exemptions) gives rise to two different thresholds, thus allowing for a two-dimensional regression discontinuity approach. Egger and Wamser find a substantially negative local average treatment effect (around the two treatment thresholds) on real investment, because a binding CFC rule significantly increases effective capital costs.

The only studies not using German data are Altshuler and Hubbard (2003) and Mutti and Grubert (2006). Altshuler and Hubbard look at US multinationals' income from financial services and rely on changes in the 'Subpart F' legislation in the Tax Reform Act of 1986. Their findings suggest that tighter US CFC rules restrict tax deferral by US multinationals. Mutti and Grubert, however, point out that there is an increased use of hybrid entities that could allow US multinationals to work around the tightening of the US CFC rules.

3 The Model

3.1 The basic framework

We set up a model of two small countries, a home country labeled h and a foreign country labeled f . Additionally, there exists a continuum of tax haven countries offering preferential tax rates t_k , which are continuously distributed in the range $[0, t_h)$. Capital is perfectly mobile across countries so that the rate of return of capital is fixed at $r > 0$.

There are two representative multinational companies (henceforth MNCs), one headquartered in each of countries h and f . Each MNC has one producing affiliate in each country, h and f respectively, and a financial center in one of the tax haven countries.⁸ Furthermore, there is also one purely national firm in each country h and f . The categorization of firms into national vs. multinational firms is exogenous to our analy-

⁸We assume that all affiliates are fully owned by the parent company. For an analysis of debt shifting in the presence of variable ownership structures, see Schindler and Schjelderup (2012).

sis, arising for example from differential fixed costs of setting up an 'internationalized' organizational structure.⁹

All firms use capital to produce a homogenous output good they sell in the world market at a price normalized to one. The output good is produced with capital and some fixed factor, leading to a production function with positive but decreasing returns to investment. Production technologies are allowed to differ between national firms and MNCs. For the national firms, the capital use is denoted by d_i , with $i \in \{h, f\}$, and production is given by $g(d_i)$. For the MNCs, capital use is k_i^j , where the superscript j denotes the ownership country (i.e., the country where the headquarter resides) and the subscript i indicates the country where capital is employed. Production by the MNCs is given by $f(\phi k_i^j)$. We assume a home bias where capital invested by a MNC in its home (headquarter) country is more productive than in the foreign (affiliate) country. One reasoning could be that agency problems in the home country are less severe so that less resources are lost or wasted. Hence, the productivity parameter is $\phi > 1$ if $i = j$, but $\phi = 1$ if $i \neq j$.

For simplicity, our analysis ignores external capital markets and assumes that all firms can raise sufficient equity to finance their optimal investment levels. Thus, all investment by national firms will be financed by equity. MNCs can, however, place their equity in the tax haven affiliate, which then makes internal loans to the affiliates in countries h and f . This generates interest income in the tax haven but deductible interest expenses in countries h and f , thus leading to aggregate tax savings by the MNC.

The governments of countries h and f can deploy three different tax instruments. These are (i) the corporate tax rates t_i ; (ii) a thin-capitalization rule λ_i ; and (iii) a CFC rule that is characterized by a minimum tax rate τ^j that the tax haven must levy to avoid taxation in the headquarter country j . These three policy instruments affect the decisions of MNCs by changing their effective tax rates. Thin-capitalization rules allow all MNCs investing in a host country i to deduct internal interest payments to the affiliate in the tax haven up to a maximum share $0 \leq \lambda_i \leq 1$ of the corporate tax base. The policy instrument λ_i may thus either capture a 'safe haven' ratio of debt to equity, or a share of total corporate profits (see Table 1). As long as the legally

⁹This follows most of the literature on discriminatory tax competition, which assumes exogenous differences in the international mobility of capital tax bases. For an analysis that endogenizes the degree of firm mobility, see Bucovetsky and Haufler (2008).

specified share λ_i is not exceeded, we assume that the internal loan transaction with the tax haven affiliate is not associated with any transaction costs for the firm. Hence, given the tax savings, affiliates will always find it optimal to engage in internal lending until the tax-deductible share of internal interest payments λ_i is exhausted.

Moreover, MNCs typically have additional ways to ‘stretch’ existing thin-capitalization rules, for example by utilizing holding structures that are allowed to have higher leverages (see Weichenrieder and Windischbauer, 2008, for details) or by misdeclaring internal debt as external debt and disguising the ownership in the internal bank.¹⁰ Such restructuring will cause additional costs, however, which we call ‘concealment costs’ in the following. Hence, in excess of the tax-deductible share of internal debt λ_i that is covered by the thin-capitalization rule, affiliates will be able to deduct a further, endogenous share β_i^j of their capital costs in the host country by means of internal debt shifting to a tax haven. The share β_i^j is chosen so as to maximize the difference between the tax gain obtained by these additional transactions and the concealment costs incurred. Concealment costs are assumed to be a linear function of the capital stock and a quadratic function of the extra leverage β_i^j and are given by $C_i^j = (\delta/2)(\beta_i^j)^2 k_i^j$.

The CFC rule, in contrast, allows governments to discriminate between domestic and foreign MNCs, as only the domestic MNCs are affected by this rule. The tax rate τ^j is the minimum tax rate that a tax haven country must levy on the profits of the MNC in order to avoid additional taxation in the MNC’s parent country (see Table 1). In the MNC’s optimum, the affiliate holding the firm’s capital (the ‘internal bank’ of the MNC) will therefore be located in a tax haven country k whose statutory tax rate t_k is just equal to this lowest possible tax rate that avoids the headquarter country j ’s CFC rules. Hence, by choosing τ^j , a headquarter country is able to limit the tax advantage that the domestic MNC obtains from internal leverage. This instrument thus applies to both the internal debt within the limit of the legally stipulated thin-capitalization rule, and to the firm’s optimal level of ‘excess’ leverage β_i^j .

3.2 Firms’ decision problems

National firms. Unlike MNCs, the national firms do not have the opportunity to use internal debt as a tax planning instrument. Costs of capital cannot be deducted

¹⁰More generally, the results in empirical studies on thin-cap rules point to that there is always some leeway left; see, e.g., Blouin et al., (2014).

from the tax base and hence the tax combines a tax on profits with a ‘pure’ capital tax. The decision problem of the national firms reduces to an investment decision problem. Profits of the national firms are

$$\pi_i^d = (1 - t_i)g(d_i) - rd_i. \quad (1)$$

The optimal investment level is then implicitly defined by the first-order condition

$$(1 - t_i)g'(d_i) = r. \quad (2)$$

The effects of an increase in the statutory tax rate t_i on the investment levels of national firms are given by

$$\frac{\partial d_i}{\partial t_i} = \frac{g'(d_i)}{(1 - t_i)g''(d_i)} < 0 \quad \forall i \in \{h, f\}. \quad (3)$$

Since the costs of financing the investment are not tax-deductible for national firms, but the returns from the investment are taxed, a higher tax rate induces national firms to reduce their investment levels. The governments’ remaining tax instruments do not affect national firms.

Multinational firms. Under the ruling international standard of separate accounting, profits are considered separately for each entity of a MNC. Moreover, for a firm that is headquartered in country j and has an affiliate in country i , net profits are

$$\pi_i^j = (1 - t_i)f(\phi k_i^j) - \rho_i^j k_i^j, \quad (4)$$

where $\phi \geq 1$, as discussed above and the firm-specific capital costs are

$$\rho_i^j = \left[1 - (t_i - \tau^j)(\lambda_i + \beta_i^j) + \frac{\delta}{2}(\beta_i^j)^2 \right] r. \quad (5)$$

Thus the capital costs of an affiliate of MNE j in country i are reduced by the tax shield of internal debt, which depends on the host country’s tax rate t_i . However, the tax gain is limited by the fact that the headquarter country’s CFC rule leads to the internal bank being located in a tax haven with the tax rate τ^j (where the interest income from the internal loan is taxed).¹¹ The amount of internal debt that is shifted

¹¹For a tax-efficient capital structure, the internal debt tax shield needs to be maximized. That implies to place the internal bank in the affiliate with the lowest effective tax rate; see Mintz and Smart (2004) and Schindler and Schjelderup (2012). In case of CFC rules, this affiliate will be the one for which the CFC rule is just not binding.

to the tax haven depends on the share of internal debt λ_i that is tax-deductible under the thin-capitalization rule, and on the excess leverage β_i^j . The latter, however, causes concealment costs that reduce the net gain from the extra leverage β_i^j and increase the capital cost.¹²

The MNC's maximization problem can be seen as a two stage process where the affiliate first chooses the profit maximizing financial structure and then, in a second step, decides on how much to invest and produce in each country. The optimal leverage ratio is obtained by minimizing the effective capital cost in (5) with respect to β_i^j , giving

$$\beta_i^j = \frac{r}{\delta}(t_i - \tau^j). \quad (6)$$

Substituting (6) in (5) gives the effective capital cost under the optimized financial structure

$$(\rho_i^j)^* = \left[1 - (t_i - \tau^j)\lambda_i - \frac{r}{2\delta}(t_i - \tau^j)^2\right] r. \quad (7)$$

From equation (7) we can derive the effects of all tax instruments on the effective capital costs of each affiliate. In country h , three different entities of MNCs need to be considered: the home affiliate of the domestic MNC, the foreign affiliate of the domestic MNC, and the home affiliate of the foreign MNC. The effect of the home country's tax parameters t_h , λ_h and τ^h on these three firm types are given by

$$\frac{\partial \rho_h^h}{\partial t_h} = -(\lambda_h + \beta_h^h)r, \quad \frac{\partial \rho_h^h}{\partial \lambda_h} = -(t_h - \tau^h)r, \quad \frac{\partial \rho_h^h}{\partial \tau^h} = (\lambda_h + \beta_h^h)r; \quad (8a)$$

$$\frac{\partial \rho_f^h}{\partial t_h} = 0, \quad \frac{\partial \rho_f^h}{\partial \lambda_h} = 0, \quad \frac{\partial \rho_f^h}{\partial \tau^h} = (\lambda_f + \beta_f^h)r; \quad (8b)$$

$$\frac{\partial \rho_h^f}{\partial t_h} = -(\lambda_h + \beta_h^f)r, \quad \frac{\partial \rho_h^f}{\partial \lambda_h} = -(t_h - \tau^f)r, \quad \frac{\partial \rho_h^f}{\partial \tau^h} = 0. \quad (8c)$$

Turning first to the effects on the domestic MNC's home affiliate in (8a), we see that an increase in country h 's statutory tax rate lowers the effective capital costs, because it increases the tax shield of (internal) debt. Similarly, a more lenient thin-capitalization rule reduces the cost of capital by decreasing the corporate tax base. Finally, an increase in τ^h , which implies a tightened CFC rule, decreases the gains from debt shifting and therefore results in higher effective capital costs.

¹²From (5) we see that the investment costs of an affiliate in country i would be fully tax-deductible, leading to effective capital costs $\rho_i^j = (1 - t_i)r$, if the headquarter country allowed the internal bank to be placed in a tax haven with a zero tax rate ($\tau^j = 0$) and there is no binding thin-capitalization rule so that $\lambda_i = 1$. In this case the affiliates would not have an incentive to use any extra leverage ($\beta_i^j = 0$) and consequently would also not occur any concealment costs.

The tax effects on the home MNC's affiliate in the foreign country f are given in (8b). This shows that neither the statutory tax rate t_h nor the thin-capitalization rule λ_h affects the effective capital costs of this affiliate. However, country h 's CFC rule applies to the domestic firm's affiliate in the foreign country. Thus, an increase in τ^h increases the effective capital costs of this affiliate.

Finally, equation (8c) shows the tax effects on the foreign MNC's affiliate in the home country h . An increase in the home country's statutory tax rate t_h or the thin-capitalization rule λ_h reduces the effective capital costs for the foreign MNC for the same reasons as they are true for the domestic MNC [see eq. (8a)]. However, the foreign MNC is unaffected by a change in the home country's CFC rule τ^j .

In the first stage, all MNCs choose their investment levels, given the optimized financial structure. From (4), optimal investment levels are

$$(1 - t_i)\phi f'(\phi k_i^j) - \rho_i^j = 0 \quad \forall i, j = h, f. \quad (9)$$

An increase in the effective capital costs ρ_i^j decreases investment by

$$\frac{\partial k_i^j}{\partial \rho_i^j} = \frac{1}{(1 - t_i)\phi^2 f''(\phi k_i^j)} < 0 \quad \forall i, j = h, f. \quad (10)$$

The effects of the home country's statutory tax rate t_h on the investment decision of each MNC result from the direct effects on net profits in (9) and the effect on the effective capital costs in (8a)–(8c). Recalling that $\phi > 1$ if $i = j$, but $\phi = 1$ if $i \neq j$ gives

$$\frac{\partial k_h^h}{\partial t_h} = \frac{\phi f'(\phi k_h^h) - (\lambda_h + \beta_h^h)}{(1 - t_h)\phi^2 f''(\phi k_h^h)} < 0, \quad \frac{\partial k_f^h}{\partial t_h} = 0, \quad \frac{\partial k_h^f}{\partial t_h} = \frac{f'(k_h^f) - (\lambda_h + \beta_h^f)}{(1 - t_h)f''(k_h^f)} < 0. \quad (11)$$

Accordingly, the statutory tax rate t_h negatively affects investment levels for all affiliates located in country h , but not the investment of the foreign affiliate of the domestic MNC. The investment effects of the other tax instruments λ_h and τ^h result only from the changes in the effective cost of capital (8a)–(8c), in combination with the negative effect of capital costs on investment levels in (10).

4 Optimal tax policy

Welfare in country h is given as a weighted average of domestic tax revenues and the sum of the profits of national firms and the domestic MNC,¹³

$$W_h = t_h \cdot T_h + \gamma \cdot \Pi^h, \quad (12)$$

where T_h is the total tax base in the home country, $\Pi^h = \pi_d + \pi_h^h + \pi_f^h$ are the total profits of firms operating in h , and $0 \leq \gamma \leq 1$ is the relative welfare weight placed on firms' profits. The welfare discount on firms' profits either reflects the fact that raising corporate tax revenue is important for society (either for redistributive reasons, or to reduce other distortive taxes), or that domestic firms are partly owned by foreign investors that do not enter the domestic welfare function. For $\gamma = 0$ we would have a Leviathan government that is solely interested in maximizing its tax revenue.

The domestic tax base T_h consists of the sales of all entities located in country h . From this is subtracted the tax cost for the government of granting a tax shield by permitting the deduction of internal debt for the home affiliates of the domestic and the foreign MNCs:

$$T_h = g(d_h) + f(\phi k_h^h) - \left[\lambda_h + \frac{r}{\delta}(t_h - \tau^h) \right] r k_h^h + f(k_h^f) - \left[\lambda_h + \frac{r}{\delta}(t_h - \tau^f) \right] r k_h^f, \quad (13)$$

The home government (and analogously the foreign government) maximizes national welfare in (12) by choosing the statutory tax rate t_h , the thin-capitalization rule λ_h and the CFC rule τ^h , subject to the optimal financing and investment decisions of the different firm types as discussed in the last section.

4.1 Choosing individual tax parameters

Optimal statutory tax rate. The welfare function shows that all types of firms in country h are affected by changes in the statutory tax rate. Differentiating the welfare

¹³Note that consumers in the home country are not affected by tax policy in our model, because the price of the single output good is determined in the large world market.

function with respect to t_h implicitly determines the optimal statutory tax rate:

$$\begin{aligned} \frac{\partial W_h}{\partial t_h} &= (1 - \gamma) [g(d_h) + f(\phi k_h^h) - (\lambda_h + \beta_h^h) r k_h^h] + \left[f(k_h^f) - (\lambda_h + \beta_h^f) r k_h^f \right] \\ &+ t_h \left\{ g'(d_h) \frac{\partial d_h}{\partial t_h} + [\phi f'(\phi k_h^h) - (\lambda_h + \beta_h^h) r] \frac{\partial k_h^h}{\partial t_h} + [f'(k_h^f) - (\lambda_h + \beta_h^f) r] \frac{\partial k_h^f}{\partial t_h} \right\} \\ &- t_h \frac{r^2}{\delta} (k_h^h + k_h^f) = 0. \end{aligned} \quad (14)$$

The first-order condition in (14) states that an increase in the statutory tax rate t_h increases the welfare in country h due to higher net gains from taxing domestic profits (the first term on the right-hand side) and from the taxation of foreign-owned profits (the second term). However, a higher statutory tax rate also reduces the domestic tax base, and hence tax revenues, as a result of lower investments by all local affiliates (the third term). Finally, the tax base of country h is further reduced because MNC affiliates in country h have an incentive to increase the variable internal debt level β_i^j (the fourth term).

Evaluating (14) at $t_h = 0$ shows that the negative third and fourth terms are zero in this case and hence $\partial W_h / \partial t_h$ is unambiguously positive at this point. Therefore, the statutory tax rate must be positive in the government's optimum.

Optimal thin-capitalization rule. Introducing a thin-capitalization rule allows the government to discriminate between purely national and MNCs, by changing the tax base for MNCs. Differentiating (12) with respect to λ_h gives

$$\begin{aligned} \frac{\partial W_h}{\partial \lambda_h} &= t_h \left\{ [\phi f'(\phi k_h^h) - (\lambda_h + \beta_h^h) r] \frac{\partial k_h^h}{\partial \rho_h^h} \frac{\partial \rho_h^h}{\partial \lambda_h} + [f'(k_h^f) - (\lambda_h + \beta_h^f) r] \frac{\partial k_h^f}{\partial \rho_h^f} \frac{\partial \rho_h^f}{\partial \lambda_h} \right\} \\ &- t_h r (k_h^h + k_h^f) - \gamma k_h^h \frac{\partial \rho_h^h}{\partial \lambda_h} \leq 0. \end{aligned} \quad (15a)$$

The first term on the right-hand side of (15a) is positive, as an increase in λ_h reduces the effective capital costs and thus induces the home affiliates of the domestic and foreign MNCs to expand their investment, and thus their sales in the home country [see (10)]. The second term is negative, however, as a more generous thin-capitalization rule allows MNCs to deduct a higher share of their financing costs from the corporate tax base. Finally, the third term is again positive, as a reduction in its capital costs increases the profits of the domestic MNC's home affiliate.

From (15a) we can infer that the government will only set a positive level of λ_h in the optimum, if the positive first and third effects overcompensate the negative second

effect. This will be the case when the affiliates' investment in country h reacts strongly to changes in the cost of capital (i.e., $\partial k_h^h / \partial \rho_h^h$ and $\partial k_h^f / \partial \rho_h^f$ are large in absolute value), or when the profits of the domestic MNC's home affiliate are important (large γ). When these conditions are met, we can rewrite (15a) as

$$\lambda_h t_h r (k_h^h + k_h^f) = \frac{t_h}{(1 - t_h)} \left[k_h^h \mu^h \varepsilon_{k_h^h, \rho_h^h} \varepsilon_{\rho_h^h, \lambda_h} + k_h^f \mu^f \varepsilon_{k_h^f, \rho_h^f} \varepsilon_{\rho_h^f, \lambda_h} \right] - \gamma k_h^h \rho_h^h \varepsilon_{\rho_h^h, \lambda_h} \quad (15b)$$

where $\mu^j = \rho_h^j - (1 - t_h)(\lambda_h + \beta_h^j) r > 0$ and we have defined the elasticities

$$\varepsilon_{k_h^j, \rho_h^j} = \frac{\partial k_h^j}{\partial \rho_h^j} \frac{\rho_h^j}{k_h^j}, \quad \varepsilon_{\rho_h^j, \lambda_h} = \frac{\partial \rho_h^j}{\partial \lambda_h} \frac{\lambda_h}{\rho_h^j}, \quad j = \{h, f\}. \quad (16)$$

The first expression in (16) is the elasticity of capital with respect to the effective capital costs. The second expression gives the elasticity with which the effective cost of capital of the domestic and the foreign MNC respond to the home country's thin-capitalization rule.

Using (15b), we can interpret how the optimal (positive) thin-capitalization rule is affected. Clearly, the optimal level of λ_h is the larger the higher is the product of the elasticities $\varepsilon_{k_h^j, \rho_h^j} \varepsilon_{\rho_h^j, \lambda_h}$. The product of these elasticities rises, in turn, when $f''(\phi k_h^h)$ and $f''(k_h^f)$ are small [see eq. (10)]. This implies that pure profits are low and the tax is mostly a tax on the normal return to capital. If capital reacts very elastically to changes in the thin-capitalization rule ($\varepsilon_{k_h^j, \rho_h^j} \varepsilon_{\rho_h^j, \lambda_h} \rightarrow \infty$), then λ_h must go towards its maximum of one. In this case the investment expansion will always dominate the tax base reduction caused by the larger tax shield.

Optimal CFC rule. Finally, the home government can set a minimum statutory tax rate τ^j for an affiliate of the domestic MNC located in a tax haven, where τ^j is just sufficient to avoid additional taxation in the home (headquarter) country. Thus, the CFC rule reduces the tax gain from internal debt and consequently raises the cost of capital for affiliates of the domestic MNC located in h and f . Differentiating (12) with respect to τ^h gives

$$\begin{aligned} \frac{\partial W_h}{\partial \tau^h} &= t_h \left\{ \frac{r^2}{\delta} k_h^h + [\phi f'(\phi k_h^h) - (\lambda_h + \beta_h^h) r] \frac{\partial k_h^h}{\partial \rho_h^h} \frac{\partial \rho_h^h}{\partial \tau^h} \right\} \\ &- \gamma [k_h^h (\lambda_h + \beta_h^h) + k_f^h (\lambda_f + \beta_f^h)] r \leq 0. \end{aligned} \quad (17a)$$

The first term in the curly bracket on the right-hand side is positive, showing that a tighter CFC rule increases tax revenues in the home country by reducing the extra

leverage β_h^h that the home affiliate of the domestic MNC chooses in its financial optimum. In contrast, the second term in the curly bracket is negative, because a tighter CFC rule increases the effective capital costs of the domestic MNC's home affiliate, thereby reducing investment and tax revenues. Finally, the third term is also negative as all affiliates of the domestic MNC lose profits due to the higher costs of capital.

Again, the government will only implement a CFC rule if the welfare gains associated with this instrument exceed the welfare losses. This is the case if the concealment cost parameter δ is low and hence internal debt responds elastically to changes in the CFC rule. Moreover, a positive CFC rule is more likely, other things being equal, if the investment response of the domestic MNC's home affiliate is inelastic and if tax revenues have a high weight in the welfare function, relative to the profits of the home MNC (γ is small). We summarize these conditions in:

Proposition 1 *Each government sets a binding CFC rule in its optimum ($\tau^h > 0$), if (i) the financing structure of the domestic MNC responds elastically to this policy change, (ii) the investment decision responds inelastically to the rise in the cost of capital; and (iii) if tax revenue is important, relative to the domestic MNC's profits.*

If the conditions in Proposition 1 are met, we can rewrite (17a) as

$$\tau^h \left\{ \gamma \left[1 + \frac{k_f^h (\lambda_f + \beta_f^h)}{k_h^h (\lambda_h + \beta_h^h)} \right] - \frac{t_h}{1 - t_h} \frac{\mu^h}{\rho_h^h} \varepsilon_{k_h^h, \rho_h^h} \right\} = -t_h \varepsilon_{\beta_h^h, \tau^h}, \quad (17b)$$

where

$$\varepsilon_{\beta_h^h, \tau^h} = \frac{\partial \beta_h^h}{\partial \tau^h} \frac{\tau^h}{(\lambda_h + \beta_h^h)}.$$

From (17b), we can infer how the optimal (positive) CFC rule is affected. Firstly, the CFC rule is the larger the smaller is the foreign investment of the domestic MNC (k_f^h), relative to its home investment (k_h^h). This is because the CFC rule increases the cost of capital for all affiliates of the domestic MNC. This increases the tax base of the home affiliate, resulting in lower profits of the domestic MNC but also in higher tax revenues. In contrast, the tax base broadening of the foreign affiliate reduces the domestic MNC's profits but the additional tax payments accrue to the foreign country f . Secondly, if profits of the domestic MNC are unimportant for welfare (γ is small) the negative effect of a decrease in the domestic MNC's profits is small. This leads to a tighter CFC rule (a higher level of τ^h), other things being equal. Thirdly, the CFC rule is the larger, the smaller is $\varepsilon_{k_h^h, \rho_h^h}$ in absolute value. This implies that domestic investment does not fall

too much if capital costs are increased. From (10) we see that the investment response is reduced if there are high profits in the home market (f'' is large), or if there is a large home bias of the domestic affiliate (ϕ is large).

4.2 The relationship between thin-capitalization and CFC rules

So far, we have discussed each policy instruments in isolation. It is interesting to see, however, whether the choice of the optimal thin-capitalization rule on the one hand and the optimal CFC rule on the other are interrelated. Multiplying the optimality condition for λ_h in (15a) with r/δ , adding it to the first-order condition for τ^h in (17a) and cancelling terms yields

$$F \equiv \frac{-t_h r^2 k_h^f}{\delta} + t_h \lambda_h r [\phi f'(\phi k_h^h) - (\lambda_h + \beta_h^h) r] \frac{\partial k_h^h}{\partial \rho_h^h} - t_h \frac{r^2(t_h - \tau^f)}{\delta} [f'(k_h^f) - (\lambda_h + \beta_h^f) r] \frac{\partial k_h^f}{\partial \rho_h^f} - \gamma [k_h^h \lambda_h + k_h^f (\lambda_h + \beta_h^f)] r = 0. \quad (18)$$

To derive the relationship between λ_h and τ^h in the government's policy optimum, we differentiate (18) with respect to both parameters. This gives

$$\begin{aligned} \frac{\partial F}{\partial \lambda_h} = & t_h \frac{r^2}{\delta} (t_h - \tau^f) \left(1 + \frac{1 - \tau^f}{1 - t_h} r \right) \frac{\partial k_h^f}{\partial \rho_h^f} \\ & + \frac{t_h}{1 - t_h} r^2 \left[1 - 2(1 - \tau^h) \lambda_h - (1 - \tau^h) \beta_h^h + \frac{\delta}{2} (\beta_h^h)^2 \right] \frac{\partial k_h^h}{\partial \rho_h^h} \\ & - \gamma \left[k_h^h + k_h^f - \lambda_h \left((t_h - \tau^h) r \frac{\partial k_h^h}{\partial \rho_h^h} + (t_h - \tau^f) r \frac{\partial k_h^f}{\partial \rho_h^f} \right) \right] r; \end{aligned} \quad (19a)$$

$$\frac{\partial F}{\partial \tau^h} = (1 + \gamma) \lambda_h r \left[\frac{\lambda_h + \beta_h^h}{1 - t_h} \left(t_h - \frac{\gamma}{1 - \gamma} \right) + \frac{r^2}{\delta} \right] \frac{\partial k_h^h}{\partial \rho_h^h}. \quad (19b)$$

The sign of (19a) is almost always negative, and certainly so when λ_h is not too large which is true if profits of the domestic MNC are not important (small γ) or costs of concealing are negligible (small δ). The sign of (19b) is ambiguous, however, also negative for low values of γ or δ .

From the implicit function theorem, we then get:

$$\frac{\partial \lambda_h}{\partial \tau_h} = \frac{\partial F / \partial \tau_h}{-(\partial F / \partial \lambda_h)} \implies \text{sign} \left(\frac{\partial \lambda_h}{\partial \tau_h} \right) = \text{sign} \left(\frac{\partial F}{\partial \tau_h} \right). \quad (20)$$

In the following, we focus on the case where the primary concern of the home government is to maximize tax revenues. In this case, γ is small and the sign of (19b) is negative. We can then formulate:

Proposition 2 *If the government's objective is to maximize tax revenues, then a tighter CFC rule (a higher level of τ^h) corresponds with a tighter thin-capitalization rule (a lower level of λ_h) in the government's policy optimum.*

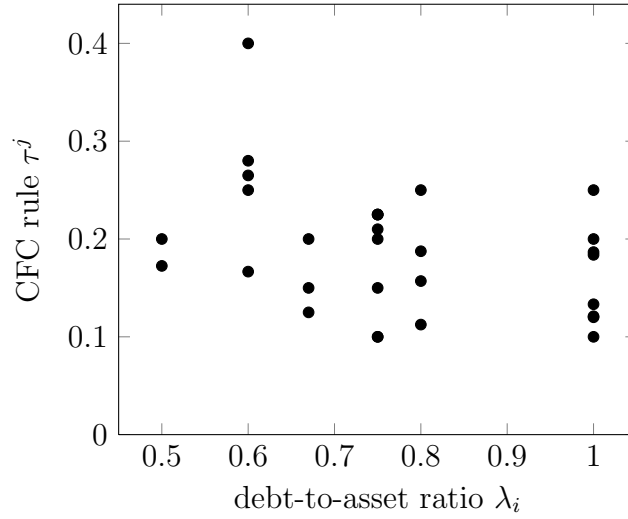
The intuition for Proposition 2 is straightforward. A tighter CFC rule reduces the tax gains that the domestic MNC has from a more lenient thin-capitalization rule. This is because the tax gain from an increased level of internal debt shifting is proportional to the difference between the home country's tax rate and the tax rate in the pivotal tax haven country (whose tax rate is just high enough to avoid CFC legislation). A stricter CFC rule reduces this tax differential. This implies that a marginal relaxation of the thin-capitalization rule will cause a lower reduction in the effective cost of capital, and hence a lower incentive to expand investment, when the domestic CFC rule is tight. But since the reason for permitting a higher share of tax-deductible internal debt is to increase the investment of MNCs in the home country, this also implies that the tax revenue gains for the government from marginally relaxing the thin-capitalization rule [the first term in (15a)] are now lower.

At the same time, the corporate tax base of the domestic MNE is always reduced by the same amount when the thin-capitalization rule is relaxed, no matter whether the CFC rule has been tightened or not. Therefore, the tax costs to the government of an increase in λ_h [the second term in (15a)] are unchanged. On net, therefore, the use of the thin-capitalization instrument becomes less attractive for the government when CFC rules are tightened. Hence, the government will reduce the maximum share of tax-deductible internal debt λ_i that it permits in its policy optimum.

We compare these predictions with the data in Table 1. Using the information from this table, Figure 1 plots host countries' CFC rules against their thin capitalization rule, employing the debt-to-asset ratio to specify the latter.¹⁴ The figure shows a negative correlation, on average, implying that countries with a strict CFC rule (high τ^j) are

¹⁴Using the debt-to-asset ratio introduces an upper limit of unity for those countries that have no thin capitalization rule at all. These are the countries on the right end of Figure 1. Note also that for those countries which have recently switched to an earnings stripping rule, Figure 1 uses the former safe haven rule.

Figure 1: Relation of CFC Rules and debt-to-asset ratios



more likely to have a low debt-to-asset ratio, and hence a strict thin capitalization rule. Therefore, the result in our Proposition 2 is consistent with this first empirical evidence.

5 Discussion and extensions

In the previous section, we have discussed the conditions under which countries choose positive values of λ_h and τ^h . This requires that the MNC's financing decision responds very elastically to tax incentives, the investment elasticities of MNCs have an intermediate value, and the governments are mostly interested in tax revenues. For many countries this seems to be a plausible combination of parameters, motivating the existence of CFC rules and a positive share of internal debt that is deductible from the corporate tax base (see Table 1).

We can go one step further, however, and interpret the optimal policies quantitatively for different country characteristics. For example, the optimal level of the thin-capitalization rule λ_h in (15b) will be higher, if a country faces a high elasticity with which investment from domestic and foreign MNCs responds to changes in the cost of capital. Such high investment elasticities are typical for small countries, for example. Therefore, the first-order condition (15b) is compatible with the result that smaller countries will have more lenient thin-capitalization rules, on average, than their larger

(and otherwise similar) neighbors.¹⁵ Alternatively, a high investment elasticity can also be the result of small location rents to be earned in a given country. This corresponds to a low value of $f''(k_i^j)$ in eq. (10). Thus, in another interpretation, our results are compatible with the finding that countries offering few location rents will have more generous thin-capitalization rules, on average (see Mardan, 2013).

Similarly, we see from (17b) that the optimal CFC tax rate τ^h is smaller when the ratio of foreign over domestic investment is high (i.e., k_f^h/k_h^h is large). This is because the foreign affiliates of the domestic MNC suffer from income losses when the CFC rule is tightened, but the tax revenues resulting from the higher effective tax rate accrue to the foreign host countries. This suggests that CFC rules will be used primarily by large countries, whose MNCs have a substantial presence in the home country. This is consistent with the evidence presented in Table 1.

We can also outline some possible extensions of our analysis. Our specification of CFC rules has focused on the minimal tax rate t_k that a (tax haven) host country must levy in order to circumvent additional taxation by the headquarter country of the MNC. A second criterion of CFC rules is that the income earned in the tax haven country must be ‘passive income’. Therefore MNCs could alternatively avoid the CFC rule, if they adjusted their activities in the tax haven so that the income is classified as active income. The CFC rule would then not bind, even if the tax rate in the host country is below the critical threshold. With such an extension, MNCs could therefore engage in costly strategies to turn passive into active income, in order to increase the tax gain of internal debt. This additional avoidance decision would thus tend to make a given CFC rule less effective as an instrument to increase tax revenue collections. However, as long as setting up a substantial physical presence in the tax haven is costly to the firm, the qualitative effects of introducing CFC rules should remain unchanged.

Finally, our model currently assumes that MNCs have no costs of placing an affiliate in a tax haven and face no transaction cost of shifting internal debt there (at least for the share of internal debt is covered by the thin-capitalization rule). More generally, MNCs will face a fixed cost of establishing a presence in a tax haven and will therefore not do so, if the tax gain is sufficiently small.¹⁶ Hence, by setting a sufficiently tight CFC rule, a headquarter country could then eliminate all debt shifting to the tax haven

¹⁵See Haufler and Runkel (2012, Proposition 4) for a rigorous analysis of this case.

¹⁶See Krautheim and Schmidt-Eisenlohr (2011) for such a modelling approach in a setting with heterogeneous firms.

for domestic MNCs, whereas foreign MNCs could still benefit from a permissive thin-capitalization rule. This model extension could explain the finding in Table 1 that some countries set CFC tax rates that are very close to their domestic statutory corporate tax rate.

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