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Duopolistic Competition, Taxes, and the Arm's-Length Principle*

Evelyn Korn and Stephan Lengsfeld[†]

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Abstract

Numerous (high-tax) countries presume that multinational firms use their transfer-pricing policies to shift profits into countries with lower tax rates. To avoid the corresponding loss in tax revenues, tax authorities develop constantly tightening rules to curb transfer-price distortions. Affected firms include the decision of compliance to these rules into their strategic considerations. In a scenario with arm's-length regulation in two countries, we analyze the transfer-pricing policy of a firm that uses the same transfer price for tax and managerial incentive purposes. Thus, the transfer-pricing policy is driven by three issues: interaction with competitors, minimization of tax burden, and avoidance of punishments. The model shows that tighter transfer-pricing rules may help firms to mitigate competition and to increase their profits and that non-compliance to the arm's-length principle is part of their equilibrium strategy.

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JEL-Classification: H25, L22, M40.

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Duopolistic Competition, Taxes, and the Arm's-Length Principle

1 Introduction

Governments and multinational corporations capture themselves in a permanent discussion about the determination of practical transfer-pricing rules. Governments claim that firms use transfer prices to shift profits from high-tax to low-tax countries.¹ To curb these shifts and the corresponding losses in tax revenue, many countries regulate transfer pricing by means of the so-called arm's-length principle: Entities of a multinational corporation should interact as if they were independent. Transfer prices should therefore reflect market conditions. Compliance to the corresponding rules needs to be documented. During the last two decades many OECD countries aimed at raising their revenues from corporate taxation by tightening these documentation requirements and, thus, closing profit-distortion gaps.

Firms criticize the regulation for mainly two reasons. They claim to suffer from costs caused by the required documentation.² In addition, they claim that a multinational enterprise whose corporate entities have to comply to tight arm's-length regulation faces severe competitive disadvantages.

Non-compliance to the arm's-length principle is for OECD countries sanctioned according to article 9 of the OECD double-taxation model convention. This article covers two issues. First, governments are allowed to impose supplementary taxation if they entertain a well-founded suspicion that a firm does not comply to the arm's-length principle, for instance if profits of a corporate entity are too low. Second and in return, the tax load should be reduced by a corresponding amount in the supposed "tax haven" to avoid a double taxation of the supplementarily taxed profit.

Most OECD countries have eagerly realized the first part in their double-taxation agreements. Yet, double-taxation agreements that address the second part – for instance by introducing clear rules that state which transfer price would be accepted as compliant to the arm's-length principle by *both* countries – are rare. The latter fact gives the impression that governments are not interested in a system of compatible arm's-length-pricing rules.

Governments' incentives in designing taxation rules for multinational corporations

¹See e.g. Bartelsman and Beetsma (2000), Clausing (2003), Harris et al. (1991) or Hines (1999) for empirical evidence.

²Arm's-length prices are claimed to be especially inappropriate for those firms who do not organize production along administrative units but along the value chain (see Brem and Tucha (2005)).

are analyzed in the public-finance literature. Our paper takes up a thread that assumes governments to maximize revenues from present corporate taxation only. Thus, governments are assumed to take firms' location as given and to choose optimal short-hand tax rates.³ Firms adapt to these tax rates and choose their optimal market behavior.⁴ Here, firms use transfer prices to strategically shift profits while legal institutions limit the magnitude of the shifting. Non-compliance to arm's-length rules is not considered as a strategic tool. Yet, firms *do* consider to choose non-compliant transfer prices and (as there are detailed sanctioning mechanisms in case of a deviation) governments do expect non-compliance.

This issues has already been addressed in a monopolistic setting by Kant (1988). Amerighi (2006) analyzes the incentives for profit shifting of a centralized firm in an oligopolistic market. Hyde and Choe (2005) model decentralized firms that use different accounting systems for tax and managerial purposes and analyze a special case of unilateral regulation. We analyze decentralized firms that use a single accounting system and that can choose non-compliant transfer prices but have to expect to be sanctioned for non-compliance by double-sided arm's-length regulation.

The paper addresses two issues: (1) Does a tight arm's-length regulation harm firms? (2) Does a tighter arm's-length regulation raise present tax revenues? To that end the paper analyzes duopolistic competition between two binational corporations. In choosing their transfer-pricing policies firms have to take into account market- as well as tax aspects. Arm's-length regulation in both countries determines the scope for transfer-price distortions.

Firms' strategic choices are driven by three effects on profits:

- *Tax effect*: If tax rates differ across corporate entities' places of business, firms want to shift profits into the low-tax country by use of distorted transfer prices.
- *Competition (managerial) effect*:⁵ If transfer prices are observable, firms can use them strategically to impact output (or price) decisions for the final prod-

³See, for instance, Elitzur and Mintz (1996), Mansori and Weichenrieder (2001), or Raimondos-Møller and Scharf (2002)

⁴See, for instance, Copithorne (1971), Horst (1971), Samuelson (1982), Halperin and Srinidhi (1987, 1991), Schjelderup and Sørsgard (1997), Narayanan and Smith (2000), and Smith (2002a, 2002b)).

⁵We use the term competition- instead of managerial effect as we are not interested in organizational details. We rather want to stress external impacts on decisions in a decentralized firm. The effect described is obviously the same as the "managerial incentive" used in Smith (2002b) and Baldenius, Melumad and Reichelstein (2004). The latter discuss the trade-off between tax- and managerial objectives if the firm is a monopolist on the intermediate- as well as the final-product market and complies to the arm's-length principle.

uct. The direction of distortion depends on the strategic variable in the final-product market: In a setting of quantity competition a low transfer price is used to expand own market share; within price competition a high transfer price is used to mitigate competition. We concentrate on quantity competition. Thus, using the Kreps-Scheinkman result on capacities determining market equilibria in price competition (Kreps and Scheinkman (1983)), our approach focuses on industries where capacity constraints matter. This approach is perfectly in line with current discussions on FDI or general regional competition.

- *Punishment effect:* Compliance to arm's-length rules is enforced by a system of sanctions. In choosing a (possibly distorted) transfer price firms take into account the probability of a detection and the impending punishment. Our model reflects the system of sanctions used within the EU: If distorted transfer prices are detected the concerned tax authority adjusts firm's profit (ex post) which leads to a double taxation of the adjusted profit. In addition, fines may be inflicted. A tightened arm's-length regulation is in our model reflected by a higher monitoring probability.

This paper aims at analyzing the interplay of these effects under different institutions. It is organized as follows: section 2 presents the basic settings. Section 3 analyzes the above mentioned aspects within Cournot competition with regulation in the intermediate-product country only (one-sided regulation) and in both countries (double-sided regulation). Section 4 discusses the model assumptions and section 5 concludes.

2 Basic Model

The basic model describes duopolistic competition between two binational firms: First, in a scenario without arm's-length regulations and, second, within an arm's-length framework.

Consider two symmetric binational firms. Firm i , $i = 1, 2$, consists of two divisions, where the manufacturing division MD_i (which is also the firm's head office) is located in country 1 and sells an intermediate product to an external market (in country 1) as well as to the sales division SD_i in country 2. To simplify the scenario we assume that there is perfect competition on the external market, i.e., the market price equals the marginal cost of production.⁶ Both sales divisions compete with

⁶Baldenius et al. (2004) discuss the impact of different market forms on transfer pricing in detail

their homogeneous final product in a duopolistic market (in country 2). In producing the intermediate product MD_i faces constant marginal cost c and (for simplicity) no fixed cost. The sales unit pays a transfer price q_i for the intermediate product. The manufacturing division's profit thus consists of two components: profit from internal transactions and profit from the external market of the intermediate good. It is of the form

$$\pi_i^{MD} = \pi_i^{ext} + (q_i - c)x_i, \quad (1)$$

where π_i^{ext} denotes profit from the external market and x_i denotes the sales division's output.

Firm i 's sales division's output x_i is chosen to maximize SD_i 's profit in a Cournot duopoly. The inverse demand function for the final product is given by

$$p(x_i, x_j) = a - (x_i + x_j) \quad i = 1, 2, j \neq i.$$

Furthermore, without loss of generality we assume that the sales divisions face no production costs on top of the transfer price q_i and we suppress tariffs.⁷ Firm i 's sales division generates profits before taxes of the form

$$\pi_i^{SD} = (a - (x_i + x_j) - q_i)x_i \quad i = 1, 2, j \neq i. \quad (2)$$

Figure 1 depicts the basic setting.

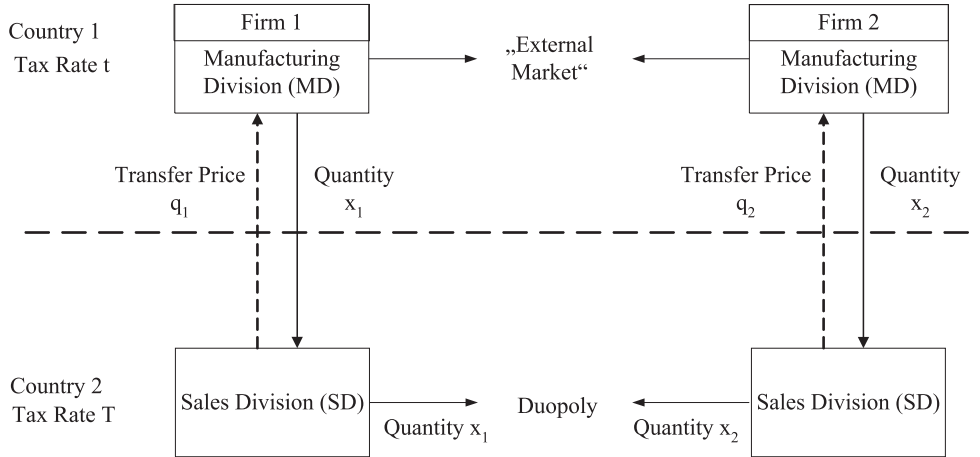


Figure 1: Strategic Setting

in a different setup. Within our setting, the market price of the intermediate good only influences firms' willingness to comply to arm's-length regulation. Therefore, the form of the intermediate-product market is not discussed in depth.

⁷Both aspects can be integrated in the setting but do not add to the model's insights.

Profits in country 1 (2) are taxed at tax rate t (T) with $t, T \in [0, 1]$. Throughout the analysis we assume that tax rates and arm's-length enforcement are "well behaved" in that they do not preclude production. If taxes are too high, firms would either choose a negative transfer price or decide not to produce at all. Thus, neither t nor T will actually come close to 1, but for sake of simplicity the upper bound is ignored.

We assume that the sales division repatriates its profit after tax by paying a dividend. To avoid double taxation, these payments are not taxed in the parent's country.⁸ If tax rates differ across both countries both firms prefer to minimize their tax burden by shifting profits into the low-tax country. By incorporating the rule that internal transactions should be made at arm's-length (i.e., as if units were independent), the high-tax country can reduce the scope of profit shifting. In our setting the admissible transfer price \bar{q}_i (henceforth the "arm's-length price") is taken from the external market.⁹ Due to the assumption that there is perfect competition on the external market the arm's-length price equals marginal cost: $\bar{q}_i = c$.

Firms have to prove compliance to arm's-length rules by documenting transactions and choice of transfer prices. Tax authorities monitor compliance with an (exogenous) probability $\varphi_i, i = 1, 2$. If a firm is monitored, a non-compliance will be detected for sure. If the monitoring shows that firm i 's transfer price differs from the arm's-length price \bar{q}_i , the tax authority corrects profits (and tax liability) ex post. To simplify matters, we do not consider fines on top of the adjustment. The adjusted tax liability in one country does not impact the tax payment in the foreign country due to the ex-post character of the adjustment. Thus, the difference between announced and adjusted profit gets taxed twice.

We assume that tax authorities as well as firms are risk neutral and that tax authorities demand an adjustment only if it increases own tax revenues. Thus, depending on the enforcement of the arm's-length principle two cases have to be considered:

Arm's-length regulation in country 1 (intermediate-product country):

Firm i 's expected corporate profit after tax consists of the manufacturing and

⁸This indemnification of foreign subsidiaries' profits is part of most EU-double-taxation treaties. In what follows, institutional details - in Germany, for instance, only 95 % of foreign profits are indemnified - are suppressed. For a discussion of these details see Spengel (2002).

⁹This way of modeling is in line with the so-called comparable-uncontrolled-price method (CUP) (see Smith (2002a)) that assumes that the intermediate good is traded on an external market. If such a market does not exist - which will be the case for most proprietary components of the final product - the arm's-length price has to be determined by more complicated methods (see e.g. Commission of the European Community (2001) and Brem and Tucha (2005)). In these cases a range of admissible prices would result.

We do not consider profit oriented transfer-pricing rules as they are not permitted within the EU.

the sales divisions' profits as given in (1) and (2) – taxed at the corresponding rates. In addition, the firm has to account for supplementary taxation in case of a profit adjustment. An adjustment will only be made if the firm is inspected and the transfer price was lower than the arm's-length price. Firm i 's expected after-tax profit is

$$\pi_i = (1-t) (\pi_i^{ext} + (q_i - c)x_i) + (1-T)(a - (x_i + x_j) - q_i)x_i - \varphi_1 t \max\{0, \bar{q}_i - q_i\}x_i.$$

Arm's-length regulation in country 2 (final-product country):

Firm i 's profit is determined in an analogous way to the first case. Yet, in this case an adjustment will only be made if the transfer price is higher than the arm's-length price. Firm i 's expected profit is

$$\pi_i = (1-t) (\pi_i^{ext} + (q_i - c)x_i) + (1-T)(a - (x_i + x_j) - q_i)x_i - \varphi_2 T \max\{0, q_i - \bar{q}_i\}x_i.$$

The setting described so far constitutes a game as shown in figure 2:

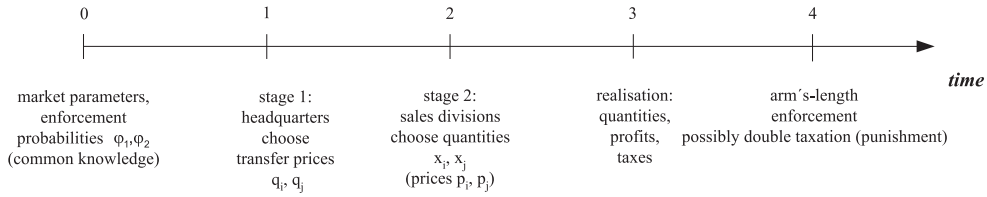


Figure 2: Timeline

At stage 1 both headquarters simultaneously choose transfer prices $q_i \geq 0$. At stage 2 – when transfer prices are common knowledge – both sales divisions choose outputs $x_i \geq 0$ (prices $p_i \geq 0$). Our model is, as far as tax and competition considerations are concerned, close to the one developed by Schjelderup and Sørsgard (1997). Their model serves as benchmark case for our analysis. We enrich their setting by incorporating indemnification and double taxation (in case of detected non-compliance).¹⁰

¹⁰The analysis to follow is only valid if transfer prices are observable across firms. For a detailed analysis of the strategic effects in absence of tax effects see Göx (1999). In case of unobservable transfer prices and no tax-rate differences there is no scope for strategic interaction between both firms, see Bagwell (1995). Yet, additional uncertainty of production cost re-establishes the strategic effects, see Maggi (1999) and Schiller (2000). The effect of tax-rate differences in a Bertrand setting with unobservable transfer prices is discussed in Narayanan and Smith (2000).

3 Tax-, Competition-, and Punishment Effect

We derive firms' optimal transfer prices by use of backward induction. In a first step we determine the sales divisions' equilibrium outputs (x_i^*, x_j^*) if a set of transfer prices (q_i, q_j) is given. In a second step the optimal transfer prices (q_i^*, q_j^*) will be determined. In choosing these prices the head offices will anticipate the sales divisions' output reaction.

3.1 Benchmark Case: No Arm's-Length Regulation

To present the different strategic aspects in the choice of transfer prices we analyze at first a setting without arm's-length regulation ($\varphi = 0$). We take the resulting prices, profits and taxes as benchmarks for the two cases "one-sided arm's-length regulation" and "double-sided regulation" which will be presented afterwards. This benchmark case and the first result follow straightforward from the analysis of Schjelderup and Sørsgard (1997) in absence of tariffs.

Firm i 's sales division SD_i maximizes its profit π_i^{SD} as defined in (2), where (q_i, q_j) are given. The optimal output for SD_i is

$$x_i^* = \frac{a + q_j - 2q_i}{3}$$

which generates profit

$$\pi_i^{SD} = x_i^{*2} = \left(\frac{a + q_j - 2q_i}{3} \right)^2.$$

If there is no arm's-length regulation, firm i 's corporate profit is of the form

$$\pi_i = (1 - t) \left(\pi_i^{ext} + (q_i - c) \frac{a + q_j - 2q_i}{3} \right) + (1 - T) \left(\frac{a + q_j - 2q_i}{3} \right)^2.$$

The optimal transfer price, which is in addition constrained by $q_i \geq 0$, is given by

$$\frac{\partial \pi_i}{\partial q_i} = (1 - t) \left(\frac{a + q_j - 2q_i}{3} - \frac{2}{3}(q_i - c) \right) - \frac{4}{3}(1 - T) \frac{a + q_j - 2q_i}{3} = 0 \quad (3)$$

First order condition (3) is equivalent to

$$q_i - c = \frac{3}{2} x_i^* \left(1 - \frac{4}{3} \frac{1 - T}{1 - t} \right) \quad (4)$$

which implies that

$$q_i^* < c \Leftrightarrow \frac{1 + 3t}{4} > T. \quad (5)$$

Thus, for a relevant range of pairs of tax rates the optimal transfer price is below marginal cost – which is the appropriate arm's-length price in our setting. In addition, a comparison between the optimal transfer price and marginal cost is an

important issue independent from arm's-length aspects. If manufacturing and sales division were a single unit, optimal output would be based on marginal cost (see Hirshleifer (1956)). Therefore, differences between transfer prices and marginal costs are due to head offices' strategic considerations. These considerations cover tax- as well as competitive issues.

The dissection in a tax- and a competition effect can be made clear by an analysis of equation (4) when $t = T$. In that case there is no tax motive for a transfer-price distortion. The first order condition reduces to

$$q_i - c = \frac{3}{2} x_i^* \underbrace{\left(1 - \frac{4}{3}\right)}_{<0}.$$

Here, the optimal transfer price is lower than marginal cost. In choosing such a low transfer price each head office induces the sales division to choose an "aggressively" high output level.

In line with propositions 1 and 2 in Schjelderup and Sørsgard (1997) we can state

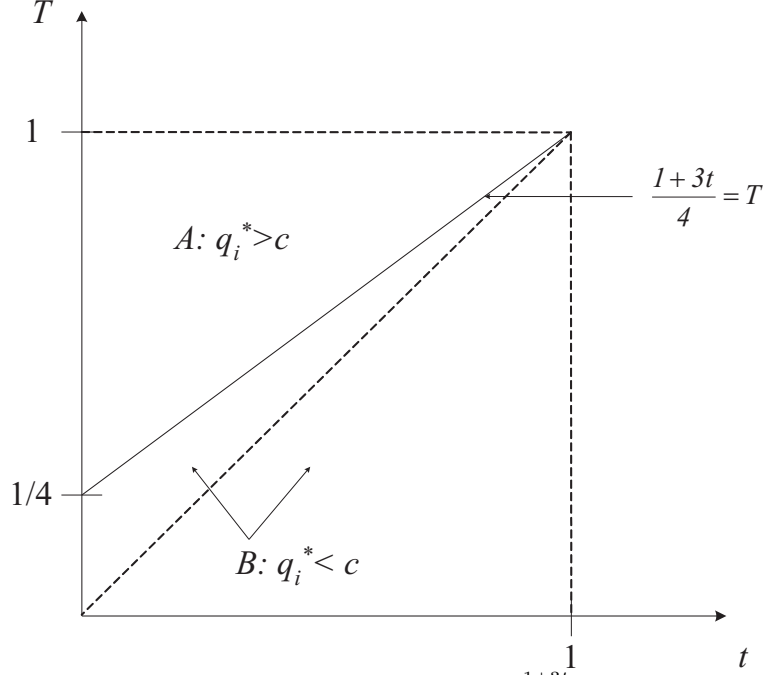
Result 1 *If there is no arm's-length regulation, the firms set a transfer price below the arm's-length benchmark (marginal cost) as long as the tax-rate difference $T - t$ is negative or positive but small.*

From the intermediate-product country's point of view this result is bad news. Without any tax-reduction motive both firms have an incentive to shift profits into the final-product country for strategic reasons as transfer prices are strategic substitutes in Cournot competition. Differences in tax rates may balance or amplify this incentive.

To be more vivid: If $t > T$, tax- and competition effect point into the same direction and firms set a transfer price below marginal cost. If $t < T$ but the tax-rate ratio is close to 1, the strategic effect dominates the tax effect and the firms again set transfer prices below the arm's-length price. If firms prefer shifting profits into the intermediate-product country, i.e., the tax effect dominates the competition effect, there must be considerable differences in tax rates. Figure 3 illustrates this result.

3.2 Arm's-length Regulation in Country 1

In this case the tax authority in the intermediate-product country sets and enforces an arm's-length price that equals marginal cost for both firms, i.e. $\bar{q}_i = c$. This rule is based on the comparable-uncontrolled-price method and uses the assumption of



All sets of tax rates below the straight line given by $T = \frac{1+3t}{4}$ result in equilibrium transfer prices below marginal cost. Below the dashed line (that charts equal tax rates in both countries) tax- and competition effect point into the same direction. Above the dashed line competition effect and tax effect point into opposite directions but the former dominates the latter until $T \geq \frac{1+3t}{4}$. In result firms still choose a transfer price below marginal cost although the tax-rate difference is in favor of a transfer price above marginal cost.

Figure 3: Optimal transfer prices without regulation

perfect competition in the intermediate-good market. Firm i 's profit is of the form

$$\begin{aligned} \pi_i = & (1-t) \left(\pi_i^{ext} + (q_i - c) \frac{a + q_j - 2q_i}{3} \right) + (1-T) \left(\frac{a + q_j - 2q_i}{3} \right)^2 \\ & - \varphi_1 t \max\{0, c - q_i\} \frac{a + q_j - 2q_i}{3}. \end{aligned}$$

From the first order condition it follows (cf. condition (4)) that

$$(q_i - c) \left(1 + \frac{t}{1-t} \varphi_1 \right) = \frac{3}{2} x_i^* \left(1 - \frac{4}{3} \frac{1-T}{1-t} + \frac{t}{1-t} \varphi_1 \right) \quad (6)$$

and thus (cf. condition (5))

$$q_i^* < c \quad \Leftrightarrow \quad \frac{1 + 3(1-\varphi_1)t}{4} > T. \quad (7)$$

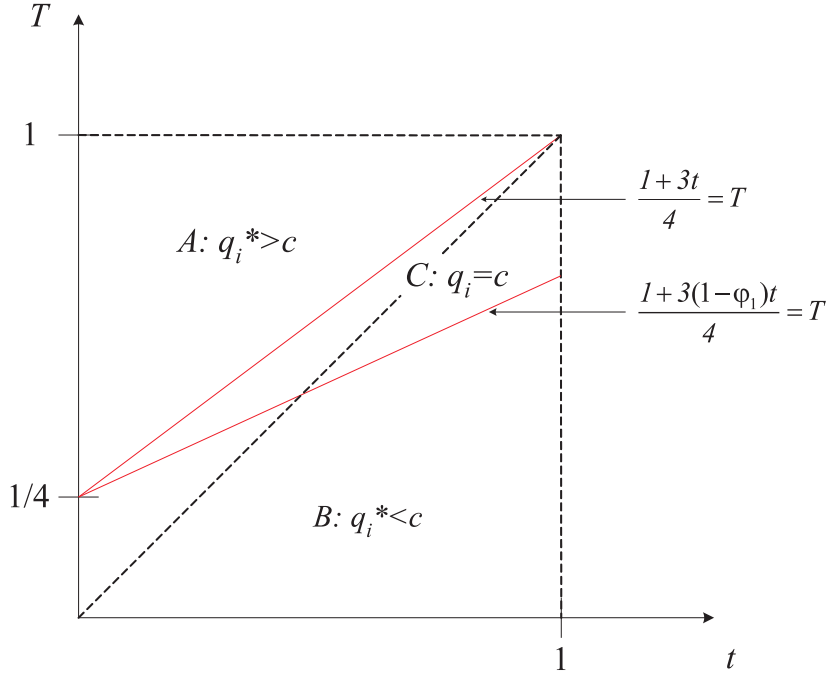
Condition (7) shows that under regulation in country 1 there are still pairs of tax rates that result in a shift of profits into country 2. Thus, arm's-length regulation does not prevent profit shifting. Yet, it reduces the amount of non-compliance considerably for two reasons. Firstly, as can be seen from (6), for a given pair of tax

rates that would result in a transfer price below marginal cost, the regulated transfer price is higher than the unregulated one. Secondly, the full range of firms' adaption to arm's-length regulation can be seen from those sets of tax rates that are not in line with condition (7) for a given φ_1 : We assumed that the tax authority will only adjust profits if $q_i^* < c$. Thus, if firms choose $q_i^* > c$ in a setting without regulation, they will do so under regulation in country 1, i.e., if $T > \frac{1+3t}{4}$. In addition, from condition (7) we see that arm's-length regulation cannot avoid transfer prices below marginal cost if $T < \frac{1+3(1-\varphi_1)t}{4}$. It remains to look at firms' adaption behavior for those pairs of tax rates where

$$\frac{1+3(1-\varphi_1)t}{4} < T < \frac{1+3t}{4}. \quad (8)$$

Without arm's-length regulation firms would choose transfer prices below marginal cost under these tax rates. Yet, under the threat of a supplementary taxation in country 1 profit shifting becomes too expensive. Thus, the firm chooses the lowest transfer price which excludes the possibility of a supplementary taxation which is $q_i^* = c$. The new optimal transfer prices are sketched in figure 4.

Our aim is to discuss the effect of a closer monitoring of firms' transfer-pricing policies. In our model a tighter monitoring is captured by an increase in φ_1 . To assess effects of the change, we need to carry out a comparative statics over φ_1 . If prosecution of non-compliance to arm's-length regulation is lax, i.e., φ_1 is close to 0, the optimal transfer price is close to the unrestricted optimum. If φ_1 rises, the sets of tax rates T that lead to profit shifting into country 2 change smoothly. Therefore, the considerations on tax effect and competition effect from the reference case also apply. These two are now accompanied by a third effect that works in country 1's favor. The higher φ_1 the smaller is the set of tax rates in country 2 (for a given tax rate in country 1) that lead to profit shifts to country 2. In addition, the size of the set of tax-rate combinations resulting in an equilibrium-transfer price $q_i^* = c$ strictly increases in φ_1 . Furthermore, we know that q_i^* is nondecreasing in φ_1 . Thus, from the tax authority's point of view a higher monitoring probability is favorable as the tax revenue increases in φ_1 . Obviously, this unambiguous advantage of monitoring activities depends on the assumption that monitoring is free of cost. Yet, the magnitude of the rise in tax revenue can be used to evaluate the advantage of monitoring when analyzing the trade-off between enforcement costs and change in tax revenues. Amerighi (2006) discusses this issue in a scenario with centralized firms. In our scenario, monitoring cost will affect the optimal strategies but not the underlying trade-offs. Therefore, we abstract from a detailed discussion.



Area A depicts those combinations of tax rates that are unaffected by arm's-length regulation in country 1 as in these cases country 1 is the “tax haven”: The difference in tax rates is so high that firms shift profits into country 1 although competition incentives point into the opposite direction. Area C depicts those tax rates for which an impending supplementary taxation in country 1 induces firms to comply to arm's-length regulation although tax- as well as competition incentives would induce a lower transfer price. In area B the enforcement mechanism does not suffice to induce compliance.

Figure 4: Optimal transfer prices under arm's-length regulation in country 1

We can cover these considerations by

Result 2 *An increased monitoring of compliance to arm's-length regulation in country 1 (an increase in φ_1) curbs the amount of profit shifting into country 2 for any given tax rate in country 1. Monitoring activities in country 1 counterbalance the competition-inherent tendency to set low transfer prices. Therefore a tighter enforcement of the arm's-length principle leads to increasing tax revenues and increasing firm profits.*

From (6) it follows that q_i^* is strictly increasing in φ_1 – as long as $q_i^* < c$ – for any given pair of tax rates. For some pairs of tax rates the optimal transfer prices would be so high that x_i and x_j turn negative (taxes would then prevent economic activity) – yet, these cases had been excluded from the analysis by assumption. For all other pairs tedious calculations show that tax revenues in the intermediate product country as well as profits increase in q_i^* .

The result shows that country 1 would benefit from tight monitoring (at the expense

of country 2.) However, firms may as well profit from a tighter arm's-length regulation as q_i^* as well as profits are (weakly) increasing in φ_1 . This effect follows from strategic considerations in quantity competition: Both sales divisions would generate maximal profits if they could coordinate on monopolistic output, i.e., $x_1 + x_2 = \frac{a-c}{2}$. Yet, this coordination is impossible as neither of them can commit on the agreed output. Each competitor chooses a higher output to increase own profit. This strategic problem – which already exists if the sales divisions choose outputs based on marginal cost – is aggravated by the fact that head offices choose transfer prices below marginal cost. In that case the sales divisions choose an even higher output which in equilibrium decreases profits. The tax authority's monitoring “heals” this problem as it establishes a commitment device. A low transfer price bears the risk of a double taxation, thus, “cheating” gets costly which in turn makes head offices' commitment to a higher transfer price credible. In consequence, the sales divisions choose a smaller output which is closer to the monopoly output. Thus, profits rise. The above considerations are based on the assumption that the intermediate-product price equals marginal cost. As long as underselling on the intermediate-product market is excluded, any other market form induces a higher external price as a benchmark for the intermediate product. In consequence, depending on the actual market form the arm's-length price will be between marginal cost and the monopoly price. Therefore, for any fixed arm's-length price the above commitment argument is still valid and independent of the form of the intermediate-product market.

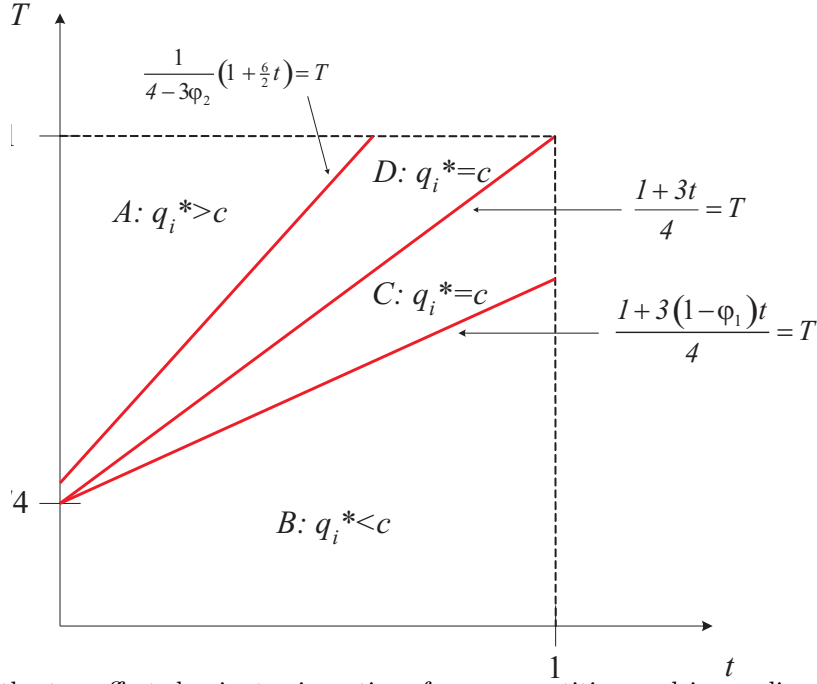
3.3 Double-sided Arm's-Length Regulation

If both tax authorities try to enforce compliance to arm's-length regulation, each firm's profit function is:

$$\begin{aligned}\pi_i = & (1-t)(\pi_i^{ext} + (q_i - c)x_i) + (1-T)(a - (x_i + x_j) - q_i)x_i \\ & - \varphi_1 t \max\{0, c - q_i\}x_i \quad (\text{supplementary taxation in country 1 if } q_i < c) \\ & - \varphi_2 T \max\{0, q_i - c\}x_i \quad (\text{supplementary taxation in country 2 if } q_i > c)\end{aligned}$$

While country 1 will impose a supplementary taxation only if the transfer price is below the arm's-length price, country 2 will do so if the transfer price exceeds marginal costs. Thus, for any given pair of transfer prices one of both enforcement agencies only is active. Therefore, the results derived in the previous section that addressed the case of a too low transfer price remain valid. Now, the analysis is enriched by an additional punishment effect caused by the regulation in country 2.

The considerations for country 2's tax authority's optimal monitoring and firms' adaptation are analogous to those in section 3.2. Accordingly, an impending sanction will induce firms to lower their transfer price in all tax scenarios that would induce $q_i^* > c$ in the unrestricted case. Similar to the regulation in country 1 a regulation in country 2 increases the set of tax rates that lead to $q_i^* = c$. Figure 5 depicts this effect.



In area A the tax effect dominates incentives from competition and impending sanctions such that $q_i^* > c$. In area D firms would prefer a transfer price above marginal cost in the unregulated case but are induced to arm's-length compliance by the enforcement mechanism in country 2. Area B and C are unchanged compared to the case of arm's-length regulation in the intermediate-product country.

Figure 5: Optimal Transfer Prices under double-sided regulation

The main properties of a double-sided arm's-length regulation are stated in

Result 3 *A tighter enforcement in both countries increases the set of tax rates that induce arm's-length compliance ($q_i^* = c$) and reduces the amount of profit shifting for any pair of tax rates.*

Enforcement in the final product country is relevant only if the intermediate-product country is a tax haven – i.e., if tax differences are so high that they dominate the competition incentive to set low transfer prices.

Two issues of this double-sided regulation are to be discussed in more detail. In contrast to arm's-length regulation in the intermediate-product country, a tight enforcement in the final-product country is in any case harmful to firms. To see

this we need to look at the three factors impacting firms' strategic choice of transfer prices: Without a tax motive firms would choose a transfer price below marginal cost to induce more aggressive behavior in the downstream division. Therefore, a transfer price above marginal cost is in our setting necessarily induced by tax motives – where country 1 is the tax haven. This tax purpose for transfer-price distortions can be counterbalanced by a sufficiently strong enforcement mechanism. Here, the threat of a supplementary taxation of the shifted profits is credible if φ_2 is sufficiently high. In that case firms lose those profits they have earned in an unlawful way without gaining a competitive advantage as had been a consequence of the intermediate-product country's monitoring activities.

In addition, the analysis of double-sided regulation allows for a consideration of the tax authorities' payoffs. Both countries' monitoring activities have adverse effects on the other country's tax revenue. For, if firm i adapts to arm's-length regulation by either choosing $q_i^* = c$ instead of $q_i^* \leq c$ (or moving into that direction) one of both countries loses the tax base the other one gains. Thus, the question arises if an enforcement of arm's-length compliance – that is costly in reality – is really enhancing tax revenues.

The answer depends on how comprehensive we model markets as well as governmental activity. In our setting tax rates are fixed and market structure is well known. In that case it is easy to predict which tax authority would be interested in establishing an enforcement mechanism. As competition incentives induce rather low transfer prices, it is the intermediate country that will be active in most cases – and firms will welcome this activity. Yet, institutions like taxes and enforcement agencies are usually designed with a longer horizon. Therefore, it is reasonable to assume that both countries not only choose their enforcement but also their tax rates. In addition, the same institution will be valid for different markets, i.e., different demand as well as cost structures. Therefore, each country may be the intermediate-product country in one market and the final-product country in another. In addition, looking at figures 3 to 5 we see that for any tax rate t in the intermediate-product country there are tax rates T in the final-product country where country 1 is the tax haven as well as tax rates where the other one is. To aggravate this problem, the separating tax rate T depends on firms' marginal costs.

Thus, the above analysis is not intended to cover all institutional aspects of corporate taxation. However, the results help to structure a subproblem of the current discussion of tax harmonization within the EU as well as the ongoing debate on global tax havens.

In addition to these caveats, the model results depend on a set of assumptions that are discussed in the next section.

4 Discussion – Robustness of the results

The result that a strict arm's-length regulation can be advantageous for firms as well as for governments is based upon three assumptions: (1) Firms compete in quantities. (2) Firms use a single transfer price for tax and incentive issues. (3) Firms' decisions where to base their divisions are fixed.

Quantity competition. The somewhat unexpected result that firms might as well as governments be interested in arm's-length enforcement clearly depends on the assumption of quantities as strategic variables. As has been explained in section 3.2 the reason for these aligned interests is the commitment to produce low quantities that is enforced by a high transfer price that supports firms market coordination. Here, a credibility problem is mitigated that depends on the prisoners'-dilemma-like structure of quantity competition. It depends on the fact that firms' output quantities are strategic substitutes. This property is crucial for the favorable interplay of tax-, competition-, and punishment effect. Therefore, the congruence of interests between firms and tax authorities in the intermediate-product country persists as long as firms' strategies are substitutes. Thus, generalizing the model to quantity competition with heterogeneous products leads to similar results. Obviously, the more different products (the weaker competition) the less scope for joint improvement. To achieve analogous results for a market with pure price competition would be impossible. Yet, as has been argued before, this consequence does not imply that our considerations are useless for all those markets where price competition is prevalent on the surface. According to Kreps and Scheinkman (1983) these markets are structurally equivalent to those with quantity competition as long as capacity constraints matter.

Single set of books. The result that firms might be interested in a tighter arm's-length regulation is driven by the assumption that a single transfer price is used for both tax and incentive reasons. In such a scenario, any change of the transfer price fully and simultaneously affects tax- and competition effect. Thus, the result is based on the assumption that firms maintain a single set of books. For firms that use the same bookkeeping system for internal and external purposes (as they are supposed to do under most legislations) our result has a basic message: If tax effects are of paramount importance in designing transfer-pricing schemes, they get a weight that is too high.

If firms could use different transfer prices for controlling managerial decisions and profit shifting, i.e., if firms would use 'two sets of books', the result changes. In that case it depends on the performance measures and incentive systems installed if managers incorporate tax effects into their strategic decisions or not. If the incentive system decouples the sales manager's decision from tax effects, the tax transfer price can be chosen in a profit-optimizing way without adverse effects on managerial incentives. Otherwise, there will be an interplay between tax and managerial effects. For instance, Choe and Hyde (2004) and Hyde and Choe (2005) analyze the effects of that connection. In their model the manager's objective function consists of the pre-tax managerial profit (depending on the internal transfer price) less the real tax payment (depending on the external transfer price). In a setting with only unilateral arm's-length regulation they show that internal and external transfer prices move into the same direction if tax rates change. At this, they implicitly use the assumption that $T \gg t$, i.e., the tax-rate difference is so high that the firms always set a transfer price above marginal cost. Thus, only arm's-length regulation in country 2 is relevant. Our analysis shows that relaxing this assumption may lead to significant new insights.

Choice of location. We show that both firms under consideration profit from a strict monitoring in the intermediate-product country. This result is due to the assumption that they have to comply to equally strict arm's-length regulation. Within our model this aspect is reflected by the assumption that both firms are placed in the same country. Our results remain valid if firms are placed in different countries with similar arm's-length regulation. Yet, if one firm has to comply to tighter rules, it has to face major disadvantages. This difference is due to the strategic properties of the assumed quantity competition. If only one firm is limited in its transfer-pricing policy, the other one can free ride on that limitation, choose a low transfer price and, in consequence, a high output of the final product. Thus, corporate profits of the firm under tighter regulation decrease whereas the other firm generates higher corporate profits. As long as firms cannot freely choose their location this difference is harmful to the firm but not necessarily to the tax authority. For, the decrease in corporate profits does not imply a decrease in tax revenues for the stricter tax authority. The stricter enforcement implies a profit decrease in the firm's foreign unit caused by a lower quantity. Yet, this lower quantity is due to a high transfer price such that the firm's home profits and, thus, the home country's tax revenues may well increase.

Therefore, on a shorthand scale a strict enforcement of arm's-length regulation in

the intermediate-product country might be a good choice. In the long run this impression changes. For, if we enlarge the game by another stage covering firms' decisions where to choose the principal place of business and where to invest the firms capital, a tighter arm's-length regulation may cause a decreased tax revenue if firms disinvest. Evers, de Mooij, and Vollebergh (2004) state a 3% loss in invested capital with a 1% rise in tax rate. This problem of disinvestment is an issue that is central to the discussion of EU tax harmonization as well as the effort of the US and EU governments to close access to tax havens. Yet, recent literature and empirical evidence suggest that there is capital mobility but that it is not as high as suspected – and as claimed by some managers. Despite high tax rates and an ongoing tightening of enforcement regulations firms also invest in high-tax countries. Our analysis gives an intuition of why firms may have good reason to do so: On the one hand, firms can use the governments' regulation as a commitment device for mitigating competition, on the other hand, non-compliance to arm's-length regulation is part of the equilibrium strategy.

5 Conclusion

This paper deals with the recent discussion on a tightening of arm's-length regulations. These rules aim at reducing the scope for profit-shifting behavior of multinational enterprises. Affected firms claim that these regulations cause major disadvantages for two reasons: a) Firms which are limited in choosing transfer prices face competitive disadvantages; b) the required documentation is too costly.

Our analysis has addressed these issues in a scenario where firms set the same transfer price for tax- and incentive purposes (one set of books). Expected sanctions for transfer-price distortions are part of a strategic setting with three main components: A tax-, a competition-, and a punishment effect. Our – at first sight surprising – result is that a tighter arm's-length regulation does not necessarily disadvantage affected firms. This result is based on the strategic aspects of competition. Impending punishments help firms to establish a commitment on non-aggressive transfer-pricing and, in consequence, market behavior. Thus, a strict arm's-length regulation can mitigate competition. It can increase tax revenues as well as firms' profits.

The analysis has been restricted to a rather narrow strategic problem. It does not consider governments as rational strategic agents. To provide a comprehensive analysis of institutions in corporate taxation, the analysis should be enriched by the following aspects: Governments' choice of tax rates is a strategic issue; in addition, a rational government takes into account that firms locational choice depends on

tax issues.

Having that said, our model results point to a structural issue in the analysis of optimal taxation. When considering firms' adaption to tax institutions governments should not concentrate on a tax-minimization goal alone but also take into account that tax enforcement influences competition in a quite immediate way. In contrast to claims of firms' pressure groups, our analysis has shown that governments' and firms' interests might well be aligned.

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