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# MULTINATIONALS AND THE RELATIONSHIP BETWEEN STRATEGIC AND TAX TRANSFER PRICES

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# Multinationals and the Relationship Between Strategic and Tax Transfer Prices

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## Abstract

Multinational enterprises engaging in cross-border, intrafirm trade can use a different price for cost accounting purposes than used for tax accounting purposes. This possibility has not been previously modeled. We study the implications for how both transfer prices are set under the separate entity and formula apportionment approaches. The relationship between the two prices in the presence of penalties for noncompliance with arm's length pricing is also examined. The results are shown to be robust to alternative market structures and imperfect taxation.

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## 1. Introduction

There are two essentially distinct transfer pricing literatures. One literature focuses on how intrafirm prices can be used to provide appropriate managerial incentives and to facilitate performance evaluation. Examples of studies in this literature are Harris, et al. (1982), Amershi and Cheng (1990), Holmstrom and Tirole (1991), and Anctil and Dutta (1999). The other literature examines the implications of tax regulations governing the pricing of intrafirm transactions across sovereign jurisdictions. Included in this literature are Musgrave (1973), Gordon and Wilson (1986), Kant (1990), Bucks and Mazerof (1993), and Goolsbee and Maydew (2000).

While the incentive literature is applicable to all multidivisional firms, the tax literature is applicable only to the subset of firms that also engage in intrafirm trade across tax jurisdictions. Despite this subset being a sizeable and growing segment of the global economy, to date these two branches of inquiry have remained surprisingly separate. That is, there have been relatively few attempts to model both *strategic* and *tax* transfer prices together.[1] Even in the analyses that do explicitly recognize the dual roles of transfer prices, the firm is invariably assumed to nominate only one transfer price per intrafirm transaction. (Halperin and Srinidhi, 1991; Elitzur and Mintz, 1996; Schjelderup and Sorgard, 1997; Haufler and Schjelderup, 2000; Nielsen, et al., 2001a,b). Specifically, these models, which are rooted in the tax literature, implicitly require that the tax transfer price do 'double duty', serving also as an incentive mechanism.

This approach ignores important opportunities, and complexities, facing multinational enterprises (MNEs). In simple terms, it implicitly assumes that MNEs keep only one set of books to satisfy both cost and tax accounting requirements. This can be criticized on theoretical grounds as it implies that MNEs are irrational. Logic dictates that a MNE cannot do worse by using two instruments instead of one to pursue tax and strategic goals, and in general will obtain a strictly higher profit. On a practical level, it might be argued that this criticism is 'academic' since it has been shown that most MNEs do not

[1] We use the term 'strategic' to refer to the transfer price that addresses incentive problems, since the need for this price arises from the strategic interaction of decision makers with different objectives. In contrast, a firm's tax transfer price arises in response to the exogenously determined tax environment.

employ separate transfer prices for incentive and tax purposes.[2] While it is unknown whether this still remains true today, it is certainly plausible that the increased scrutiny of transfer pricing by tax authorities in the last twenty years will have led more MNEs to recognize the benefit of employing two different transfer prices.[3] Thus, while our model can be viewed as a *normative* analysis of transfer pricing, to the extent that the MNEs do in fact distinguish between tax and strategic transfer prices, it can also be viewed as a *positive* analysis of transfer pricing.[4]

We ask four separate questions, all centering on the nature of relationship between the optimal tax and strategic transfer prices. First, does the relationship depend on whether the *separate entity* or *formula apportionment* approaches are used to determine taxable income?[5] Second, how do changes in the MNEs tax and cost environment affect the relationship? Third, what are the implications of oligopoly vis-à-vis monopoly for the relationship? Lastly, is it affected by whether double taxation or 'less than single' taxation occurs?[6]

Penalties for noncompliance with arm's length pricing have previously been modeled, but only in the context of a pure tax model – incentive problems were absent (Kant, 1988; Kant, 1990). By recognizing that non-arm's length pricing leaves MNEs vulnerable to penalties we are better able to understand the real world interactions between the strategic and tax transfer prices. Note, however, that the realities of penalty exposure are more complicated than our model suggests. For example, tax authorities typically make

[2] Chechowicz, et al., (1982) reported that 89% of U.S. MNE's use the same transfer price for incentive and tax purposes.
[3] As tax transfer pricing regulations become more narrowly defined and effectively enforced, MNEs that employ only one transfer price will find it increasingly difficult to implement the price that optimally trades off both tax and strategic considerations. On the other hand, Chechowicz, et al., (1982) reported that some MNE's felt that tax authorities would be antagonistic toward the use of two different transfer prices.
[4] We do not, however, model the costs due to the increased complexity of using two prices rather than one.
[5] The formula apportionment approach refers to the use of a formula based on consolidated sales, assets, payroll and possibly other factors to allocate consolidated taxable income among the MNE's affiliates. In contrast, the separate entity approach treats each affiliate as if it were a legally separate entity in determining their taxable income. This approach is embraced by the OECD and effectively the global standard for international transfer pricing (OECD, 1995). Others have referred to this as the 'separate accounting' approach – our terminology is consistent with OECD usage and, we feel, more suggestive.
[6] The term 'less than single taxation' is the opposite of double taxation – it refers to the situation where some income is not taxed in either jurisdiction.

adjustments to transfer prices that they deem not to be arm's length.[7] Our purpose here is not to render a model that is realistic in all respects, but rather to examine the nature of the role of penalties in MNE decision-making.

We assume decentralized decision making in the sense that the subsidiary determines the amount it purchases from its parent.[8] Also, the parent has a *first-mover* advantage – it sets the transfer prices first, then the subsidiary reacts. Given the power that a parent naturally has over its subsidiary, this is a sensible assumption.[9] The subsidiary maximizes its own, rather than consolidated, after-tax profit, implying a misalignment of incentives from the parent's perspective.[10] Both the subsidiary and the parent are assumed to be monopolists in their own market. We show that this market structure is sufficient to motivate the separate roles of strategic and tax transfer prices.

Under the formula apportionment (FA) approach to determining taxable income, we show that a simple two-stage procedure can be employed to solve for the two transfer prices. First the optimal tax transfer price is deduced, which is then used to solve for the optimal strategic transfer price. This same procedure can be used under the separate entity (SE) approach to determining taxable income if there is no penalty for noncompliance with arm's length pricing. In the presence of penalties, however, the strategic and tax transfer prices must be solved for simultaneously – the two-stage procedure cannot be used. The strategic and tax transfer prices are shown typically not to be equal under all scenarios examined, implying that models that do not distinguish between the two transfer prices understate MNE (after-tax) profit and overstate the adverse effect of a harsher tax regime.

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[7] Although this possibility is not allowed for in our model, such adjustments could possibly be viewed as being implicitly embedded in the penalty.

[8] Subsidiaries often have considerable autonomy in decision-making. In fact, it is not uncommon for the subsidiary and parent to even negotiate transfer prices.

[9] Our model differs from Nielsen, et al. (2001a) in that we assume the parent determines its domestic sales quantity at the same time as the transfer prices, thus meaning that it sets its quantity prior to the subsidiary – they assume the parent and subsidiary quantities to be determined simultaneously. Given that they compete in different markets, this difference seems unimportant.

[10] This misalignment need not be detrimental to the parent in an oligopolistic setting, due to the potential benefits of delegation (Vickers, 1985). See Elitzur and Mintz (1996) for an analysis of transfer pricing in the context of unobservable managerial effort.

More importantly, changes in the tax environment are shown to affect *both* the tax and strategic transfer prices. Specifically, as the penalty for noncompliance with arm's length pricing increases or the likelihood of being penalized increases, a more conservative tax transfer price is adopted. In addition, the strategic transfer price simultaneously adjusts so as to buffer the effect of the tax transfer price adjustment on the subsidiary's decision making – that is, to minimize the induced change in the subsidiary purchases from its parent. Thus, the strategic transfer price plays a compensatory role, serving to mitigate the negative flow-on effects of the increase in the tax transfer price.

We then examine how a change in the MNE's cost structure affects the two transfer prices. This complements the analysis above by allowing us to understand the effect of non-tax changes in the economic environment. Assuming the parent faces a lower tax rate than the subsidiary, an increase in the parent's marginal cost of production causes the strategic transfer price to increase and the tax transfer price to decrease. The former induces the subsidiary to purchase less from the parent, an efficient response since the good has become more costly to produce. The decrease in the tax transfer price reinforces the subsidiary's incentive to reduce its purchases.

It is unclear, however, why the parent would adjust *both* transfer prices in order to lower the subsidiary's purchases. Given that the tax regime remains unchanged, why alter the tax transfer price when the desired effect can be achieved by increasing the strategic transfer price alone? In fact, the observed decrease in the tax transfer price is motivated by other considerations, being a flow-on effect from the adjustment in the strategic transfer price. As the subsidiary decreases it purchases, the tax transfer price becomes less effective in the sense of shifting less profit back to the parent. Given that the penalty for noncompliance with arm's length pricing remains unchanged, it is rational for the parent to decrease the tax transfer price so as to reduce their penalty exposure – this restores equality of the marginal benefit and marginal cost associated with varying the tax transfer price.

Our analysis thus shows that changes in the MNE's tax environment, cost structure or strategic environment can have implications for both its strategic policy and its tax

policy. Thus, an integrated approach is required in identifying the MNE's optimal transfer pricing policies. Previous analyses have failed to recognize this fact.

We show that our results are robust in the sense of also holding an oligopolistic setting. The reason is that, while competitive strategy needs also to be taken into consideration when setting the strategic transfer price under oligopoly, its basic role (as an incentive mechanism) remains unchanged. Specifically, an increase in the strategic transfer price induces the subsidiary to purchase less from the parent regardless of whether it is a monopolist or oligopolist. Moreover, we show that our findings are also robust to less than single or double taxation. Both outcomes are very real possibilities, being a key motivation for the growing number of international tax treaties we see today.

We begin in section 3 by examining how both the strategic and tax transfer prices are set under both the FA and SE approaches. In section 4 we introduce penalties for noncompliance with the arm's length principle. The implications of transfer pricing in an oligopolistic setting are discussed in section 5. In section 6 we examine how our results are affected by both double taxation and less than single taxation. Concluding comments are made in section 7.

## 2. Model

We consider a multinational enterprise (MNE) that consists of two affiliates, A and B. Affiliate A produces and markets an amount $q_A$ of a good in country A, while affiliate B purchases an amount $q_B$ of the good from affiliate A at price $s$ and markets it in country B. The amount $q_B$ is determined by affiliate B, while the transfer price, $s$, is determined by affiliate A. Affiliate A should thus be thought of as the parent company and affiliate B its subsidiary. Both affiliates are monopolists in their own market.

Affiliate A's cost is given by $C(q_A + q_B)$, where $C'(\cdot) > 0$ and $C''(\cdot) \geq 0$. For simplicity we assume that marketing and distribution costs for both affiliates are zero, so affiliate B's only cost is that of purchasing product from A. Demand in market A is described by $p_A(q)$ where $p_A$ denotes the price in market A. Similarly, demand in market B is denoted $p_B(q)$ and market revenue is denoted by $R_A(q)$ and $R_B(q)$. The only assumptions we make

about demand, in addition to the law of demand, are $R_A''(\cdot) < 0$, $R_B''(\cdot) < 0$, $R_A'''(\cdot) = R_B'''(\cdot) = 0$ and $\lim_{q_B \to 0} R_B'(q_B) = +\infty$.[11]

From a separate entity perspective, the pre-tax profit of the two affiliates is

$$\tilde{\pi}_A = R_A(q_A) - C(q_A + q_B) + s\,q_B, \tag{1}$$

$$\tilde{\pi}_B = R_B(q_B) - s\,q_B. \tag{2}$$

After-tax profit for both affiliates is determined by the tax rate in each jurisdiction, $\tau_A$ and $\tau_B$, and the determination of taxable income. Taxable income, in contrast to pre-tax profit, is a function of the transfer price, $t$, the MNE nominates for tax purposes. Taxable income is given by

$$I_A = R_A(q_A) - C(q_A + q_B) + t\,q_B,$$

$$I_B = R_B(q_B) - t\,q_B.$$

We impose the restriction $t \geq 0$, reflecting that losses in country B cannot be applied against affiliate A's taxable income in order to lower their tax liability. The upper bound on $t$, denoted by $T$, is the transfer price that implies zero taxable income for affiliate B.[12]

Under the separate entity approach, after-tax profit is given by[13]

$$\pi_A^{SE} = \tilde{\pi}_A - \tau_A I_A = (1-\tau_A)[R_A(q_A) - C(q_A + q_B)] + (s - \tau_A t)q_B \tag{3}$$

$$\pi_B^{SE} = \tilde{\pi}_B - \tau_B I_B = (1-\tau_B)R_B(q_B) - (s - \tau_B t)q_B \tag{4}$$

Affiliate B chooses $q_B$ to maximize its own after-tax profit, $\pi_B^{SE}$, while affiliate A chooses $q_A$, $s$ and $t$ in order to maximize consolidated after-tax profit, $\pi_T^{SE} = \pi_A^{SE} + \pi_B^{SE}$. Denoting the arm's length price of the good by $a$, recall that $s \neq a$ does not imply noncompliance with the arm's length principle – this occurs only if $t \neq a$.[14]

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[11] The last assumption simply rules out the possibility that $q_B^* = 0$.

[12] That is, we implicitly assume that losses in country B cannot be applied against country A profits in order to lower affiliate A's taxation – this is realistic.

[13] Note that we assume taxation occurs at source, not residence. Although this assumption is consistent with the general thrust of the OECD model tax treaty, some countries (e.g., the U.S.) still tax worldwide income, granting tax credits for foreign taxes paid. Our analysis can also be applied to case of residence taxation provided $\tau_A < \tau_B$.

[14] Under perfectly competitive conditions, $a$ equals the marginal cost of production. Under all other market structures $a$ is more difficult to determine, depending upon the degree of buyer and seller market power. In

We compare the MNE's transfer pricing incentives under the separate entity (SE) approach to those under the formula apportionment (FA) approach to taxation. Profits under the SE approach are described by Equations (1)-(4). While in principle the FA approach allows for an affiliate's profit to be calculated as a function of its share of consolidated payroll, sales, assets and other factors, we follow previous analyses by focusing solely on sales as the allocation key. Defining $\sigma_A \equiv q_A/(q_A + q_B)$ and $\sigma_B$ similarly, after-tax profit under the FA approach is given by

$$\begin{aligned} \pi_A^{FA} &= \tilde{\pi}_A - \tau_A \sigma_A I_T \\ &= (1-\tau_A \sigma_A)[R_A(q_A) - C(q_A + q_B)] - \tau_A \sigma_A R_B(q_B) + s q_B \end{aligned} \tag{5}$$

$$\begin{aligned} \pi_B^{FA} &= \tilde{\pi}_B - \tau_B \sigma_B I_T \\ &= (1-\tau_B \sigma_B) R_B(q_B) - \tau_B \sigma_B [R_B(q_B) - C(q_A + q_B)] - s q_B \end{aligned} \tag{6}$$

Affiliate A moves first, setting its output level and the two transfer prices, $(q_A, s, t)$. Affiliate B observes these choices and then reacts by choosing $q_B$. Using backwards induction, we solve for the subgame perfect Nash equilibrium.

## 3. Separate Entity and Formula Apportionment Approaches

A preliminary comment on the monopolistic market structure is warranted. A benefit of employing this market structure is that it allows us to strip away the strategic interactions between competitors, thus simplifying the analysis. On the other hand, by definition there exists no arm's length price in a monopolistic market, raising questions as to the relevance of the analysis – especially in relation to the separate entity approach.

Our view is that the arm's length price here should be viewed as a notional price, determined by the tax authorities to be 'reasonable'. Taking this perspective, there is no inherent conflict in studying transfer pricing in the context of a monopolistic market

reality, tax authorities define a range of acceptable prices, usually the interquartile range obtained from analyzing a set of comparable firms.

structure.[15] Moreover, we establish in section 5 that little is to be gained by studying a more competitive market structure.

In order to determine affiliate A's transfer pricing incentives, we must first determine how $q_B$ varies with both $s$ and $t$. Recall that affiliate B maximizes their after-tax profit, given by Equations (4) and (6) under the SE and FA approaches respectively. Affiliate A then takes into account Affiliate B's reaction function in determining how to optimally set the two transfer prices (and its own quantity).

### 3.1. The Formula Apportionment Approach

Inspecting Equation (6) we see that affiliate B's after-tax profit is a function of $s$ but not $t$, implying that its profit maximizing quantity, $q_B^*$, is also a function of $s$ but not $t$. Assuming concavity of affiliate B's after-tax profit function, it is straightforward to show that $dq_B^* / ds < 0$. That is, the law of demand is satisfied.

Although consolidated after-tax profit, $\pi_T^{FA} = \pi_A^{FA} + \pi_B^{FA}$, also does not depend directly on either $s$ or $t$, it does depend indirectly on $s$ through the functional relationship $q_B^*(s)$. It follows that affiliate A, while indifferent between all possible tax transfer prices, will typically have a strict preference over the level of the strategic transfer price.

**Result 1.** *Under FA, there is no incentive to distort the tax transfer price away from the arm's length price. However, the strategic and tax transfer prices will typically not be equal:* $s^* \neq t^*$.

*Proof:* The first statement follows immediately from the fact that $d\pi_T^{FA} / dt = 0$. To assess the second statement, suppose initially that under some environment $s^* = t^* = a$. Now consider a perturbation, $\Delta a$, in the arm's length price. Since consolidated after-tax profit is independent of $a$, so also is $s^*$. However, it remains true that $t^* = a$. •

The first part of this result is identical to that obtained by Nielsen, et al. (2001a), implying that the result that under monopoly there is nothing to be gained from distorting

[15] This is not an unrealistic scenario. Tax authorities often have to deal with the transfer of unique intangibles between related parties, in which case monopoly is the appropriate market description. Nonetheless, this does not prevent the application of arm's length-based transfer pricing guidelines.

the tax transfer price when applying the FA approach is robust. The reason is that consolidated profit is independent of the tax transfer price regardless of whether one distinguishes between the strategic and tax transfer prices.

The second part establishes that it is nonetheless important to distinguish between the two transfer prices under the FA approach. If not, then the fact that affiliate A is able to use the strategic transfer price to exert influence over affiliate B's decision making is overlooked. Moreover, ignoring the distinction between the two transfer prices will result in an understatement of the MNE's after-tax profit. That is, the MNE must be worse off if it is constrained to set two prices equal when it would prefer to let them differ – failing to distinguish between the two transfer prices is equivalent to assuming they are always equal.

### 3.2. The Separate Entity Approach

Affiliate B's after-tax profit is now given by Equation (4) and it can be shown that

$$\frac{dq_B^*}{ds} = \frac{1}{(1-\tau_B)R_B''(q_B)} < 0, \tag{7}$$

$$\frac{dq_B^*}{dt} = \frac{-\tau_B}{(1-\tau_B)R_B''(q_B)} > 0. \tag{8}$$

Now affiliate B is affected by both transfer prices, although they have opposite effects on its quantity choice. While an increase in $s$ again results in a decrease in affiliate B's purchases (for the reasons noted above), an increase in $t$ actually benefits affiliate B by reducing its taxable income and thus also its tax payable.

Affiliate A must take into account that $q_B^*$ varies with both $s$ and $t$ when determining the optimal level of the two transfer prices. Consolidated after-tax profit is given by

$$\begin{aligned}\pi_T^{SE} = {} & (1-\tau_A)[R_A(q_A) - C(q_A + q_B(s,t))] \\ & + (1-\tau_B)R_B(q_B(s,t)) - [\tau_A - \tau_B]\, t\, q_B(s,t)\end{aligned} \tag{9}$$

It is possible to discern affiliate A's transfer pricing incentives directly from this expression.

**Result 2.** *Under the SE approach there is an incentive to choose a non-arm's length tax transfer price. The tax and strategic transfer prices will typically not be equal.*

*Proof:* Suppose $\tau_A < \tau_B$ and $t^* < T$. Inspecting Equation (9) it can be seen that, holding $q_B^*$ constant, $\pi_T^{SE}$ is increasing with $t$ and independent of $s$. Also, $q_B^*$ remains constant if $\Delta s = \tau_B \Delta t$, this being implied by Equations (7) and (8). It follows that $\pi_T^{SE}(T, q_B^*) > \pi_T^{SE}(t^*, q_B^*)$, contradicting the optimality of $t^*$. Thus, we have $\forall\, a,\ t^* = T$. The same logic applies in the case of $\tau_A \geq \tau_B$, where $\forall\, a,\ t^* = 0$.

The second statement requires only that it be recognized that any solution satisfying $s^* = t^*$ is not generic. That is, if in fact $s^* = t^*$, then a slight perturbation in the model parameterization causes this equality to fail. The easiest way to see this is to suppose a small decrease, $\Delta T$, in the upper bound on $t$. Since $\tau_A < \tau_B$ implies $t^* = T$, by the envelope theorem $q_B^*$ remains unchanged. However, from Equations (7) and (8), it follows that $s$ decreases by $\Delta s = \tau_B \Delta t < \Delta t$, implying that now $s^* \neq t^*$ •

The MNE now has a clear incentive to distort the tax transfer price because, as can be seen from Equation (9), it directly impacts upon consolidated after-tax profit. Quite simply, given the absence of any penalty exposure, the MNE should seek to shift as much taxable income as possible into the low tax jurisdiction. This idea is not new, being central to almost all discussions, both practical and theoretical, of transfer pricing.

Also, again we see that the MNE benefits from setting different strategic and tax transfer prices. This is simply because the two prices serve distinct and different purposes – profit-shifting and the provision of incentives for affiliate B. Thus, regardless of the approach to calculating taxable income, models that fail to distinguish between the two transfer prices fail to capture the full complexities of transfer pricing.

### 3.3. Summary

Comparing our results to those of Nielsen, et al. (2001a), who do not distinguish between the strategic and tax transfer prices, we draw the following conclusion.

**Proposition 1.** *The tax transfer pricing incentives under the SE and FA approaches are independent of whether the MNE employs different transfer prices for strategic and tax purposes.*

*Proof*: This follows from comparison of Results 1 and 2 with Proposition 1 in Nielsen, et al. (2001a). •

We have established that if the MNE is a monopolist then its incentives in regards to tax transfer pricing can be understood without reference to its transfer pricing for strategic purposes. Under the SE approach it has an incentive to set its tax transfer price as high (low) as possible if the tax rate in the producing country, is lower (higher) than the tax rate in the purchasing country. In contrast, under the FA approach the MNE has nothing to gain from choosing a transfer price different from the arm's length price. Both results hold regardless of whether the MNE sets only one transfer price or distinguishes between the strategic and tax transfer prices.

That the MNE's tax transfer pricing incentives are independent of the strategic transfer price reflects the fact that the tax transfer pricing incentives are particularly robust. Neither result, however, is a particularly appealing description of the incentives facing real-world MNEs. Moreover, it is clear that in the context of the SE approach, breaking the result requires the introduction of penalties for noncompliance with arm's length pricing. By mitigating the MNE's incentive to engage in profit shifting, penalties may also help to uncover a meaningful relationship between the optimal strategic and tax transfer prices.[16] On the other hand, intuition suggests that even penalties will not alter the tax transfer pricing incentives under the FA approach.

## 4. Transfer Pricing Penalties

If a MNE distorts its tax transfer prices away from arm's length prices, in reality there is a risk of being penalized by the tax authorities in the jurisdiction that deems its revenue base to have been eroded.[17] Recalling that the arm's length price is $a$, we now assume that affiliate A has some probability of being penalized an amount $P > 0$ when choosing a

[16] Technically speaking, the essence of the relationship between $s^*$ and $t^*$ is more likely to be apparent in settings in which there exists a unique, interior solution to $t^*$.

[17] The realities of penalty exposure are complicated and we do not attempt a full exposition here. It is worth noting, though, that tax authorities typically make adjustments to transfer prices deemed not to be arm's length. This possibility is not explicitly factored into our model, although such adjustments could possibly be viewed as being implicitly embedded in the penalty.

non-arm's length tax transfer price.[18] This probability is described by the cumulative distribution function $F(|t-a|)$, where $F(0) = 0$ and $F(\bar{a} - a) = 1$. Thus, if affiliate A chooses $t > \bar{a}$, they will be penalized with certainty. The associated probability distribution function is denoted $f(|t-a|)$, satisfying $f(0) = 0$ and $f'(|t-a|) > 0$.[19] To simplify the analysis we assume that $\tau_A < \tau_B$, in which case there is no loss of generality in restricting attention to $t \geq a$.[20]

### 4.1. The Formula Apportionment Approach

Under the FA approach there is no rationale for penalties for noncompliance with arm's length pricing since we saw in section 3.1 that affiliate A has no incentive to deviate from arm's length pricing even in the absence of penalties. The only effect of introducing penalties is to ensure that affiliate A has a *strict* preference for choosing $t^* = a$, whereas in the absence of penalties they were indifferent as to the level of the tax transfer price. However, since we assumed that affiliate A chose $t^* = a$ when indifferent, the introduction of penalties has no effect on our equilibrium prediction.

Since the penalty does not interact directly with the strategic transfer price in the expression for $\pi_T^{FA}$, it follows that the introduction of the penalty also does not affect affiliate A's incentives in relation to the strategic transfer price.

**Result 3.** *Penalties for noncompliance with arm's length pricing have no effect on the strategic or tax transfer prices under FA.*

This result is not surprising as there is no incentive problem here for the penalty to solve. The notion of arm's length principle is really only of interest in the context of the SE approach to determining taxable income.

### 4.2. The Separate Entity Approach

[18] The penalty is assumed to be levied on after-tax profits. Modeling the penalty as being levied on B rather than A would not affect our results.

[19] Note that $f' > 0$ implies that as $t$ increases, the probability of being penalized increases at an increasing rate. This seems plausible and perhaps even likely.

[20] That is, the MNE has an incentive to set a high (tax) transfer price when the tax rate in country A is low. The analysis below can also be applied directly to the case where $\tau_A > \tau_B$, only then we have $t \leq a$.

Consolidated after-tax profits are now given by

$$\pi_T^{SE} = (1-\tau_A)[R_A(q_A) - C(q_A + q_B(s,t))] + (1-\tau_B)R_B(q_B(s,t)) - [\tau_A - \tau_B]\, t\, q_B(s,t) - F(t-a)P \tag{10}$$

The first-order conditions describing the profit-maximizing values $(s^*, t^*, q_A^*)$ are

$$t: \quad \frac{dq_B^*}{dt}[(1-\tau_B)R_B' - (1-\tau_A)C' - (\tau_A - \tau_B)t] - (\tau_A - \tau_B)q_B - f(t-a)P = 0 \tag{11}$$

$$s: \quad \frac{dq_B^*}{ds}[(1-\tau_B)R_B' - (1-\tau_A)C' - (\tau_A - \tau_B)t] = 0, \tag{12}$$

$$q_A: \quad (1-\tau_A)[R_A' - C'] = 0. \tag{13}$$

Provided the penalty is sufficiently high, affiliate A's profit maximizing tax transfer price is now characterized by an interior solution. That is, unlike in section 3.2, affiliate A no longer shifts as much income as possible to the low tax jurisdiction. To see this note that the expression in square brackets in Equation (12) must equal zero. This means that Equation (11) reduces to

$$[\tau_B - \tau_A]\, q_B(s,t) = f(t-a)\, P$$

The optimal tax transfer price cannot satisfy $t \leq a$ since this ensures that the right hand side is zero while, recalling footnote 11 and the restriction $\tau_A < \tau_B$, we know that the left hand side is strictly positive. On the other hand, for all $t \geq \bar{a}$, if the penalty is sufficiently high then the right hand side is greater than the left. Thus, by the Intermediate Value Theorem, we have $t^* \in (a, \bar{a})$.

We are interested in understanding the relationship between $s^*$ and $t^*$. This is achieved by examining how they vary with the underlying parameters of the model, such as the penalty. In order to simplify the analysis, we make the following assumptions.

**Assumption 1.**

(a) *Consolidated after-tax profit is concave in* $s \times t \times q_A$.

(b) $C''(q_A + q_B) = 0$.

Assumption 1(a) is natural to the extent that we are concerned here only with characterizing equilibria that exist – we are not interested in isolating conditions under which existence is guaranteed.[21] Assumption 1(b) simplifies the analysis by breaking the link between the two markets through the cost function. By assuming a constant marginal cost of production, $q_A^*$ and $q_B^*$ can be solved for independently rather than simultaneously.

**Proposition 2.** *Both the optimal strategic and tax transfer prices decrease as (a) the penalty for non-arm's length pricing increases, and (b) the probability of being penalized increases.*

*Proof*: (a) Taking into account Assumption 1, totally differentiating Equations (11)-(13) and applying Cramer's Rule gives

$$\text{sign}\left\{\frac{ds^*}{dP}\right\} = \text{sign}\left\{\frac{dt^*}{dP}\right\} = \text{sign}\left\{f'\frac{dq_B^*}{ds}\right\} < 0.$$

(b) Similarly,

$$\text{sign}\left\{\frac{ds^*}{dP}\right\} = \text{sign}\left\{\frac{dt^*}{dP}\right\} = \text{sign}\left\{P\frac{dq_B^*}{ds}\right\} < 0 \qquad \bullet$$

The fact that the tax transfer price decreases as the penalty for noncompliance with the arm's length principle increases or the probability of being penalized increases is not surprising – the latter was also observed by Kant (1988). In contrast, the result that the strategic transfer price also decreases with the penalty is more interesting. It establishes that there is indeed a connection between the tax environment and the strategic policy of the MNE. In other words, a change in various aspects of the tax regime does not affect only the tax transfer price, but also affects the transfer price used to provide strategic incentives to the subsidiary.

But what is the purpose of this adjustment to the strategic transfer price? Is it defensive, in the sense of simply trying to preserve the MNE's competitive position in each market, or is it offensive in the sense of trying to restore the effectiveness of the MNE's profit shifting strategy? The latter argument is that the MNE might respond to the harsher

[21] Given Assumption 1(b), concavity is ensured provided $P$ is sufficiently large. This is not surprising given the preceding discussion.

penalties by placing more reliance on the strategic transfer price as the mechanism to achieve profit-shifting goals. In other words, the strategic and tax transfer prices may be viewed as being substitutes to some extent.

In fact, the adjustment in the strategic transfer price is more in the nature of a defensive reaction to the harsher penalty. Referring back to Equation (10) it can be seen that $s$ does not directly affect consolidated after-tax profit, rather entering only indirectly through affiliate B's choice of output, $q_B$. In other words, the strategic transfer price cannot be used as an instrument to shift profits. Rather, the adjustment in $s$ serves simply to minimize the disruption in country B caused by the change in the tax transfer price. As $t$ decreases, we know from Equation (8) that affiliate B reacts by decreasing $q_B$. This is not desirable for affiliate A as it results in the marginal benefit in country B being higher than the marginal cost of production. Thus, affiliate A responds by simultaneously decreasing the strategic transfer price, which we know from Equation (7) results in an offsetting increase in $q_B$.

Having established how the optimal transfer prices vary in response to a change in the MNE's tax environment, we now examine how they vary with the MNE's cost environment. In particular, we analyze how $s^*$ and $t^*$ vary as affiliate A's marginal cost of production increases.

**Proposition 3.** *An increase in the marginal cost of production results in an increase in the optimal strategic transfer price and a decrease in the optimal tax transfer price.*

*Proof*: Taking into account Assumption 1, totally differentiating Equations (11)-(13) and applying Cramer's rule gives

$$(\tau_B - \tau_A)\frac{dq_B^*}{dt} - f'P \;<\; 0 \quad \Rightarrow \quad \frac{ds^*}{dC'} \;>\; 0.$$

The expression on the left is clearly positive if $P$ is sufficiently large, which is implied by Assumption 1(a).

Also, by the same process,

$$\text{sign}\left\{\frac{dt^*}{dC'}\right\} \;=\; \text{sign}\left\{(1+\tau_A)(1-\tau_A)\frac{dq_B^*}{ds}\frac{dq_B^*}{dt}\right\} \;<\; 0. \qquad \bullet$$

We would expect both $q_A^*$ and $q_B^*$ to decrease in response to an increase in the marginal cost of production – this follows simply from the requirement that marginal revenue and marginal cost be equated and the fact that marginal revenue decreases with output. While affiliate A controls $q_A$, the only way for it to implement the reduction in $q_B$ is to vary $s$ and $t$ in such a way as to induce affiliate B to reduce $q_B^*$. Equations (7) and (8) indicate that this requires some combination of increasing $s$ and reducing $t$.

But why doesn't affiliate A use the strategic transfer price alone to implement the change in $q_B$? After all, varying $s$ affects only $q_B$ and introduces no other distortions while, on the contrary, varying $t$ affects not only $q_B$ but also the extent of profit shifting. However, given that the tax regime is unchanged, it is not obvious why affiliate A would want to alter the amount of profit it shifts back to country A.

The answer is that affiliate A increases the tax transfer price up to the point where the marginal benefit from increasing it further is just equal to the marginal cost. The marginal benefit is a function of the amount of profit that can be shifted out of country B, while the marginal cost is a function of the magnitude of the penalty. For example, if $q_B^*$ is low and the penalty is high, then affiliate A has a strong incentive to lower the tax transfer price. Indeed, we have seen that as the marginal cost of production increases, $s^*$ increases and causes $q_B^*$ to fall. Thus, the marginal benefit from increasing $t$ is now lower than what it was before, while the marginal costs remain unchanged (since the penalty is unchanged). Profit maximization requires then that affiliate A make a downward adjustment to the tax transfer price.

Thus, we see that the relationship between the two transfer prices can be complicated and not always easy to anticipate. Following a change in the MNE's economic environment, they may move in the same direction or in opposite directions, depending on the nature of the change. Also, the change in the tax transfer price may drive, or be driven by, the associated change in the strategic transfer price. Models that do not distinguish between the two transfer prices necessarily fail to appreciate these possibilities and complexities.

## 5. Oligopoly

It is natural to ask whether our results extend to market settings involving oligopoly since this a more realistic scenario than monopoly. Moreover, the richer strategic interactions due to interfirm rivalry seem likely to result in a more complex, and perhaps realistic, relationship between the strategic and tax transfer prices. Indeed, this is suggested by Nielsen et al., (2001a), whose analysis of the FA approach purports to show that the MNE has an incentive to distort the transfer price under oligopoly but not under monopoly.

We show here that, apart from providing a more realistic setting, the move from monopoly to oligopoly adds little to our understanding of the interrelationship between the two transfer prices. This is not to deny, however, that introducing competition in country B brings new considerations to bear. Specifically, if rivals compete in quantities in country B, it is well understood that affiliate A has a stronger incentive to set $s$ lower under oligopoly because this turns affiliate B into a low cost competitor. This allows it to increase market share, which in turn increases consolidated profits (Vickers, 1985; Sklivas, 1987). However, the primary effect of this delegation benefit is to impact upon the equilibrium level of $s^*$, rather than the comparative statics properties of $s^*$ and $t^*$.

**Proposition 4.** *Propositions 2 and 3 hold also if affiliate B is a duopolist engaging in quantity competition.*

*Proof*: It follows from the proofs of Propositions 2 and 3 that it is required only to establish that $dq_B^* / dt > 0$ and $dq_B^* / ds < 0$. Supposing that affiliate B's competitor, firm C, produces output $q_C$ at cost $K(q_C)$, where $K''(q_C) > 0$, the first-order conditions for B and C respectively are

$$(1-\tau_B)[p_B + p_B' q_B] - (s - \tau_B t) = 0,$$

$$(1-\tau_B)[p_B + p_B' q_C - K''] = 0.$$

Assuming concavity of both B and C's after-tax profit functions and denoting the second order conditions by $(1-\tau_B)S_B$ and $(1-\tau_B)S_C$ respectively, we have $S_B < 0$ and $S_C < 0$. Totally differentiating and applying Cramer's rule gives

$$\text{sign}\left\{\frac{dq_B^*}{ds}\right\} = \frac{S_C}{(1-\tau_B)\,[S_B S_C - (S_B - p_B')(S_C - p_B' + K'')]} < 0,$$

$$\text{sign}\left\{\frac{dq_B^*}{dt}\right\} = \text{sign}\left\{-\tau_B \frac{dq_B^*}{ds}\right\} > 0.$$

In the monopoly setting, affiliate A uses $s$ to provide the appropriate incentives to affiliate B in relation to their purchase decision, $q_B$. Moving to oligopoly requires affiliate A to work through another layer of complexity in solving for the optimal strategic transfer price – it must anticipate not only affiliate B's response to a given pair of transfer prices, but their rivals' responses to affiliate B's response. However, the fact that $s$ defines affiliate B's unit cost is just as true under oligopoly as under monopoly. Indeed, it is hard to imagine a market setting in which $q_B^*$ increases with $s$.

Conversely, an increase in $t$ causes affiliate B's effective marginal cost to decrease since it lowers taxable income in proportion to $q_B$. Again, it is hard to imagine a market structure in which an increase in $t$ would cause affiliate B to respond by decreasing $q_B$. This suggests that Proposition 4 holds for a much broader range of market structures than we have shown, implying that our results are indeed very robust.

The impression given by Nielsen, et al. (2001a) that oligopoly gives rise to important strategic interactions that are not observed in monopoly is misleading. In their analysis of the FA approach under monopoly they state, "... even if the MNE can manipulate the transfer price within some limits, the transfer price does not have a meaningful role as a profit shifting device." However, the reason for this is that under monopoly they implicitly assume that affiliate A that chooses $q_B$, in which case there is clearly no need to craft the transfer price so as to offer affiliate B appropriate incentives – affiliate B has no decision making ability.

In contrast, under oligopoly they assume affiliate B chooses $q_B$, giving rise to a strategic role for the transfer price that was not observed under monopoly. A strategic role under monopoly would have existed, however, had they allowed affiliate B to choose $q_B$ in this setting also. That is, the source of this strategic role is not the oligopolistic market setting but rather the decentralization of decision-making – we demonstrate this in section 3.1.

## 6. Less than Single (and Double) Taxation

Two important goals of all international tax treaties are the elimination of both 'double' and 'less than single' taxation. That is, tax authorities agree that income should be taxed once, not more and not less. Many of the issues that arise in competent authority negotiations – for example, source versus residence taxation – are rooted in the above-mentioned principle. Indeed, the benefit of using the formula apportionment approach to calculating taxable income is that it essentially eliminates the possibility for double or less than single taxation. It does this by using a simple key upon which to allocate consolidated pre-tax profit amongst the affiliates of the MNE, thus ensuring that all profit gets allocated (and thus taxed) once and only once.

On the other hand, it could be argued that the separate entity approach is more susceptible to both double and less than single taxation. The reason is that the tax authorities in each country typically act independently in assessing the taxable income of the affiliate in their jurisdiction. Not sharing information leaves them vulnerable to the possibility that, through error of judgment or calculation by one or both authorities, some income is either taxed twice or not at all. In contrast, the FA approach effectively avoids this problem by implicitly centralizing the taxation process. To see this, note that in order for the FA approach to be implemented, the two tax authorities must reach agreement on the magnitude of the MNE's consolidated taxable income and also how to allocate this income between the affiliates.

It might be further argued that there is more scope for less than single taxation than there is for double taxation, given that each affiliate has recourse to the competent authority procedure if they suffer double taxation. In contrast, affiliates have no incentive to reveal mistakes resulting in less than single taxation.[22]

We inquire here whether either double taxation or less than single taxation have any impact on our results in the previous section. In particular, do the roles of the two

[22] The tax audit process is the only means by which such mistakes are uncovered, although this is a random process.

transfer prices change at all? It might be conjectured, for example, that less than single taxation gives rise to the possibility that the strategic transfer price has not only an indirect, but also a direct, effect on consolidated after-tax profits. This would result in the strategic transfer price assuming a profit-shifting role in addition to its strategic function, thus adding further layers of complexity in understanding the relationship between the two transfer prices.

We pursue this line of inquiry by assuming that while taxable income is correctly assessed in country B, either double or less than single taxation may occur in country A. Less than single taxation involves the tax authority assessing taxable income to be less than what it is in reality. Letting $\tilde{I}_A$ denote assessed taxable income in country A, less than single taxation requires that $\tilde{I}_A < I_A$. Similarly, double taxation requires that $\tilde{I}_A > I_A$.

**Proposition 5.** *Propositions 1-3 are unaffected by less than single or double taxation.*

*Proof*: Suppose that $\tilde{I}_A = \mu I_A$, where $\mu > 0$. Consolidated after-tax profit is now

$$\pi_T^{SE} = (1-\tau_A\mu)[R_A(q_A) - C(q_A + q_B)] + (1-\tau_B)R_B(q_B) - [\tau_A\mu - \tau_B]\, t\, q_B - F(t-a)P$$

Letting $\tilde{\tau}_A = \mu\tau_A$, consolidated after-tax profit can be rewritten as

$$\pi_T^{SE} = (1-\tilde{\tau}_A)[R_A(q_A) - C(q_A + q_B)] + (1-\tau_B)R_B(q_B) - [\tilde{\tau}_A - \tau_B]\, t\, q_B - F(t-a)P.$$

But this expression is identical to Equation (10) except that $\tilde{\tau}_A$ now replaces $\tau_A$. It follows immediately that, regardless of whether $\mu > 1$ or $\mu < 1$, Proposition 2 remains unchanged. •

Proposition 5 establishes that our results do not depend in any important way on the accuracy or efficiency of the taxation system in the sense discussed above. This adds further credibility to the results we have obtained.

## 7. Conclusion

The goal here has been to construct a more realistic and rational model of transfer pricing. In particular, we have tried to draw out the relationship between the transfer price used for cost accounting purposes and the transfer price used for tax accounting purposes. We have shown that this relationship can be complex and that changes in

either price can drive changes in the other. Failing to recognize that MNEs can employ two transfer prices results in an inability to recognize the full complexity of how MNEs can respond to changes its underlying economic environment. For example, changes in the tax environment can induce changes in the MNE's internal cost accounting policies.

The model employed here is simplistic in many respects and there is considerable scope for further research to better understand how MNEs determine their transfer prices. For example, it would be useful to model more carefully the institutional details surrounding tax transfer pricing, such as the ability of tax authorities to make adjustments to transfer prices, the conditions under which this occurs and the determinants of the magnitude of the adjustments. Also, modeling the link between the size of the penalty and the magnitude of the adjustment could increase our understanding of how MNEs choose their transfer prices.

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