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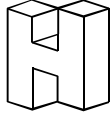
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**FORMULA APPORTIONMENT AND  
TRANSFER PRICING UNDER  
OLIGOPOLISTIC COMPETITION**

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# Formula Apportionment and Transfer Pricing under Oligopolistic Competition\*

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## Abstract

This paper demonstrates that under conditions of imperfect (oligopolistic) competition, a transition from separate accounting (SA) to formula apportionment (FA) does not eliminate the problem of profit shifting via transfer pricing. In particular, if affiliates of a multinational firm face oligopolistic competition, it is beneficial for the multinational to manipulate transfer prices for tax-saving as well as strategic reasons under both FA and SA. The analysis shows that a switch from SA rules to FA rules may actually strengthen profit shifting activities by multinationals.

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# 1 Introduction

The last decade has seen a widespread discussion on the relation between national tax systems and the strategic decisions on the part of multinational enterprises (MNEs) concerning the location of their investment, production and profits. At the heart of the matter is the fear that low-tax countries may attract a disproportionate share of the activities of MNEs at the expense of high-tax countries.

Equally worrisome are the possibilities open for MNEs to shift income from high-tax to low-tax jurisdictions. Such income shifting can be undertaken by choosing transfer prices for intra-firm transactions that would increase costs in high-tax jurisdictions and income in low-tax jurisdictions. At present, the taxation of profits of MNEs is in most countries based on Separate Accounting (SA) principles. Under SA, total income by the MNE is divided among its affiliates based on each affiliate's accounts and the application of an arm's length pricing standard for intra-firm transactions. Since the price on such intra-company transactions often is not observable in the market place, national tax authorities rely on several methods to impute the price that would have obtained between independent parties. These methods involve either the use of (a) comparable arm's length prices for similar transactions, (b) estimated costs plus a profit margin, (c) the resale price (achieved by subtracting a measure of profits from the sales price), (d) split profits (that is, partitioning of profits between the vendor and the purchaser), or (e) comparable profit measures.<sup>1</sup> Not only are these methods imperfect and costly to administrate, but the use of arm's length pricing standards are not coordinated internationally. Hence, there is a potential of conflict between states that happen to use different standards on the same transaction.<sup>2</sup>

Recently policy-makers and economists have pointed out that the problems related to profit shifting and Transfer Pricing (TP) under SA warrant a switch to a

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<sup>1</sup>The US has recently enacted laws that allow the use of quite different schemes to curb transfer pricing such as the Comparable Profits method (see Schjelderup and Weichenrieder (1999), for an analysis) and the Advanced Pricing scheme.

<sup>2</sup>See Raimondos-Møller and Scharf (1998) for an analysis of this issue.

system more similar to that practiced by the US on domestic firms.<sup>3</sup> When taxing domestic firms located in different states, the US does not rely on SA but instead on formulas to calculate the tax base applicable in individual states. These formulas in effect apportion US assets, sales, and/or payroll to any individual state in which the firms operate and then use these shares to compute the base applicable for taxation in that state.<sup>4</sup> This system, called Formula Apportionment (FA), is by many seen as a superior method of taxing multinationals, since it ensures that MNEs cannot evade taxation in any single state as long as it has some activity going on in that state. FA, therefore, is perceived to curtail or even eliminate the incentives for using TP to shift profits into low-tax countries. Although there are some disadvantages related to the use of FA, for example, that it may under certain circumstances create price distortions, the overriding argument in favor of FA seems to be its favorable impact over SA with respect to curbing transfer pricing.<sup>5</sup>

Most of the literature on profit shifting and transfer pricing pay little attention to the nature of competition in final markets and assume that subsidiaries of multinationals are monopolists in their local markets. The focal point in these papers is how differences in national tax systems as well as tariffs affect the incentives to engage in transfer pricing.<sup>6</sup> However, the nature of competition in local markets are more often than not oligopolistic (e.g. the car industry or the oil industry). Under oligopoly, it has been shown by Schjelderup and Sørsgard (1997) that transfer prices trade-off tax incentives against strategic incentives.<sup>7</sup> The strategic role of the transfer price occurs because the multinational can use transfer pricing as an instrument to capture markets shares in local markets and thereby increase its profits. For example, if affiliates of a multinational firm face oligopolistic competition, the multinational can gain by setting the transfer price at a central level and delegate

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<sup>3</sup>See e.g. Musgrave (1973), Bird and Brean (1986), McLure (1989), Bucks and Mazerov (1993), and Shackelford and Slemrod (1998). Canada practices a system similar to the US and with greater emphasis on harmonization of tax bases. Mintz (2000) provides a survey of the US and Canadian tax rules under FA.

<sup>4</sup>See Weiner (1996) for a survey of these rules.

<sup>5</sup>See Gordon and Wilson (1986), for an analysis of factor price distortions under FA.

<sup>6</sup>See e.g. Kant (1990), and more recently Schjelderup and Weichenrieder (1999).

<sup>7</sup>See Schjelderup and Sørsgard (1997); Propositions 3 and 7.

decisions about prices or quantities to its local affiliates if this triggers favorable responses by local competitors.<sup>8</sup> To see why, suppose the MNE sets the transfer price at a central level, but allows its subsidiaries to set quantities in local markets (Cournot competition). If the central level sets the transfer price low, an importing affiliate becomes a low cost firm that behaves aggressively by selling a large quantity. Such aggressive behavior under Cournot competition induces its local rival to behave softly by setting a low quantity. The soft response from the rival is beneficial to the multinational firm as a whole. Hence, delegation can achieve higher profits than would arise if all decisions were undertaken centrally. The implication is that the transfer price has a strategic value in addition to being an instrument for profit shifting.

This paper undertakes a reexamination of the implications of Separate Accounting and Formula Apportionment for transfer pricing activities of MNEs. The emphasis is on whether FA may be preferable to SA in a setting where the MNE has leverage to engage in profit shifting via TP. We show that if competition occurs under oligopoly and decision-making in multinationals are decentralized, a switch from SA to FA will not eliminate transfer pricing. Such a reform may actually intensify the profit shifting activities of MNEs via transfer pricing. This result is valid under even the most favorable assumptions for FA involving international agreement over both the appropriate tax base to be used for allocating income and the formula apportionment weights. Such agreement is normally claimed to eliminate any incentive to engage in TP (see Gordon and Wilson, (1986)). Under oligopoly, however, even agreement over these crucial issues will not prevent MNEs from shifting profits between countries, as we demonstrate below.

In the next sections we proceed as follows. In section 2 we set up a standard model of a horizontally integrated MNE that undertakes intra-firm trade in final

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<sup>8</sup>It is well known in the Industrial Organization (IO) literature that a principal may gain extra benefit by hiring an agent and giving him/her the incentive to maximize something other than the welfare of the principal. See e.g. Vickers (1985), Sklivas (1987), and Fershtmann and Judd (1987), Katz (1991), and Basu (1993). These precommitment gains have been shown to exist even if one allows for renegotiation of the contract between the principal and the agent (Caillaud et.al. (1995)).

goods. We then proceed to examine the transfer pricing incentives under monopoly when FA and SA applies, respectively. We show in that section that the problem of transfer pricing on the part of the MNE, which is present under SA, is eliminated under FA. Section 3 turns to oligopolistic competition by allowing one of the affiliates to face a local competitor and investigates transfer pricing under FA and SA. It is then shown that transfer pricing under both FA and SA is determined by both strategic incentives and tax manipulation considerations. Section 4 compares the results under SA and FA and provides a numerical example that illustrates the differences between SA and FA. Section 5 offers some concluding remarks.

## 2 Transfer pricing incentives under monopoly

The model used is one of horizontally integrated trade in a secondary processed good. The MNE has two affiliates, each in one of the two countries to be called country  $A$  and country  $B$ . Both affiliates are initially assumed to be monopolists in their respective markets. The affiliate in country  $A$  produces quantities  $S_A$  and  $S_B$  with a cost function  $C(S_A + S_B)$ , where  $C' > 0$ ,  $C'' > 0$ . Quantity  $S_A$  is sold in country  $A$  at a price  $P_A(S_A)$ , yielding revenue  $R_A(S_A)$ , where  $R_A'' \leq 0$ ,  $P_A' < 0$ . Quantity  $S_B$  is exported to the affiliate in country  $B$  at a transfer price  $q$  and resold in country  $B$  at a price  $P_B(S_B)$ , earning revenue of  $R_B(S_B)$ , with  $P_B' < 0$  and  $R_B'' \leq 0$ . It is assumed that the MNE is able to practice price discrimination between the two markets.<sup>9</sup> The profits of the affiliates are defined as

$$\pi_A = R_A(S_A) - C(S_A + S_B) + qS_B, \quad (1)$$

$$\pi_B = R_B(S_B) - qS_B, \quad (2)$$

and the global before tax profit as

$$\pi^T = \pi_A + \pi_B = R_A(S_A) + R_B(S_B) - C(S_A + S_B). \quad (3)$$

Equation (3) completes the set up of the model. In the two next subsections we investigate the transfer pricing incentives by MNEs under SA and FA.

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<sup>9</sup>Price discrimination is assumed to exist due to market segmentation.

*Formula Apportionment (FA)*

Under the FA scheme, global profits are apportioned to each country based on the activities of the MNE in each country in proportion to the MNE's world-wide activities.<sup>10</sup> Under a *general* formula apportionment system, the tax liability to the government in country  $i$  would be equal to

$$T_i = t_i \left[ \alpha_K \left( \frac{K_i}{K} \right) + \alpha_S \left( \frac{S_i}{S} \right) + \alpha_P \left( \frac{P_i}{P} \right) \right] \pi_i^T, \quad (4)$$

where

$t_i$  = is country  $i$ 's tax rate

$\alpha_i$  = weight given to factor  $j$  in the apportionment formula ( $\sum \alpha_j = 1$ )

$K_i$  = capital/property in country  $i$  ( $\sum K_i = K$ )

$S_i$  = sales in country  $i$  ( $\sum S_i = S$ )

$P_i$  = payroll in country  $i$  ( $\sum P_i = P$ )

$\pi_i^T$  = taxable global profits as defined by country  $i$ 's tax law

In the above formula the part of the multinational's global profits which is allocated to country  $i$  is found by weighting the relative capital stock, relative sales, and relative payroll of that country. To simplify, but without loss of generality, we assume in our analysis that  $\alpha_K = \alpha_P = 0$ , so that only sales enter the formula. In addition, we assume that taxable profits do not differ from true profits in each country so that  $\pi^T = \pi_i^T = \pi_j^T$ ,  $i \neq j$ . By doing so we eliminate the most common distortions that create incentives for TP. Given these simplifying assumptions, the multinational's tax liability to the government in country  $i$  is equal to

$$T_i = t_i \left( \frac{S_i}{S} \right) \pi^T, \quad i = A, B$$

Consequently, global after tax profits under FA are

$$\begin{aligned} \Pi^{FA} &= \pi^T - t_A \left( \frac{S_A}{S} \right) \pi^T - t_B \left( \frac{S_B}{S} \right) \pi^T \\ &= \pi^T \theta, \end{aligned} \quad (5)$$

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<sup>10</sup>The FA system is currently used in the U.S., Canada, and Switzerland to tax national firms, which operate in multiple states/cantons.



where  $\theta = \frac{S_A(1-t_A)+S_B(1-t_B)}{S} = 1 - t$  is equal to one minus the average after tax rate (denoted by  $t$ ) on global profits.

It is evident from (5) that even if the MNE can manipulate the transfer price ( $q$ ) within some limits, the transfer price does not have a meaningful role as a profit shifting device. To see this notice from (5) that,

$$\frac{\partial \Pi^{FA}}{\partial q} = 0, \quad (6)$$

so that when the affiliates are monopolists in their local markets, the transfer price does not affect global after-tax profits. The reason is that the transfer price cannot interfere with sales decisions for the two markets.<sup>11</sup> Equation (6), then, essentially confirms conventional beliefs that imposing the FA scheme on multinationals will eliminate incentives for profit shifting.

#### *Separate Accounting (SA)*

Under the Separate Accounting method of taxation each country imposes a tax on the profits generated within its country borders, i.e. profits are taxed in the country of source. Although repatriated profits are taxed in the country of residence, there is general agreement that due to deferral possibilities and limited tax credit rules, the source principle of taxation is effectively in operation (see Keen (1993) and Tanzi and Bovenberg (1990)). Taking this into account, global after tax profits are given by

$$\Pi^{SA} = (1 - t_A) \pi_A + (1 - t_B) \pi_B.$$

If the multinational practices transfer pricing, then over- and underinvoicing will occur in order to minimize tax payments. In particular, the MNE will set its transfer price according to the sign of

$$\frac{\partial \Pi^{SA}}{\partial q} = S_B(t_B - t_A). \quad (7)$$

Equation (7) makes it clear that if  $t_B > t_A$ , and if the MNE is not bound by transfer pricing regulation, its optimal high transfer price is the price that makes profits in

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<sup>11</sup>Taxation under FA will in general influence the MNE's sales in the two markets, but the effects on sales run via the formula for calculating the average tax rate, not via the transfer price.

country  $B$  zero.<sup>12</sup> Such a price will shift all profits to the low tax country thereby minimizing global tax payments of the MNE. If  $t_B < t_A$ , it would be desirable with a low transfer that shifts all profits to the affiliate in  $B$ .

In general MNEs are not at liberty to choose transfer prices freely, but must adhere to arm's length prices. Although these prices may not be accurate in the sense that they eliminate the profit shifting activities of MNEs, they most often prevent the extreme cases we have outlined above. We emphasize, however, that equation (7) shows that under SA, the MNE has incentives to either under- or overinvoice the price on intra-firm sales. Thus, only in so far as tax authorities are successful in imposing 'true' arm's length prices can profit shifting be completely prevented. Evidence suggest that this is indeed very difficult.

To summarize our discussion of the FA and SA schemes so far, we may state:

**Proposition 1** *Under monopoly and international harmonization of national tax bases, a switch from SA to FA eliminates the transfer pricing incentives of the multinational firm.*

Notice that the success of the FA scheme relies on some quite strong assumptions. In itself, the harmonization of national tax bases is a formidable task. Furthermore, the assumption that affiliates hold monopoly positions in national markets is not only strong, but also clearly at odds with empirical observations. In the next section we will show that introducing oligopolistic competition in at least one market will cause incentives for TP to reappear under FA.

### 3 Transfer pricing under oligopolistic competition

We introduce oligopolistic competition into the present set up by assuming that the affiliate in country  $B$  faces a local rival. We take quantity to be the strategic variable in market  $B$ , but our qualitative results do not depend on this, as we shall

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<sup>12</sup>A subsidiary, which is incorporated in a foreign country cannot gain any tax advantage by showing losses in the foreign country since such losses in most countries cannot be deducted against home profits. We assume for simplicity the absence of any carry-forward or carry-backward provisions (i.e., the period considered may be perceived as long enough for such strategies to be exhausted).

see when we discuss price competition later on. The competitor chooses optimally a quantity  $S_B^*$ . Given the competitor's sales, the affiliate of the MNE in country  $B$  earns a revenue of  $R_B(S_B, S_B^*)$ , with  $\partial^2 R_B / \partial S_B^2 \leq 0$ , and  $\partial R_B / \partial S_B^* < 0$  (so the two products are substitutes). Taxable global profits of the multinational are denoted (as before)

$$\pi^T = \pi_A + \pi_B,$$

where profits by the affiliate in country  $B$  now are

$$\pi_B = R_B(S_B, S_B^*) - qS_B,$$

As before,  $\pi_A$  are profits in country  $A$ . Before we examine how transfer prices are set under FA and SA, we examine how the multinational firm will set the transfer price in the absence of taxation.

When the multinational firm delegates decisions about quantities to its affiliates in national markets, the central authority of the MNE must take into account that the transfer price will have an impact on the outcome of competition in market  $B$ . A high transfer price, for example, will make the affiliate in  $B$  into a high-cost firm, while a low transfer price will have the opposite effect. To find the optimal transfer price that triggers the most favorable response from the competitor, therefore, the central authority within the MNE must make sure that the pricing strategy maximizes global after tax profits.<sup>13</sup> Thus, the maximization procedure has the following sequence of moves. First, the central authority within the MNE sets  $q$ ; then the affiliates in countries  $A$  and  $B$  as well as the local competitor set quantities, taking  $q$  as exogenously given. Hence,  $S_i = S_i(q)$  and  $S_B^* = S_B^*(q)$ , where  $i = A, B$ . As usual we solve this game by backward induction. For given  $q$  the two affiliates set their quantities according to the first order conditions,

$$\frac{\partial \pi_A}{\partial S_A} = R'_A - C' = 0, \quad \text{and} \quad \frac{\partial \pi_B}{\partial S_B} = \frac{\partial R_B(S_B, S_B^*)}{\partial S_B} - q = 0. \quad (8)$$

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<sup>13</sup>Notice that the assumption that there is monopoly in country  $A$  does not affect any of our results in a qualitative way. Introducing duopoly in country  $A$  would, however, dampen the incentive to increase sales in  $B$  because of the cost linkage to the duopoly in country  $A$ .

The central authority within the MNE maximizes global profits with respect to  $q$ , and the first order condition is:

$$\frac{\partial \Pi^{FA}}{\partial q} = \left[ (R'_A - C') \frac{\partial S_A}{\partial S_B} \frac{\partial S_B}{\partial q} - C' \frac{\partial S_B}{\partial q} + q \frac{\partial S_B}{\partial q} \right. \\ \left. \frac{\partial R_B(S_B, S_B^*)}{\partial S_B^*} \frac{\partial S_B^*}{\partial S_B} \frac{\partial S_B}{\partial q} + \left( \frac{\partial R_B(S_B, S_B^*)}{\partial S_B} - q \right) \frac{\partial S_B}{\partial q} \right] = 0 \quad (9)$$

where we have used the fact that  $\partial S_B^*/\partial q = (\partial S_B^*/\partial S_B)(\partial S_B/\partial q)$ .<sup>14</sup>

The central authority takes into account the response by its affiliates when it sets  $q$ . Hence, using (8) in (9), and solving for  $(q - C')$  we obtain

$$q - C' = - \frac{\partial R_B(S_B, S_B^*)}{\partial S_B^*} \frac{\partial S_B^*}{\partial S_B} \equiv \sigma < 0. \quad (10)$$

where  $\sigma \equiv -(\partial R_B(S_B, S_B^*)/\partial S_B^*)(\partial S_B^*/\partial S_B) < 0$  denotes the strategic effect.<sup>15</sup> Equation (10) shows that in the absence of taxes, the transfer price will differ from marginal cost under oligopolistic competition.<sup>16</sup> The strategic effect indicates that it is profitable to set the transfer price below marginal cost in order to render the firm in country  $B$  into a low-cost firm that behaves aggressively by increasing its quantity.<sup>17</sup> This is beneficial for the MNE since the local competitor's best response to such behavior is to reduce its sales, thereby allowing the affiliate (and thus the MNE as a whole) to earn higher profits. We can therefore conclude that under oligopolistic competition the transfer price in the absence of taxation is a strategic device, which can be used by multinationals to win market shares.

<sup>14</sup>See Tirole (1988; p. 326) or Brander (1995; p. 1408).

<sup>15</sup>Notice that  $\sigma$  is taken to be negative since: (i) Under Cournot competition we have that  $\frac{\partial S_B^*}{\partial S_B} < 0$  for a large class of demand functions (see Bulow et. al. (1985)), and (ii)  $R'_{S_B} < 0$  since  $S_B$  and  $S_B^*$  are substitutes.

<sup>16</sup>If all variables were decided at a central level, the transfer price would cancel out in the global profit function. In this case the MNE would adjust sales in each market according to the standard rule of marginal cost equal to marginal revenue. With taxation, only the tax shifting effect would determine the desirable transfer price. With or without taxes, profits of the multinational would be lower under centralism.

<sup>17</sup>The competitor's response hinges on the observability of the transfer price. The multinational firm has a strong incentive to reveal the transfer price to its competitor. In many cases the transfer price is observable since custom lists over imports and their prices are public information. See Katz (1991) for a discussion on the issue of observability in general.

In the two next sections we examine how transfer pricing incentives are affected by taxation when FA and SA applies. We then compare how the transfer price is set under the two tax schemes.

*Formula Apportionment (FA)*

Under FA, global profits after tax are (as before) given by

$$\Pi^{FA} = (\pi_A + \pi_B) \theta = \pi^T (1 - t)$$

The first order condition with respect to  $q$  is:

$$\begin{aligned} \frac{\partial \Pi^{FA}}{\partial q} = & \left[ (R'_A - C') \frac{\partial S_A}{\partial S_B} \frac{\partial S_B}{\partial q} - C' \frac{\partial S_B}{\partial q} + q \frac{\partial S_B}{\partial q} \right. \\ & \left. \frac{\partial R_B(S_B, S_B^*)}{\partial S_B^*} \frac{\partial S_B^*}{\partial S_B} \frac{\partial S_B}{\partial q} + \left( \frac{\partial R_B(S_B, S_B^*)}{\partial S_B} - q \right) \frac{\partial S_B}{\partial q} \right] \theta \\ & + \pi^T \frac{\frac{\partial S_B}{\partial q} (t_B - t_A) \left( \frac{\partial S_A}{\partial S_B} S_B - S_A \right)}{S^2} = 0 \end{aligned} \quad (11)$$

Using (8) in (11) and rearranging we have that

$$q_{FA} - C' = \sigma - \left[ \left( \frac{\pi^T}{\theta S^2} \right) (t_B - t_A) \left( \frac{\partial S_A}{\partial S_B} S_B - S_A \right) \right], \quad (12)$$

where  $q_{FA}$  is the transfer price under FA. Equation (12) shows that there are two effects present. The first effect, the strategic effect ( $\sigma$ ), is the same as before and indicates, ceteris paribus, that the transfer price should be set below marginal cost. The second term (i.e., the squared bracket) is the profit shifting incentive or tax manipulation effect. Since the transfer price will influence the quantities sold by the MNE at home and abroad, varying it will affect the average tax rate facing the MNE. If for instance  $t_A < t_B$ , then raising  $q_{FA}$  will induce a decline in  $S_B$  and an increase in  $S_A$ . The weight attached to  $t_B$  in the formula for the average tax rate is consequently reduced, and this lowers the average tax rate to the benefit of the MNE. We conclude that under FA, the MNE has an additional incentive to distort the transfer price so as to shift profits to minimize its tax payments.

Closer inspection of the tax manipulation effect reveals that its sign depends on  $sign(t_B - t_A)$ . If  $t_A < t_B$ , the tax effect is positive, indicating a transfer price above

marginal costs.<sup>18</sup> With country  $B$  a high tax country relative to country  $A$ , the MNE would like to reduce sales in  $B$  by increasing the transfer price so as to bring down the average tax rate. In optimum, the firm balances the benefits of increasing its market share in  $B$  by setting a low transfer price (the strategic effect) against the gains from lowering the effective rate of tax (the tax manipulation effect). Since the tax manipulation effect counteracts the strategic effect when  $t_A < t_B$ , the outcome is ambiguous (i.e.,  $q_{FA} \gtrless C'$ ) and will depend on the properties of demand and cost functions as well as tax rates.

If  $t_A > t_B$ , the MNE would like for tax saving reasons to increase sales in country  $B$  (and reduce its sales in  $A$ ) to reduce the burden of the high level of taxation in country  $A$ . The incentive to save tax in this case reinforces the strategic effect leading to an even lower transfer price ( $q_{FA} < C'$ ).

It is now straightforward to show that if price in country  $B$  were the strategic variable between the local competitor and the affiliate of the MNE, a formula similar in structure to that given in (12) would appear. In such a setting the strategic incentive taken alone would dictate a transfer price above marginal costs. The intuition is that a high transfer price will force the affiliate in  $B$  to set a high price on its final sales. The local rival's best response to such a policy is to set a high price as well. Such non-aggressive behavior by the local competitor is beneficial to the affiliate of the MNE (and the MNE as a whole). The tax incentives will in this framework be in the same direction as before. For the case of  $t_A < t_B$  the tax saving incentive works in same direction as the strategic effect, leading to a transfer price above marginal costs ( $q_{FA} > C'$ ). If on the other hand  $t_A > t_B$ , the tax effect warrants a low transfer price. In this case the total effect is ambiguous, and the transfer price may be above or below marginal costs.

Summing up, this section has demonstrated that FA will not eliminate transfer pricing, if there is oligopolistic competition in markets. This, however, does not necessarily mean that a transition to FA leads to more transfer pricing than does SA. In what follows we examine transfer pricing under SA, and then compare the

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<sup>18</sup>Notice that  $\left(\frac{\partial S_A}{\partial S_B} S_B - S_A\right) < 0$ , since from comparative statics it is easily seen that  $\frac{\partial S_A}{\partial S_B} \leq 0$ , assuming that the firm is facing either constant or increasing marginal costs.

two principles of taxation to see if one involves more transfer pricing than the other.

*Separate Accounting (SA)*

The maximization procedure under SA is the same as that under FA. Notice that since the MNE delegates decision-making about quantities to its affiliates, the second step of the maximization procedure is identical under the two tax schemes. Hence, the first order conditions given by equation (8) are valid also under SA<sup>19</sup>. In the first stage of the maximization procedure, the central layer of the MNE, maximizes

$$\Pi^{SA} = (1 - t_A) \pi_A + (1 - t_B) \pi_B,$$

with respect to  $q$ . A marginal change in  $q$  has the following effect on global after tax profits,

$$\begin{aligned} \frac{\partial \Pi^{FA}}{\partial q} = & (1 - t_A) \left[ (R'_A - C') \frac{\partial S_A}{\partial S_B} \frac{\partial S_B}{\partial q} - C' \frac{\partial S_B}{\partial q} + S_B + q \frac{\partial S_B}{\partial q} \right] \\ + (1 - t_B) & \left[ \frac{\partial R_B(S_B, S_B^*)}{\partial S_B^*} \frac{\partial S_B^*}{\partial S_B} \frac{\partial S_B}{\partial q} + \left( \frac{\partial R_B(S_B, S_B^*)}{\partial S_B} - q \right) \frac{\partial S_B}{\partial q} - S_B \right] = 0 \end{aligned} \quad (13)$$

Rearranging (13), using (8), we obtain the optimal transfer price,  $q = q_{SA}$ , as

$$q_{SA} - C' = \sigma^{SA} - \frac{(t_B - t_A)}{(1 - t_A)} \frac{S_B}{\left( \frac{\partial S_B}{\partial q} \right)}, \quad (14)$$

where  $\sigma^{SA} = \sigma \frac{(1-t_B)}{(1-t_A)} < 0$ .

As under FA (cf. equation (12)), the first term in (14) represents the strategic effect, while the last term stands for the tax manipulation effect. In the case of zero or identical tax rates, the pricing rule becomes identical to that obtained under FA, that is,  $q - C' = \sigma < 0$ , as the strategic effects are the same, and tax manipulation effects are absent.

If  $t_B > t_A$ , it is profitable for tax saving purposes to charge a transfer price above marginal costs thereby shifting profits to the affiliate in the low tax country  $A$ . The tax motive in this case acts against the strategic effect, and the total outcome depends on the relative magnitude of the two effects. If  $t_B < t_A$ , the MNE for tax

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<sup>19</sup>For a full formalization of the delegation approach under SA see Schjelderup and Sørsgard (1997).

reasons wishes to set  $q_{SA} < C'$ , and this is in accordance with the strategic effect. The outcome is therefore a transfer price below marginal cost.

If price was the strategic variable between the local competitor and the affiliate, it can be shown (see Schjelderup and Sørsgard, 1997) that the strategic incentive alone would dictate a high transfer price. The intuition is the same as that given under FA.

We can summarize our findings in this section by the following statement,

**Proposition 2** *Under oligopolistic competition, both the FA and the SA schemes provide incentives for transfer pricing.*

Whether one scheme induces more transfer pricing than the other is the topic of the next section.

## 4 Comparisons of Results

The purpose of this section is to compare how MNEs set the transfer price under FA and SA. We collect our results from the previous section in the table below (referring to (12) and (14)):

	Formula Apportionment	Separate Accounting
$t_A = t_B$	$q_{FA} = q_{SA} < C'$	$q_{FA} = q_{SA} < C'$
$t_A > t_B$	$q_{FA} < C'$	$q_{SA} < C'$
$t_A < t_B$	$q_{FA} \begin{matrix} \geq \\ < \end{matrix} C'$	$q_{SA} \begin{matrix} \geq \\ < \end{matrix} C'$

Table 1 shows that the incentives for transfer pricing under the two schemes qualitatively have the same properties. However, only if taxes are zero or harmonized do the two schemes yield the same transfer price. To gain further insight into the transfer pricing behavior under SA and FA we subtract (14) from (12). It is then



the case that  $q_{FA} - q_{SA} < 0$  if and only if

$$\sigma \frac{(t_B - t_A)}{(1 - t_A)} + (t_A - t_B) \left[ \left( \frac{\pi^T}{\theta S^2} \right) \left( \frac{\partial S_A}{\partial S_B} S_B - S_A \right) - \frac{S_B}{\left( \frac{\partial S_B}{\partial q} \right) (1 - t_A)} \right] < 0 \quad (15)$$

The first term in (15) is the difference between the strategic effect under FA and SA (i.e.,  $\sigma - \sigma^{SA}$ ). From our previous discussion it follows that the strategic effects dictate a low transfer price. We may thus state:

**Proposition 3** *The MNE will have stronger incentives for strategic reasons alone to underinvoice under SA than FA if  $t_A > t_B$  (and vice versa for  $t_A < t_B$ ).*

The reason is that under SA, profits in each country are subject to the national tax rate. The impact of the transfer price as a strategic weapon under SA therefore depends on the relative tax rates as expressed by the ratio  $(1 - t_B) / (1 - t_A)$ . When  $t_A < t_B$ , the fraction is less than one, reducing (in absolute value) the effectiveness of the transfer price. Under FA global profits are taxed by the single rate  $t$  so the 'strategic part' of the transfer price must not be weighted by national tax rates.

Turning to examine the last term (the square bracket) - which is the difference between the tax manipulation effects - it appears from (15) that it may in principle be of either sign. Hence, further assumptions are needed to ascertain whether tax saving considerations distort transfer prices more under FA than under SA. In what follows we shall provide a numerical example which allows us to examine the issue of the relative size of transfer prices under the two rival international tax regimes in greater detail.

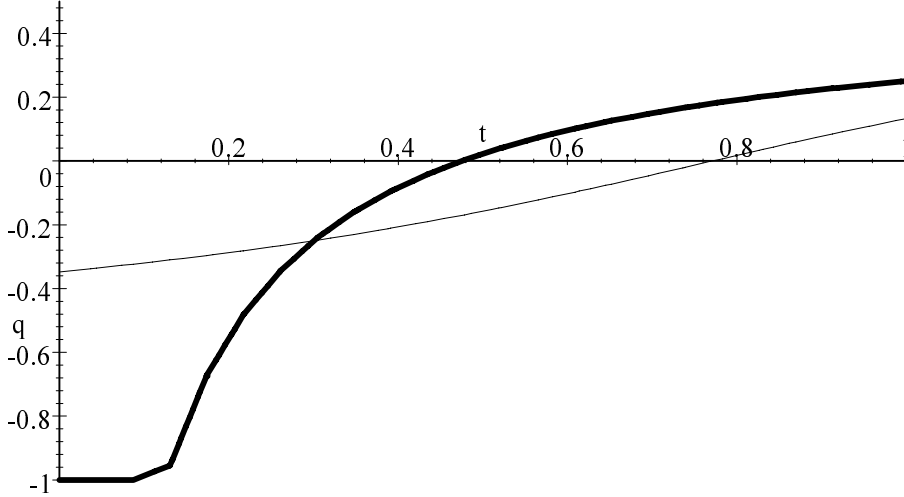
#### *A Numerical Example*

To simplify we assume a linear demand function in country  $A$  of the type  $P_A = 1 - S$ . The inverse demand function for the two competitors in country  $B$  is  $P_B = 1 - S_B - S_B^*$ , so the two goods are perfect substitutes. Marginal costs are normalized to zero ( $C' = 0$ ).<sup>20</sup> We set  $t_A = 0.3$  and let  $t_B$  vary between zero and unity. Figure 1 shows the results of the numerical simulations. The two transfer pricing formulas

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<sup>20</sup>This assumption weakens the tax effect under FA since the term  $(\partial S_A / \partial S_B) S_B$  is eliminated from the optimal pricing formula in (12). However, numerical simulations - using quadratic cost

which form the basis of the curves in figure 1 are given in the Appendix. The figure shows the transfer price  $q$  under the FA and SA regimes as a function of the tax rate  $t_B$ .



**Figure 1:** Transfer pricing under FA and SA

In figure 1 the bold line (thin line) represents the transfer price chosen under SA (FA). As is evident from the figure, the transfer price will under both schemes in general deviate from marginal costs (which were normalized to zero). In particular, only for  $t_B = 0.475$  does the transfer price equal marginal cost under SA, while  $t_B \approx 0.78$  equates marginal costs to the transfer price under FA. Furthermore, when  $t_B = 0.3$ , so that the two tax rates coincide, the transfer price is the same under FA and SA.

The figure shows that the transfer price is lowest under FA, when the tax rate in country B exceeds that in country A, and vice versa. One lesson from the figure is that the strategic effect is quite strong under both schemes. It can further be shown that for the tax interval  $t_B \in [0.3, 0.6]$  the FA scheme leads to more transfer pricing than does SA (in the sense that the transfer price under FA is further removed from functions - show that normalizing costs to zero does not affect the simulation results in a qualitative way (simulations with quadratic cost functions are available from the authors upon request). Notice that even with constant positive marginal costs the term  $\partial S_A / \partial S_B$  would be zero in general.

the true price). Thus there are indeed reasonable values for tax rates where the FA scheme would lead to more profit shifting than the SA scheme. We state this insight as

**Proposition 4** *When MNEs engage in oligopolistic competition in some markets, FA may well lead to more transfer pricing than SA.*

## 5 Concluding remarks

In this paper we have studied the incentives on the part of multinationals to engage in transfer pricing under formula apportionment and separate accounting. A widely held belief among both policymakers and economists is that a transition to a system of formula apportionment will eliminate the profit shifting incentives of multinationals. Our analysis does not support this belief. In particular, we find that in markets involving multinationals, profit shifting incentives are *not eliminated* under formula apportionment. The reason is that under oligopolistic competition the transfer price takes on a dual role as both a strategic and a tax saving device. The strategic effect arises since the MNEs can benefit from setting the transfer price at a central level, but delegate decision-making about quantities (or prices) in local markets to its affiliates in these markets. Since affiliates then take the transfer price as given, the central layer of the MNE can use the transfer price as a strategic device to win markets shares in local markets under oligopoly. In particular, if quantity is the strategic variable, the strategic effect dictates a subsidy to affiliates in the sense that the transfer price should be set below marginal costs of exporting. The tax saving role of the transfer price under formula apportionment arises, since an increase in local sales changes the tax liabilities of the MNE via a change in its average effective tax rate. The strategic benefits may therefore be counteracted or enhanced by the incentive to reduce tax payments, depending on the relation between tax rates in countries in which the MNE operates.

Our second policy question concerned a comparison of the profit shifting incentives under formula apportionment to that under separate accounting. If tax rates are not harmonized, the analysis finds that the strategic and tax-saving incen-

tives to exploit transfer pricing may well be stronger under formula apportionment than under separate accounting. Whereas the analytical comparisons between the two schemes do not yield conclusive insights, a simple numerical example demonstrates that the incentive to set a low transfer price can be more pronounced under formula apportionment, when the subsidiary of the MNE exposed to oligopolistic competition is located in the high tax country. A general lesson that emerges from the analysis, confirming the findings of Schjelderup and Sørsgard (1997), is that the strategic incentives for transfer pricing can be quite strong.

The analysis in this paper has assumed given tax rates. However, besides affecting transfer pricing on the part of MNEs, a move from separate accounting to formula apportionment may also affect the general level of corporate income taxes. In a companion paper we examine whether the introduction of formula apportionment is likely to raise or lower taxes (cfr. Nielsen et. al. (1999)).

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## Appendix

The two transfer pricing formulas of the numerical example are

$$q_{SA} = \frac{(1 - t_B) \frac{4}{3} - 0.7}{\frac{8}{3}(1 - t_B) - 4(0.7)}, \quad (16)$$

$$q_{FA} = q = - \left( \frac{1 - 2q}{6} - (t_B - .3) \frac{1 \left( \frac{1}{2} + \frac{1-2q}{3} \right) \left( \frac{1}{4} + \frac{1+q}{3} \frac{1-2q}{3} \right)}{2(1 - .3) \frac{1}{2} + (1 - t_B) \frac{1-2q}{3}} \right). \quad (17)$$

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