Corporate Tax Systems, Multinational Enterprises, and Economic Integration*

Hans Jarle Kind
Norwegian School of Economics and Business Administration and LOS

Karen Helene Midelfart Knarvik
Norwegian School of Economics and Business administration and CEPR

Guttorm Schjelderup
Norwegian School of Economics and Business administration and CESifo

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ABSTRACT: This paper studies how economic integration affects transfer pricing, tax policy, and welfare when multinationals are taxed either according to formula apportionment (FA) or separate accounting (SA). It is shown that economic integration induces multinationals to lower their transfer prices under both tax systems, but that transfer prices become less tax sensitive under FA than under SA. A main result of the paper is that economic integration lowers tax rates in the Nash equilibrium under SA, but leads to higher taxes in the Nash equilibrium under FA.

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1 Introduction

The past two decades have witnessed a growing trend towards economic integration where national borders have diminished in importance, and capital, firms, and labor have become more mobile internationally. Hand in hand with the economic integration of independent economic systems – local, national, and otherwise – has been the immense growth of foreign direct investments (FDI) and thus the rising importance of multinationals (MNCs). At the end of 1997, the gross product (value added) of all multinational corporations including parent firms stood at an estimated $8 trillion, comprising roughly a quarter of the world's gross domestic product.[1]

The increased importance of MNCs in the world economy poses at least two challenges to the design of corporate taxation in the global economy. The first pertains to the division of the tax base of MNCs among the jurisdictions where MNCs have some ongoing activity. The problem is how to disentangle the operations of national subsidiaries from the activities of the MNC as a whole. The second problem pertains to a key public-finance aspect of the behavior of MNCs that has been thoroughly researched in the literature on MNCs, namely the role of transfer pricing in shifting profits to low tax jurisdictions. The profit shifiting activities of MNCs are well documented. Grubert and Mutti (1991), Hines and Rice (1994), Harris et al. (1993), and Collins, Kemsley and Lang (1998) study U.S. data and find strong evidence in support of profit shifting to low tax countries. Broader data are analyzed by Bartelsman and Beetsma (2001) who find evidence for transfer pricing in most OECD countries. [2] Transfer pricing in Europe is documented by Weichenrieder (1996) who shows that German firms have shifted profits to the manufacturing sector in Ireland, thereby taking advantage of the low Irish tax rate.[3]

There are two competing systems of corporate taxation that aim at solving the two problems outlined above. Most OECD countries use Separate Accounting (SA) as a foundation for their corporate tax system. Under this system accountants and tax authorities try to identify the exact receipts and expenditures attributable to

[1] World Investment Report 2000, ch. 1, United Nations.

[2] For a survey of this literature, see Hines (1999).

[3] For theoretical studies of transfer pricing behavior see e.g., Horst (1971) and Kant (1990).

the corporation's activities in each country. One interpretation of this system is that it is a variation of the source principle of taxation where income is taxed in the country where it is derived. The competing alternative to SA is Formula Apportionment (FA). Under FA, a taxing jurisdiction uses an apportionment formula, whereby it determines taxable income within its borders on the basis of relative activity measures weighted together. Variants of FA are used in Canada, Switzerland and the US. In the U.S., for example, each state that levies a corporate income tax determines taxable income within its state on the basis of its state's shares of the corporation's total property, payroll and sales.

The division of international corporate income has been analyzed both in the strategic trade and the public finance literature. In the public finance literature, several recent papers have addressed corporate tax competition in the presence of multinational firms under SA.[4] Transfer pricing behavior is explicitly introduced by Mansori and Weichenrieder (1997) and Raimondos-Møller and Scharf (1997). In these papers there is competition in transfer pricing regulations between two governments. Elitzur and Mintz (1996) discuss corporate tax competition under alternative transfer pricing rules when the transfer price affects both the overall tax payment and the incentives for the subsidiary's managing partner. More recently, Haufler and Schjelderup (2000) analyze the optimal taxation of corporate profits under separate accounting when firms can shift profits between countries by transfer pricing. They find that recent corporate tax reforms in the OECD where corporate tax rates have been reduced while the tax base has been broadened, are optimal responses to the increased presence of multinationals. Finally, Nielsen, Raimondos-Møller and Schjelderup (1999) compare basic properties of SA and FA when the multinational firm can shift some profits by transfer pricing. They show that if the pure profits harvested by multinationals are either very low or very high, and at the same time the costs of engaging in transfer pricing are of intermediate size, then a switch from separate accounting to formula apportionment will lower tax revenue and welfare in the two countries.

In the literature on strategic trade policy, the focal point has been on optimal interventions that affect international firms' profits when governments maximize na-

[4]See e.g. Janeba, 1995, 1996; Konan, 1997.

tional welfare under imperfect competition (e.g. Brander and Spencer, 1984, 1985 and Eaton and Grossman 1986). A key element in the strategic trade literature is the use of policy instruments that allow governments to discriminate against foreign firms either by imposing import tariffs or by subsidizing domestic firms. From a practical point of view discriminatory practices against foreign firms are in violation with the most recent GATT and WTO agreements and are therefore difficult to implement. From a theoretical perspective these policies and their effectiveness hinge on whether governments can commit themselves to the announced policy. The incentive to reoptimize and thus the lack of credibility is prominent in these models making the proposed trade policy less appealing.

This paper has as its starting point the trade literature, but it takes the traditional analysis one step further by not allowing discriminatory policies. Instead, the choice variable of each government is the corporate tax rate. The focal point is on how economic integration affects trade, transfer pricing, corporate tax rates and national welfare in a non-cooperative setting under imperfect competition. The analysis is undertaken by assuming that governments either employ the SA or the FA system. This allows for an easy comparison of which system is preferable from a welfare point of view.

Also different from the trade literature is that the headquarters (HQs) of MNCs take on the same role as governments used to have in the early models of strategic trade (see e.g. Brander 1985). The transfer price can be used either as a profit shifting device or as a strategic trade instrument.[5] The strategic effect of the transfer price is as follows: if affiliates of an MNC face oligopolistic competition, the MNC can gain by setting the transfer price on internationally traded goods at a central level and delegate decisions about quantities (or prices) to its local affiliates. Such a strategy is beneficial if it triggers favorable responses by local competitors. For example, under Cournot competition, a low transfer price by the HQs, makes the importing affiliate into a low cost firm that behaves aggressively by selling a large quantity. Such aggressive behavior induces the local rival to behave softly by setting a low

[5]See Elitzur and Mintz (1997) and Schjelderup and Sørgard (1997) for how incentives of this type can affect the performance of multinationals. Basu (1993) provides a survey of the literature on delegation in Industrial Organization.

quantity.[6] The soft response from the rival is beneficial to the MNC 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. Furthermore, since it is the HQs of the MNC that conduct trade policy, the chosen transfer price is both credible and not in violation with international trade agreements.[7]

A critical difference between previous work and our paper is that we study how economic integration under tax competition affects equilibrium tax rates, transfer prices and national welfare. We show that the transfer price is relatively tax elastic for a high degree of economic integration under a separate accounting regime, while the opposite is true under formula apportionment. As a consequence, the impact of economic integration on welfare and on the intensity of tax competition depends crucially on the choice of tax scheme. Under separate accounting the conventional wisdom that increased economic integration forces government to reduce tax rates is supported by our findings. However, this is not true under formula apportionment, where increased integration reduces the tax elasticity of the transfer prices and indeed allows governments to levy higher tax rates. Finally, we show that from a welfare point of view the preferred tax principle may hinge on the level of economic integration.

In the following we study a three-stage game under separate accounting and formula apportionment respectively. The game leads to endogenous determination of tax rates and transfer prices, and the action by each government is observable in subsequent stages. The structure of the game is as follows: At the first stage the two governments choose tax rates simultaneously. Then, at the second stage the headquarters of each MNC set the transfer price. Finally, at the third stage there is quantity competition between plants in each country. Solving the game backwards, we start at the third stage, which is independent of the tax system. We then proceed

[6] The opposite result would be true under price competition (i.e., a high transfer price would be preferable - see Schjelderup and Sørgard 1997).

[7] The strategic role of the transfer price has been observed in the car industry and the petroleum industry. In the car industry it is often the case that the HQs of the MNC determine the export price on cars, but delegate decisions about the final price of the car to its subsidiary.

to analyze the second and third stages of the game in sections 3 and 4. Section 5 concludes.

2 Quantity competition (third stage)

We consider two countries, A and B, which are identical in all respects. Each country is host to the headquarters of a multinational corporation (MNC), and the headquarters command two plants, one in each country. The plant located in i produces quantities x_{ii} and x_{ij} with zero unit costs (where the first subscript indicates where the headquarters are located).[8] Quantity x_{ii} is sold in country i at a price p_i, while quantity x_{ij} is exported to the affiliate in country j at a transfer price g_i and resold in country j at price p_j. A positive g_i implies that the transfer price is higher than the marginal cost of production, while a negative g_i signifies underinvoicing. Quantity is the strategic variable and profits before tax for the home and foreign MNCs are the sum of revenues from the affiliates,

$$\begin{aligned} \Pi_i &= \pi_{ii} + \pi_{ij} = [p_i x_{ii} + g_i x_{ij} - C(g_i)] + [p_j - g_i - \tau]\, x_{ij}, \\ \Pi_j &= \pi_{jj} + \pi_{ji} = [p_j x_{jj} + g_j x_{ji} - C(g_j)] + [p_i - g_j - \tau]\, x_{ji} \qquad i = A, B, i \neq j \end{aligned} \tag{1}$$

where τ denotes trade costs and $C(g_i)$ is concealment costs of transfer pricing. It is assumed that the good is specialized so that the true cost of exporting cannot be directly observed by tax authorities. Hence, g_i becomes an additional choice variable for the multinational firm, which is determined by the headquarters of each multinational. In line with most of the literature on transfer pricing we make the realistic assumption that it is costly to conceal deviations in the transfer price from the true costs of exporting. The concealment cost function has the following properties

$$C(0) = C'(0) = 0, \quad sign(C') = sign(g_i), \quad C''(g_i) > 0.$$

This means that the concealment costs are a convex function of the difference between the declared and the true price of the exported good.[9]

[8] It can be shown that allowing positive unit costs does not affect results qualitatively.

[9] This assumption can be interpreted either as an increased probability of detection by the tax

Domestic and foreign plants maximize their profit with respect to quantities. For simplicity we assume that the firms produce homogenous goods, but this has no qualitative implications for our results. The inverse demand functions faced by the firms are given by

$$p_i = \alpha - (x_{ii} + x_{ji}), \qquad p_j = \alpha - (x_{ij} + x_{jj}), \qquad \alpha > 0.$$

The first order conditions can be readily found from $\partial \pi_{ii}/\partial x_{ii} = 0$ and $\partial \pi_{ij}/\partial x_{ij} = 0$ as

$$x_{ii} = p_i, \qquad \text{and} \qquad x_{ij} = (p_j - g_i - \tau), \tag{2}$$

which allows us to express equilibrium quantities at the third stage as

$$x_{ii} = \frac{\alpha + \tau + g_j}{3}, \qquad x_{ij} = \frac{\alpha - 2(\tau + g_i)}{3}. \tag{3}$$

Using (3) we derive the partial effects for an enterprise of increasing its transfer price. It is straightforward to verify that a change in the transfer price of a firm k does not affect demand in the domestic market, that is, $\partial x_{ii}/\partial g_i = \partial x_{jj}/\partial g_j = 0$. However, an increase in the transfer price affects the demand in the foreign country as follows:

$$\partial x_{ij}/\partial g_i = -\frac{2}{3}, \quad \partial x_{jj}/\partial g_i = \frac{1}{3}, \tag{4}$$

From (4) we see that a marginal increase in the transfer price decreases the importing affiliate's sales by 2/3 units, and increases the local competitor's sales by 1/3 unit. Hence, the response to an increase in the transfer price by the local competitor is to expand sales and win a greater share of the market.

Turning to stages 2 and 1, we consider the outcomes under Separate Accounting (SA) and Formula Apportionment (FA) separately. We start by investigating the transfer pricing behavior of MNCs.

authorities (see, e.g. Kant, 1988) or as costs that need to be incurred in order to conceal the true price of the product for example by hiring of lawyers and accountants (see, e.g., Haufler and Schjelderup, 2000).

3 Optimal transfer prices and economic integration (second stage)

At stage 2 the central authority within the multinational firm determines how the transfer price should optimally be set, taking the tax rates as given.

Separate Accounting (SA) Under the SA method of taxation each country imposes a tax on the profits generated within its borders. The aim of the tax code is therefore to identify the precise receipts and expenditures attributable to the corporation's activities in each jurisdiction. Although repatriated profits in principle 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 (Keen, 1993, and Tanzi and Bovenberg, 1990). Taking this into account, global after tax profits of a multinational firm with headquarters in country i are

$$\Pi_i^{SA} = (1 - t_i)\,\pi_{ii} + (1 - t_j)\,\pi_{ij}, \quad i = A, B \tag{5}$$

The global after tax profits of a multinational are equal to

$$\Pi_i^{SA} = (1 - t_i)\,\pi_{ii} + (1 - t_j)\,\pi_{ij}, \tag{6}$$

The problem of the headquarters is to maximize (6) subject to (2) and (3), and this yields the first order condition

$$\frac{\partial \Pi_i^{SA}}{\partial g_i} = (1 - t_i)\left(x_{ij} - \frac{2}{3}g_i - C'\right) - (1 - t_j)\,\frac{4}{3}x_{ij} = 0, \tag{7}$$

where we have used (2) to rewrite the first order condition in terms of x_{ij}.

Formula Apportionment (FA) Under the FA scheme the tax liability is apportioned to each country based on the activities of the MNC in each country relative to the MNC's world-wide activities.[10] The activity measure used in this model is

[10] The FA system is currently used in the US, Canada, and Switzerland.

sales in each country, and after tax profits of the MNC with headquarters in country i are

$$\Pi_i^{FA} = (1-t_i)\left(\frac{x_{ii}}{x_{ii}+x_{ij}}\right)\Pi_i + (1-t_j)\left(\frac{x_{ij}}{x_{ii}+x_{ij}}\right)\Pi_i, \quad i = A, B \tag{8}$$

At the second stage the MNC with headquarters in country i has the following maximization problem

$$\Pi_i^{FA} = \max_{g_i}\left\{(1-t_i)\left(\frac{x_{ii}}{x_{ii}+x_{ij}}\right)\Pi_i + (1-t_j)\left(\frac{x_{ij}}{x_{ii}+x_{ij}}\right)\Pi_i\right\}, \tag{9}$$

where $\Pi_i = \pi_{ii} + \pi_{ij}$, c.f. equation (1), and the quantities are given by equation (3). It is now useful to define

$$\phi_i \equiv \frac{\partial}{-\partial g_i}\left(\frac{x_{ij}}{x_{ii}+x_{ij}}\right) = \frac{x_{ii}}{(x_{ii}+x_{ij})^2}\left(\frac{\partial x_{ij}}{-\partial g_i}\right), \tag{10}$$

The variable ϕ_i measures by how much the foreign affiliate's share of total sales, $x_{ij}/(x_{ii}+x_{ij})$, increases if the transfer price g_i is reduced by one unit.[11] From equation (4) we know that a marginal reduction in the transfer price leads to a rise in foreign sales by $2/3$ units . The resulting increase in the foreign affiliate's share of total sales is thus higher the smaller the initial value of x_{ij}. Since the export quantity x_{ij} is decreasing in τ it follows that

$$\partial\phi_i/\partial\tau > 0. \tag{11}$$

Inserting $\partial x_{ij}/\left(-\partial g_i\right)$ by use of (4) in (10) we have that

$$\phi_i = \frac{2x_{ii}}{3(x_{ii}+x_{ij})^2}. \tag{12}$$

Under FA, the tax payment of the multinational firm abroad depends on its foreign sales in proportion to world-wide sales. ϕ_i is an indirect measure of how the share of foreign sales, and thus foreign tax payments, is influenced by a change in the transfer price. If ϕ_i is large, a marginal change in the transfer price has a significant effect on the apportionment on profits between the two countries. Hence, the larger is ϕ_i, the more effective will the transfer price be as a profit shifting device.

[11] Equivalently, since $\partial(x_{ii}^k/(x_{ii}^k+x_{ij}^k))/(-\partial g_i) = -\phi_i^k$, the variable also measures the corresponding fall in the share of domestic sales.

In order to derive the optimal transfer price we maximize (9) with respect to g_i, and by inserting for (12) we find that

$$(t_j - t_i)\,\phi_i \Pi_i + \left[(1-t_i)\frac{x_{ii}}{x_{ii}+x_{ij}} + (1-t_j)\frac{x_{ij}}{x_{ii}+x_{ij}}\right]\frac{\partial \Pi_i}{\partial g_i} = 0 \tag{13}$$

in optimum.

Strategic transfer pricing under SA and FA The optimal transfer prices under SA and FA can be derived from (7) with (13). To investigate the strategic trade motive of transfer pricing we set $t_i = t_j \equiv t$. Using this assumption in (7) and (13) we establish that the optimal transfer price reduces to

$$g_i = -\frac{x_{ij} + 3C'}{2} < 0, \tag{14}$$

under both SA and FA.[12] Equation (14) shows that when strategic considerations are the only determinant of the transfer price, it should be set below marginal costs. The reason is that a low transfer price turns the foreign affiliate into a low cost firm that behaves aggressively by increasing its sales in the foreign market. The response of the competing local firm is to scale down its sales thus allowing the foreign affiliate to capture a larger share of the market.

Using (3) and (14) it is now possible to investigate how economic integration affects foreign sales (x_{ij})and the transfer price (g_i):

$$\frac{dx_{ij}}{d\tau} = \frac{d\left(p_j - g_i - \tau\right)}{d\tau} = -\frac{2}{3}\left(1 + \frac{2}{4 + 9C_i''}\right) < 0, \tag{15}$$

and

$$\frac{dg_i}{d\tau} = \frac{2}{4 + 9C_i''} > 0. \tag{16}$$

[12] Solving equation (7) we can express the general expression for the optimal transfer price under SA as

$$g_i = \frac{3\left(x_{ij} - C'\right)\left(1 - t_i\right) - 4x_{ij}\left(1 - t_j\right)}{\left(1 - t_i\right)2}.$$

Note that it is not possible to compute g_i explicity under FA.

Equation (16) shows that economic integration lowers the transfer price. The intuition is straightforward. A reduction in trade costs enhances the profit margin from foreign sales ($p_i - g_i - \tau$) and thus increases the volume and profitability of foreign sales. Hence, it becomes more attractive to use the transfer price as a strategic device to win foreign market shares. Economic integration thus increases profits from sales abroad and makes it more attractive to underinvoice, thereby enhancing the competitiveness of the foreign affiliate.

Our findings in this section are summarized in:

PROPOSITION 1: *In the absence of profit shifting incentives ($t_i = t_j$), economic integration lowers the transfer price under SA and FA.*

It is obviously of interest to investigate how the transfer price reacts to differences in national tax rates. This issue is examined in the next section.

4 Optimal tax rates and economic integration (first stage)

At the first stage each government sets the tax rate in order to maximize national welfare, taking the taxes of the other country as given. For simplicity, we assume that the multinational firms are owned by third country residents so welfare equals the sum of consumer surplus (CS) and tax income (TR). We emphasize that excluding producer surplus from the welfare function does not affect the main conclusions of the analysis that follows, but that it simplifies the analysis significantly.[13] We start by analyzing tax policy under SA.

Separate Accounting (SA) Under SA consumer surplus (CS) and tax income (TR) are given by:

$$CS_i = \frac{1}{2}\left[(\alpha - p_i)x_{ii} + (\alpha - p_j)x_{ji}\right], \tag{17}$$

[13] An early version of this paper showing this is available from the authors upon request.

and

$$TR_i^{SA} = t_i(p_i x_{ii} + g_i x_{ij} - C_i + \pi_{ji}). \tag{18}$$

The problem of the government is thus to maximize

$$W_i^{SA} = \max_{t_i} \left\{ CS_i + TR_i^{SA} \right\}, \tag{19}$$

subject to (7).

The qualitative relationship between equilibrium tax rates and trade costs depends on the tax elasticity of the transfer price. Other things being equal, a low tax elasticity means that taxes can be set high and vice versa. In order to derive how the transfer price set by the MNC with headquarters in country i is affected by changes in tax rates, we use equations (7) and (4) (derivation is given in the Appendix a fortiori assuming identical taxes at the outset):

$$\frac{\partial g_i}{\partial t_j} = (p_j - g_i - \tau) \frac{12}{(1-t)\left[9C'' + 4\right]} > 0, \qquad \frac{\partial g_i}{\partial t_i} = -\frac{\partial g_i}{\partial t_j} < 0 \tag{20}$$

Notice first that a marginal deviation in the tax rate of country i from the symmetric Nash equilibrium rate makes it less attractive to accumulate profits in country i. Equation (20) states that the response of the headquarters in country i to an increase in t_i (t_j) is to reduce (increase) the transfer price, thereby saving tax payments by shifting profits to country j (i).

Using (16) in (20) we obtain the following result:

PROPOSITION 2: *Under Separate Accounting, other things being equal, transfer prices are more tax sensitive the lower the level of trade costs.*

The numerator in (20) equals the profit margin of the foreign affiliate, which we have shown to be greater the lower are trade costs. An increase in t_j means that the MNC wants to shift profits to country i by increasing the transfer price. The increase in the transfer price is larger, the greater is the profit margin (i.e., the lower is τ), since this implies that the MNC needs to shift more profits per unit back to

country i. Conversely, if t_i increases, the MNC will want to shift sales to the foreign affiliate by underinvoicing. A large profit margin abroad (low trade costs) provides a stronger incentive to underinvoice than if profits from foreign sales are low. To conclude, economic integration increases the profit shifting activities of MNCs and the tax sensitivity of national tax bases.

Formula Apportionment (FA) As under SA, the welfare level in country i is

$$W_i^{FA} = \max_{t_i} \left\{ CS_i + TR_i^{FA} \right\}, \tag{21}$$

where consumer surplus is still given by (17), and tax revenue equals

$$TR_i^{FA} = t_i \left[\frac{x_{ii}}{x_{ii} + x_{ij}} \Pi_i + \frac{x_{ji}}{x_{jj} + x_{ji}} \Pi_j \right]. \tag{22}$$

The government in each country thus maximizes (21) subject to (13). In order to examine the solution to this maximization problem, we shall again use the method of examining how sensitive the transfer prices are to changes in the tax rates. Differentiating equation (13) a fortiori assuming identical taxes at the outset, we find that

$$\frac{\partial g_i}{\partial t_i} = -\frac{9\phi_i}{9C'' + 4} < 0 \tag{23}$$

and

$$\frac{\partial g_i}{\partial t_j} = \frac{9\phi_i}{9C'' + 4} > 0. \tag{24}$$

We see from (23) and (24) that the signs of $\partial g_i / \partial t_i$ and $\partial g_i / \partial t_j$ are the same as under SA: a higher tax rate in one country encourages firms to use the transfer price as a device to shift profits to the other country. However, from (11) we note that ϕ is an increasing function of τ. Using this result in equations (23) and (24) we may state:

PROPOSITION 3: *Under Formula Apportionment, other things being equal, transfer prices are less tax sensitive the lower the level of trade costs.*

This result is the opposite of what we found under SA. The reason is the following: If the transfer price is tax sensitive, it reflects the fact that the MNC can easily

shift profits to the low tax country. The ease by which the MNC can shift profits under FA is mirrored by ϕ_i, which gives the impact of a change in the transfer price on the apportionment of profits across countries. From (10) and (12) it is seen that a change in the transfer price has a significant impact on ϕ_i if the foreign affiliate's share of total sales – due to high trade costs – is small initially. In this case a given change in g_i (and thus in x_{ij}) has a large effect on the (relative) share of sales abroad, since the increase in foreign sales starts from a very low level, because of the high trade costs. On the other hand, for low levels of trade costs, the foreign affiliate's share of total sales is quite large, and the relative share of sales will therefore not change very much in response to a change in the transfer price. Thus, the tax gain from changing the transfer price is small, implying that g_i is relatively insensitive to changes in either of the tax rates.

Numerical simulations It is not possible to derive an explicit analytical solution to the welfare maximization problem under FA. We must therefore rely on numerical simulations to compare the two tax principles and how economic integration affects the equilibrium tax rates.

Figure 1 shows that equilibrium tax rates under SA are lower, the lower the level of trade costs. The reason is that as economic integration proceeds, transfer prices under SA become more tax sensitive. This means that the tax base becomes more sensitive to changes in national tax rates. Each country, therefore, has an incentive to lower its tax rate in order to attract taxable profits. Since neither country takes into account the fiscal externality from a marginal change in its own tax rate, this leads to a "race to the bottom" (i.e., tax rates will be too low in the tax equilibrium compared to the outcome under coordination). This result is similar to the outcome in standard tax competition models.[14]

By examining Figure 1 it is seen that there is an inverse relationship between trade costs and equilibrium taxes under FA. The intuition can be found by examining (11) and (23). Since ϕ is an increasing function of τ (see eq. (11)), economic

[14]See e.g. Zodrow and Mieszkowksi (1986) and Wildasin (1988), and Bucovetsky and Wilson (1991).

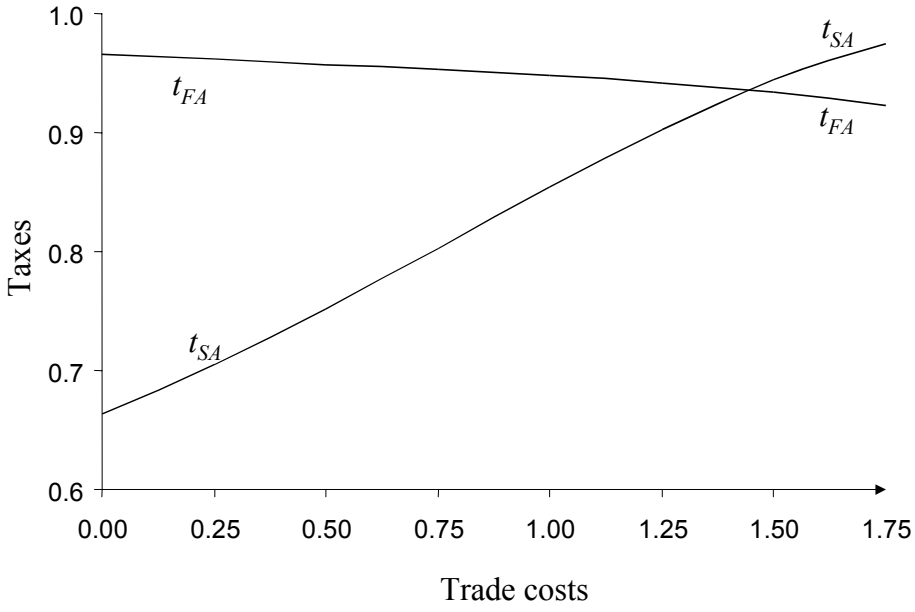

Figure 1: Equilibrium tax rates; SA versus FA

integration reduces the effectiveness of the transfer price as an instrument for profit shifting under FA. Changing sales in one country in order to save tax payments is thus more expensive to the corporation the lower the level of trade costs. Economic integration thereby makes the firms less tax elastic, making it optimal for each country to increase its tax rate.

To conclude, Figure 1 shows that the effect of increased economic integration on equilibrium taxes and tax revenue depends crucially on the tax regime in force. While under SA increased economic integration leads to lower tax revenue, the opposite is true under FA. This suggests that at the intersection between the two curves in Figure 1, one tax principle may be preferred to the other. However, to make a full welfare assessment it should be noted that economic integration under any tax regime affects consumer surplus positively due to enhanced competition leading to lower prices and larger quantities sold. Thus, under SA we have two opposing effects of increased integration; on the one hand, rising consumer surplus, on the other hand, falling tax rates, and as a consequence, lower tax revenue. In contrast, with FA, both consumer surplus and tax rates rise, implying higher tax revenues. Figure 2 conveys the discussion above by indicating that an SA regime provides the highest

welfare level for a low degree of integration (high trade costs), while an FA regime becomes more attractive as integration proceeds. Simply put, with high trade costs the effect of tax competition is weak under SA, but strong under FA in the sense that incentives to shift profits are small under SA but large under FA. Hence, for a high degree of economic integration, the FA regime may come to dominate the SA regime from a welfare perspective.

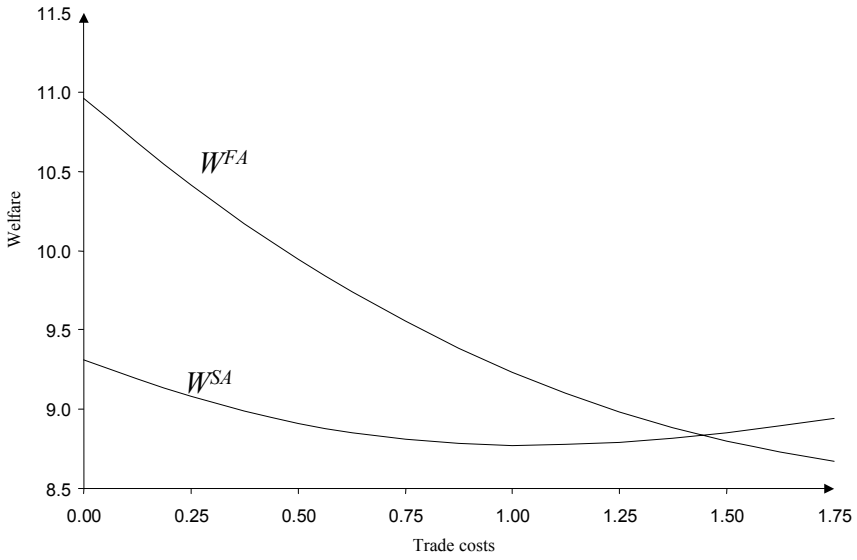

Figure 2: Welfare comparison; SA versus FA

5 Concluding remarks

The analysis has demonstrated that the transfer price is relatively tax elastic for a high degree of economic integration under SA, while the opposite is true under formula apportionment. As a consequence, the impact of economic integration on welfare and on the intensity of tax competition depends crucially on the choice of tax scheme. Economic integration under SA intensifies tax competition while reducing the competitive forces under FA. These relationships are mirrored in the relationship between economic integration and welfare under the two different tax regimes. In terms of national welfare, the SA system may dominate for low degrees of integration, while the FA system takes prominence as an integration process proceeds. Hence, our

results support the view brought forward by many other economists[15] that increased economic integration may call for a substantial reform of the corporate tax system.

[15]See, e.g. Musgrave (1973), Bird and Brennan (1986), McLure (1989), Bucks and Mazerov (1993) and Shakelford and Slemrod (1998).

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A Appendix

Derivation of equations (20):

By differentiating the first-order condition in equation (7) with respect to t_i we find

$$-(x_{ij}^k - \frac{2}{3}g_i^k - C') + (1-t_i)\left(\frac{\partial x_{ij}^k}{\partial g_i^k} - \frac{2}{3} - C''\right)\frac{\partial g_i^k}{\partial t_i} - (1-t_j)\frac{4}{3}\frac{\partial x_{ij}^k}{\partial g_i^k}\frac{\partial g_i^k}{\partial t_i} = 0. \quad (25)$$

Note from equation (7) that around $t_i = t_j$ we have

$$x_{ij}^k - \frac{2}{3}g_i^k - C' = \frac{4}{3}x_{ij}^k. \quad (26)$$

Inserting for (26) into (25), we find (20). The corresponding expressions under the FA tax regime, are found in a similar way.

Parameter values employed in the numerical simulations:

$\alpha = 5$, $c_h = c_f = 0$, $n_h = n_f = 1$

Concealment function: $C(g_i) = 2g_i^2$.