**Working Paper No 4/01**

# Corporate Tax Systems, Multinational Enterprises and Economic Integration

**by**

**Hans Jarle Kind**
**Karen Helene Midelfart Knarvik**
**Guttorm Schjelderup**

SNF project no 1110
Globalisation and Economic Policy

The project is financed by the Research Council of Norway

SIØS - Centre for International Economics and Shipping

FOUNDATION FOR RESEARCH IN ECONOMICS AND BUSINESS ADMINISTRATION
BERGEN, FEBRUARY 2001
ISSN 0803 - 4028

*SIØS - CENTRE FOR INTERNATIONAL ECONOMICS AND SHIPPING*

SIØS – Centre for international economics and shipping – is a joint centre for The Norwegian School of Economics and Business Administration (NHH) and The Foundation for Research in Economics and Business Administration (SNF). The centre is responsible for research and teaching within the fields of international trade and shipping.

*International Trade*

The centre works with all types of issues related to international trade and shipping, and has particular expertise in the areas of international real economics (trade, factor mobility, economic integration and industrial policy), international macroeconomics and international tax policy. Research at the centre has in general been dominated by projects aiming to provide increased insight into global, structural issues and the effect of regional economic integration. However, the researchers at the centre also participate actively in projects relating to public economics, industrial policy and competition policy.

*International Transport*

International transport is another central area of research at the centre. Within this field, studies of the competition between different modes of transport in Europe and the possibilities of increasing sea transport with a view to easing the pressure on the land based transport network on the Continent have been central.

*Maritime Research*

One of the main tasks of the centre is to act as a link between the maritime industry and the research environment at SNF and NHH. A series of projects that are financed by the Norwegian Shipowners Association and aimed directly at shipowning firms and other maritime companies have been conducted at the centre. These projects include studies of Norwegian shipowners' multinational activities, shipbuilding in Northern Europe and the competition in the ferry markets.

**Human Resources**

The centre's human resources include researchers at SNF and affiliated professors at NHH as well as leading international economists who are affiliated to the centre through long-term relations. During the last few years the centre has produced five PhDs within international economics and shipping.

**Networks**

The centre is involved in several major EU projects and collaborates with central research and educational institutions all over Europe. There is particularly close contact with London School of Economics, University of Glasgow, The Graduate Institute of International Studies in Geneva and The Research Institute of Industrial Economics (IUI) in Stockholm. The staff members participate in international research networks, including Centre for Economic Policy Research (CEPR), London and International Association of Maritime Economists (IAME).

# Corporate Tax Systems, Multinational Enterprises, and Economic Integration*

Hans Jarle Kind
Norwegian School of Economics and Business Administration, Foundation for Research in Economics and Business Administration, and LOS

Karen Helene Midelfart Knarvik
Norwegian School of Economics and Business Administration, Foundation for Research in Economics and Business Administration, and CEPR

Guttorm Schjelderup
Norwegian School of Economics and Business Administration, Foundation for Research in Economics and Business Administration, and CESifo

ABSTRACT: This paper addresses the outcome of international tax competition in the presence of multinationals that use transfer pricing for strategic purposes as well as to reduce their tax burden. We examine how economic integration affects tax levels, transfer pricing behaviour and national welfare. We show that the tax elasticity of the transfer price depends on the tax system and on the extent of economic integration. Under separate accounting the conventional wisdom that increased economic integration forces governments 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.

Keywords: multinational enterprises, tax regimes, international tax competition, economic integration

JEL: F15, F23, H25, H87

* Financial support from the Research Council of Norway is gratefully acknowledged (grant no. 130987/510).

## Non-technical summary

This paper addresses the outcome of international tax competition in the presence of multinationals that use transfer pricing for strategic purposes as well as to reduce their tax burden. In particular we examine how economic integration affects tax levels, transfer pricing behaviour and national welfare under different corporate taxation regimes.

It is well known in the literature on multinationals that firms may use transfer pricing as a strategic device to increase profits in foreign markets. To see the strategic motive for transfer pricing consider a multinational enterprise (MNE) that has a foreign subsidiary which is active in markets with Cournot competition. Essential intermediates are supplied by the headquarter to the foreign affiliate. If the MNE sets low prices, the foreign 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 and leads to higher profits in the foreign market as well as to increased profits for the multinational enterprise as a whole.

It is also well known from the literature that MNEs may use transfer pricing as a means to shifting profits to low-tax countries. From a policy point of view transfer pricing to shift profits to low tax countries is worrisome, since the profit shifting activities threaten to undermine the fiscal autonomy of high tax countries. At least two policy options exist to curb transfer pricing. The first measure is to enforce arm's length prices on intra-firm transactions. Not only is this difficult to achieve, but the administrative costs are also considerable. The second solution pertains to the choice of tax system. If, by choosing the ''right'' system for corporate taxation, one can reduce the disparities in countries' tax bases and tax rates, incentives to shift profits would be diminished. Currently, most OECD countries use separate accounting 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 the corporation's activities in each country. A problem with the separate accounting system is that the globalization of the world economy has made it ever more difficult to disentangle individual operations of multinational corporations. The alternative corporate tax system is formula apportionment, where the total income of a corporation is apportioned on the basis of a weighted formula, where the weights are, say, sales, payroll or property. Variants of formula apportionments are used in Canada, Switzerland and the US.

In our analysis we explore the interaction between corporate taxation, transfer pricing and welfare. We show that the relationship between these factors depends on degree of economic integration and the choice of tax regime.

We show that the transfer price of a multinational is actually independent of the prevailing tax regime, separate accounting or formula apportionment. Nonetheless, the tax elasticity of the transfer price depends on the tax system and on the extent of economic integration.One important result that emerges is that the effect of increased economic integration on equilibrium taxes depends crucially on the tax regime in force. 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 a formula apportionment regime. 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. While under SA increased economic integration leads to lower tax revenue, the opposite is true under FA.

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; rising consumer surplus and falling tax rates. In contrast, with FA, consumer surplus and tax rates rise. Figure 4 indicates that an SA regime provides the highest welfare level for a low degree of integration (high trade costs), while the FA regime becomes more attractive as integration proceeds. Thus, for a high degree of economic integration, the FA regime may come to dominate the SA regime from a welfare perspective.

We find that the impact of increased economic integration on the intensity of international tax competition hinges on the choice of tax regime. Under Separate accounting increased integration leads to intensified tax competition, while under Formula apportionment increased integration actually reduces the intensity of tax competition. 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 dominates for low degrees of integration, while the FA system becomes dominating as an integration process proceeds. Hence, our results support the view brought forward by many other economists that increased economic integration may call for a substantial reform of the corporate tax system.

# 1 Introduction

It is well known in the literature on multinationals that firms may use transfer pricing as a strategic device to increase profits in foreign markets.[1] To see the strategic motive for transfer pricing consider a multinational enterprise (MNE) that has a foreign subsidiary which is active in markets with Cournot competition. Essential intermediates are supplied by the headquarter to the foreign affiliate. If the MNE sets low prices, the foreign 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 and leads to higher profits in the foreign market as well as to increased profits for the multinational enterprise as a whole.

It is also well known from the literature that MNEs may use transfer pricing as a means to shifting profits to low-tax countries.[2] From a policy point of view transfer pricing to shift profits to low tax countries is worrisome, since the profit shifting activities threaten to undermine the fiscal autonomy of high tax countries. At least two policy options exist to curb transfer pricing. The first measure is to enforce arm's length prices on intra-firm transactions. Not only is this difficult to achieve, but the administrative costs are also considerable. The second solution pertains to the choice of tax system. If, by choosing the "right" system for corporate taxation, one can reduce the disparities in countries' tax bases and tax rates, incentives to shift profits would be diminished. Currently, most OECD countries use separate accounting 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 the corporation's activities in each country. A problem with the separate accounting system is that the globalization of the world economy has made it ever more difficult to disentangle individual operations of multinational corporations. The alternative corporate tax system is formula apportionment, where the total income of a corporation is apportioned on the basis of a weighted formula, where the weights are, say, sales, payroll or property. Variants of formula apportionments are used in Canada,

[1] See e.g.Schjelderup and Sørgard (1997) and Gabrielsen and Schjelderup (1999).

[2] See e.g. Horst (1971), Kant (1990).

Switzerland and the US.

This paper addresses the outcome of international tax competition in the presence of multinationals that may use transfer pricing both for strategic purposes as well as to reduce their tax burden. A central element of our analysis is the interaction between economic integration and international tax competition, and we examine how economic integration affects tax levels, transfer pricing behavior and national welfare. We show that the transfer price of a multinational is actually independent of the prevailing tax regime, separate accounting or formula apportionment. Nonetheless, the tax elasticity of the transfer price depends on the tax system and on the extent of economic integration. In particular, 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 a formula apportionment regime. 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 – formula apportionment or separate accounting. 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.

# 2 The model

We consider two symmetric countries, labelled country $h$ (home) and $f$ (foreign). There is a fixed number $n_h = n_f$ of enterprises in the country, and each enterprise is a multinational firm with a foreign subsidiary. For simplicity we will 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

$$p_{ii} = \alpha - \left[\sum\nolimits_{n_i} x_{ii} + \sum\nolimits_{n_j} x_{ji}\right] , \tag{1}$$

$$p_{ij} = \alpha - \left[\sum\nolimits_{n_i} x_{ij} + \sum\nolimits_{n_j} x_{jj}\right] , \tag{2}$$

where $x$ is quantity and $p$ price. The first subscript denotes producer country and the second subscript consumer country, e.g., $p_{ij}$ is the price of a good produced in

country $i$ and consumed in country $j$.

We define profits before tax for enterprise $k$ in country $i$ as $\pi_i^k = \pi_{ii}^k + \pi_{ij}^k$, where $\pi_{ii}^k$ is the profit level of the parent firm and $\pi_{ij}^k$ is the profit level of the foreign subsidiary (subscript $i$ denotes localization of headquarters while subscript $j$ indicates physical location of the plant). All firms producing in country $i$ are identical and have the same real unit production costs $c_i$. To simplify, we assume that $c_i = c_j = 0$.[3] The foreign affiliate of firm $k$ is charged $g_i^k$ when it purchases a good from the parent firm in country $i$. A positive $g_i^k$ implies that the transfer price is higher than the marginal cost of production, while a negative $g_i^k$ signifies underinvoicing.

Each multinational delegates decisions about prices and quantities in national markets to its affiliates in these markets, while the headquarter sets the transfer price. Profits before tax for the parent firm and the foreign affiliate are respectively

$$\pi_{ii}^k = p_{ii}x_{ii}^k + g_i^k x_{ij} - C(g_i) \quad \text{and} \quad \pi_{ij}^k = (p_{ij} - g_i^k - \tau)x_{ij}^k, \tag{3}$$

where $\tau$ denotes trade costs and $C(g_i)$ are concealment costs of transfer pricing. It is assumed that the true cost of exporting cannot be directly observed by tax authorities, so $g_i$ 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. This means that the concealment costs are a convex function of the difference between the declared and the true price of the exported good.[4] Hence, the concealment cost function has the following properties

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

*Separate Accounting (SA)*

[3] It can be shown that this simplification does not affect results qualitatively.

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

Under the SA method of taxation each country imposes a tax on the profits generated within its borders. Although in principle 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 (Keen, 1993, and Tanzi and Bovenberg, 1990). Taking this into account, global after tax profits for a multinational firm located in country $i$ and with a foreign affiliate in country $j$ are given by

$$\pi_i^{SA} = (1 - t_i)\,\pi_{ii} + (1 - t_j)\,\pi_{ij} \tag{4}$$

*Formula Apportionment (FA)*

Under the FA scheme the tax liability is apportioned to each country based on the activities of the MNE in each country relative to the MNE's world-wide activities.[5] The activity measure used in this model is sales in each country, and after tax profits for a multinational firm located in country $i$ and with a foreign affiliate in country $j$ are given by

$$\pi_i^{FA} = (1 - t_i)\left(\frac{x_{ii}}{x_{ii} + x_{ij}}\right)\pi_i^G + (1 - t_j)\left(\frac{x_{ij}}{x_{ii} + x_{ij}}\right)\pi_i^G, \tag{5}$$

where $\pi_i^G = \pi_{ii} + \pi_{ij}$ denotes global profits before tax.

*The Game*

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:

**First stage:** Governments choose tax rates simultaneously.

**Second stage:** The headquarters of multinationals set the transfer price.

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

**Third stage**: Quantity competition between plants in each country.

Solving the game backwards, we start by the third stage, which is independent of the tax system.

**Stage 3: Quantity competition between plants in each country**

Domestic and foreign plants maximize their profit with respect to quantities, and the first order conditions are given by

$$\begin{aligned} \partial\pi_{ii}/\partial x_{ii} &= 0 \quad \Rightarrow \quad x_{ii}^k = p_{ii}, \\ \partial\pi_{ij}/\partial x_{ij} &= 0 \quad \Rightarrow \quad x_{ij}^k = (p_{ij} - g_i^k - \tau). \end{aligned} \tag{6}$$

Letting $g_i$ and $g_j$ denote the average transfer prices used by other firms than $k$, we have

$$\begin{aligned} p_{ii} &= \frac{\alpha + n_j(g_j + \tau)}{1 + n_i + n_j}, \\ p_{ij} &= \frac{\alpha + n_i(g_i + \tau) + (g_i^k - g_i)}{1 + n_i + n_j}. \end{aligned} \tag{7}$$

By combining equations (6) and (7) we can write the equilibrium quantities, which are the outcomes of the third stage, as

$$\begin{aligned} x_{ii} &= \frac{\alpha + n_j(\tau + g_j)}{1 + n_i + n_j}, \\ x_{ij} &= \frac{\alpha - (1 + n_j)\tau - (n_i + n_j)\, g_i^k + (n_i - 1)\, g_i}{1 + n_i + n_j}. \end{aligned} \tag{8}$$

Using (7) we derive the partial effects for a given enterprise of increasing its transfer price. A change in the transfer price of a firm $k$ does not affect the prices in the domestic market ($\partial p_{ii}/\partial g_i^k = \partial p_{ji}/\partial g_i^k = 0$). However, an increase in the transfer price leads to an increase in the price faced by the affiliate and its local competitors in the foreign market:

$$\partial p_{ij}/\partial g_i^k = \partial p_{jj}/\partial g_i^k = \frac{1}{1 + n_i + n_j}, \tag{9}$$

As for the impacts of transfer pricing on quantities, these are derived from (8), and summarized in (10):

$$\begin{aligned} \partial x_{ii}^k/\partial g_i^k &= \partial x_{ji}^k/\partial g_i^k = 0 \\ \partial x_{ij}^k/\partial g_i^k &= -\left(\frac{n_i+n_j}{1+n_i+n_j}\right) \equiv -\lambda \\ \partial x_{jj}^k/\partial g_i^k &= \frac{1}{1+n_i+n_j}. \end{aligned} \tag{10}$$

Again we see that the transfer price does not affect the equilibrium outcome in the country of the parent firm, but impacts on the quantities sold by the affiliate and its local competitors. An increased transfer price decreases the affiliate's market share; if the transfer price increases by one unit, the foreign affiliate sells $\lambda$ units less.

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

# 3 Transfer pricing and non-cooperative tax policy under SA

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.

**Stage 2: The headquarters set transfer prices**

The global after tax profits of a multinational are equal to

$$\pi_i^{k,SA} = (1-t_i)\,\pi_{ii}^k + (1-t_j)\,\pi_{ij}^k, \tag{11}$$

The problem of the headquarter is to maximize (11) subject to (7) and (8), and this yields the first order condition

$$\frac{\partial \pi_i^{k,SA}}{\partial g_i^k} = (1-t_i)\left(x_{ij}^k - \lambda g_i^k - C'\right) - (1-t_j)\,2\lambda x_{ij}^k = 0, \tag{12}$$

where we have used (6) to substitute for $x_{ij}^k$ in deriving the first order condition. Solving equation (12) we can express the transfer price as

$$g_i = \frac{(x_{ij} - C')(1 - t_i) - 2\lambda x_{ij}(1 - t_j)}{(1 - t_i)\lambda}, \tag{13}$$

where we have dropped the superscripts $k$ due to the symmetry between the firms. From (13) we see that if the countries levy the same tax rates ($t_i = t_j$) – which they will do in equilibrium due to symmetry – equation (13) reduces to

$$g_i = -\frac{(2n-1)x_{ij} + (1+2n)C'}{2n} < 0 \tag{14}$$

As seen from (14) the transfer price is negative. 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 firms in the foreign market is to scale down their sales thus allowing the foreign affiliate to capture a larger share of the market. This is profitable for the foreign subsidiary as well as for the multinational as a whole.

From (13) we see that in the general case, the transfer price will be negative if the domestic tax rate is higher than the tax rate abroad. In this case both tax and strategic considerations dictate a low transfer price. However, equation (13) shows that the tax incentive works in the opposite direction of the strategic incentive if the tax rate abroad is higher than the domestic rate. With a significant gap in tax rates between domestic and foreign tax rates, it is thus possible that multinationals with headquarters in the low-tax country will set a positive transfer price.

A central element of the analysis that follows is the degree of economic integration, and how increased integration affects equilibrium transfer prices and tax rates. Using (13) together with (10) and (9), yields

$$\frac{dg_i}{d\tau} = \left[\frac{1-2n}{2n + (1+2n)C''}\right]\frac{dx_{ij}}{d\tau} \tag{15}$$

and

$$\frac{dx_{ij}}{d\tau} = -\frac{1+n}{1+2n} - \frac{2n}{1+2n}\frac{dg_i}{d\tau} < 0. \tag{16}$$

Equation (16) in combination with equation (6) illustrates that the profit margin $(p_{ij} - g_i - \tau) = x_{ij}$ of the foreign subsidiary falls if trade costs increase thus reducing the sales of the enterprise abroad. Using (15) and (16) we further find that

$$\frac{dg_i}{d\tau} = \frac{(2n-1)(1+n)}{4n + (1+2n)^2 C_i''} > 0, \tag{17}$$

which shows that the transfer price is an increasing function of the level of trade costs. The reason is that it becomes more expensive to export and therefore less profitable to use the transfer price as a strategic device to win market shares abroad the higher the level of trade costs. Since the two countries are symmetric, it follows that they will set the same tax rate in equilibrium.[6] Hence, equation (14) applies, and the relationship between trade costs and the transfer price is as illustrated in Figure 1 (see appendix for parameter values).

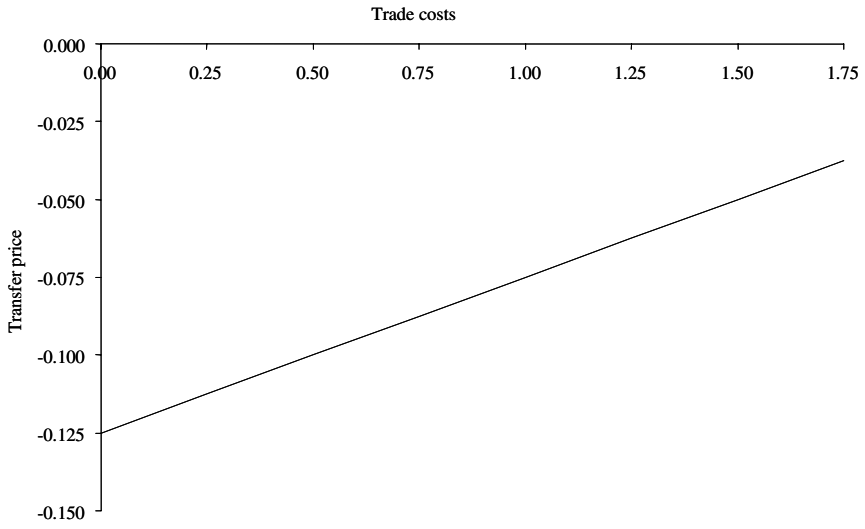


Figure 1: Equilibrium transfer prices.

**Stage 1: The optimal choice of tax rates**

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

[6] See e.g., Zodrow and Miezskowski (1986); Wildasin (1988); Bucovetsky and Wilson, (1991) for an elaboration of the symmetry result in the tax competition literature.

the sum of consumer surplus ($CS$) and tax income ($TR$), which respectively are given by :[7]

$$CS_i = \frac{1}{2}\left[n_i(\alpha - p_{ii})x_{ii} + n_j(\alpha - p_{ji})x_{ji}\right], \tag{18}$$

and

$$TR_i^{SA} = t_i(n_i p_{ii} x_{ii} + n_i g_i x_{ij} - n_i C_i + n_j \pi_{ji}). \tag{19}$$

The problem of the government is thus to maximize

$$W_i^{SA} = \max_{t_i}\left\{CS_i + TR_i^{SA}\right\}, \tag{20}$$

subject to (12). It is not possible to derive explicit analytical expressions to this problem. However, we are able to find the qualitative relationship between taxes and trade costs, since equilibrium taxes are restricted by how sensitive the transfer price is to tax changes. Other things being equal, a low sensitivity allows high taxes, while a high sensitivity requires low taxes. In order to derive how the transfer price is affected by changes in tax rates we use equation (12) together with (9) and (10), and find (see derivation in the Appendix):

$$\frac{\partial g_i}{\partial t_i} = -4nx_{ij}\frac{1+2n}{(1-t)\left[(1+2n)^2 C'' + 4n\right]} < 0 \tag{21}$$

and

$$\frac{\partial g_i}{\partial t_j} = 4nx_{ij}\frac{1+2n}{(1-t)\left[(1+2n)^2 C'' + 4n\right]} > 0, \tag{22}$$

where $t$ is the common tax rate.

The sign of equations (21) and (22) shows that an increase in the domestic (foreign) tax rate increases (decreases) the transfer price since it becomes more (less) profitable to shift profits abroad. Since $x_{ij}$ is decreasing in $\tau$ we can also pose the following proposition:

[7] Excluding producer surplus from the welfare function does not affect the main conclusions of the analysis. An early version of this paper showing this is available upon request from the authors.

**PROPOSITION 1:** *Under Separate Accounting, other things being equal, transfer prices are more tax sensitive the lower the level of trade costs.*

From equations (6) and (16) it is seen that the profit margin of the foreign affiliate ($p_{ij} - g_i - \tau = x_{ij}$) is decreasing in the level of trade costs. Hence, as trade costs fall, it becomes more profitable to use the transfer price to shift profits. A change in either tax rate will therefore lead to a larger response in the transfer price the greater the profit margin.[8] A direct implication of Proposition 1 is that as trade costs are reduced, the tax base of each country becomes more vulnerable to profit shifting. Thus;

**PROPOSITION 2:** *Under Separate Accounting, other things being equal, equilibrium tax rates are lower the lower the level of trade costs.*

Proposition 2 is parallel to the results found in the tax competition literature.[9] Lower trade costs increase the mobility of the tax base and make it more attractive for each country to lower its tax rate. In doing so each country neglects the fiscal externality that arises from a change in the tax rate. Hence, tax rates will fall as economic integration proceeds (and will be too low in the tax equilibrium compared to the outcome under coordination). Proposition 2 is illustrated by the upward-sloping tax curve in Figure 2, which is found by solving (20) numerically.

[8]Note also that $g_i$ must be equal to zero if trade is prohibitively expensive, i.e., if $p_{ij} - \tau \leq 0$. More generally, underinvoicing can never be optimal, unless the export profit margin ($p_{ij} - g_i - \tau$) is strictly positive.

[9]See Wildasin (1988).

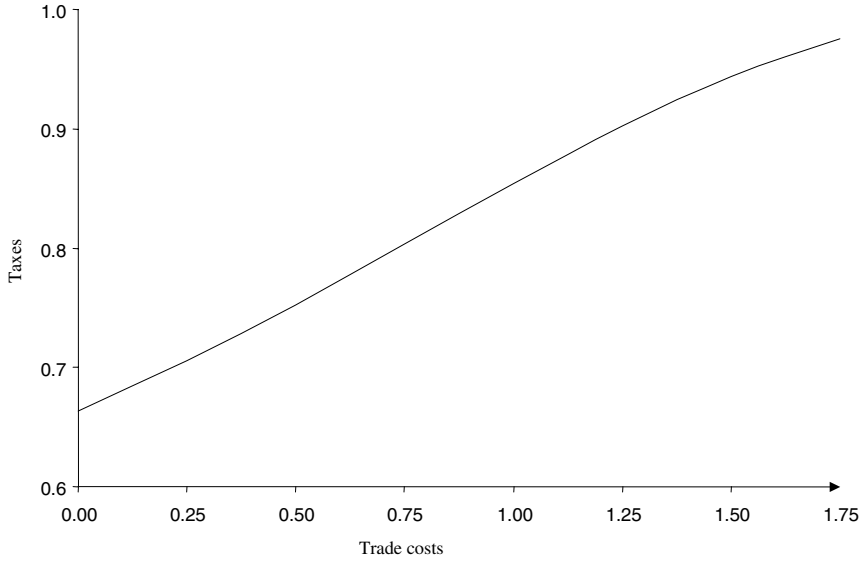


Figure 2: Equilibrium tax rates under Separate Accounting.

# 4 Transfer pricing and non-cooperative tax policy under FA

Just as under an SA regime the central authority within the multinational firm determines at stage 2 how the transfer price should optimally be set. In doing so it takes the tax rates as given.

**Stage 2: The headquarters set transfer prices**

At the second stage firm $k'$s maximization problem is given by

$$\pi_i^{k,FA} = \max_{g_i^k} \left\{ (1-t_i) \left( \frac{x_{ii}^k}{x_{ii}^k + x_{ij}^k} \right) \pi_i^{k,G} + (1-t_j) \left( \frac{x_{ij}^k}{x_{ii}^k + x_{ij}^k} \right) \pi_i^{k,G} \right\}, \tag{23}$$

where $\pi^{k,G} = \pi_{ii}^k + \pi_{ij}^k$, c.f. equation (3), and the quantities are given by equation (8). It is now useful to define

$$\phi_i^k \equiv \frac{\partial}{-\partial g_i^k} \left( \frac{x_{ij}^k}{x_{ii}^k + x_{ij}^k} \right) = \frac{x_{ii}^k}{(x_{ii}^k + x_{ij}^k)^2} \left( \frac{\partial x_{ij}^k}{-\partial g_i^k} \right), \tag{24}$$

The variable $\phi_i^k$ measures by how much the foreign subsidiary's share of total sales, $x_{ij}^k/(x_{ii}^k + x_{ij}^k)$, increases if the transfer price $g_i^k$ is reduced by one unit.[10] From equation (10) we know that by reducing $g_i^k$ by one unit the firm will sell $\partial x_{ij}^k/\left(-\partial g_i^k\right) = \lambda$ units more abroad. The resulting increase in the foreign subsidiary's share of total sales is thus obviously higher the smaller the initial value of $x_{ij}^k$. Since the export quantity $x_{ij}^k$ is decreasing in $\tau$ it follows that

$$\partial\phi_i/\partial\tau > 0,$$

where we have omitted the superscript $k$ since firms are symmetric. Inserting for $\partial x_{ij}^k/\left(-\partial g_i^k\right)$ into (24) we have that

$$\phi_i = \frac{x_{ii}\lambda}{(x_{ii} + x_{ij})^2}. \tag{25}$$

Since corporate taxation under FA divides profits between locations according to the share of sales, the variable $\phi_i$ identifies the extent to which transfer pricing allows for profit shifting across locations. The fact that $\phi_i$ is increasing in $\tau$ will be shown to be important when we consider the relationship between trade costs and equilibrium taxes below.

In order to derive the optimal transfer price we maximize (23) with respect to $g_i$, and by inserting for (25) we find that

$$(t_j - t_i)\,\phi_i\pi_i^G + \left[(1 - t_i)\frac{x_{ii}}{x_{ii} + x_{ij}} + (1 - t_j)\frac{x_{ij}}{x_{ii} + x_{ij}}\right]\frac{\partial\pi_i^G}{\partial g_i} = 0 \tag{26}$$

in optimum. From (3), (6), (9), and (10) it follows that

$$\frac{\partial\pi_i^G}{\partial g_i} = (1 - 2\lambda)x_{ij} - g_i\lambda - C_i'. \tag{27}$$

Note that (26) reduces to $\partial\pi_i^G/\partial g_i = 0$ if the countries levy the same tax rate. This will be true in equilibrium, since countries are symmetric. Inserting for $\lambda$ in (27) and solving for $g_i$ yield

$$g_i = -\frac{(2n - 1)x_{ij} + (1 + 2n)C'}{2n} < 0, \tag{28}$$

[10] 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.

which is identical to the expression we found under the SA tax system, c.f. equation (14). At first glance this may seem a bit surprising, since it shows that the transfer price is independent of the tax system in use. However, it simply reflects the fact that when tax rates are identical ($t_i = t_j$), only the strategic motive is driving the transfer pricing behavior of the firm.

Since transfer prices are the same regardless of tax regime, it also follows that the impact of economic integration (reduced trade costs) on transfer prices and exports, $dg_i^k/d\tau$ and $dx_{ij}/d\tau$, is the same regardless of whether we consider the SA or FA. From equations (16) and (17) we thus know that the quantity sold by the subsidiary in the foreign market is decreasing in $\tau$, while the transfer price is an increasing function of $\tau$.

**Stage 1: The optimal choice of tax rates**

The welfare level in country $i$ is

$$W_i^{FA} = \max_{t_i} \left\{ CS_i + TR_i^{FA} \right\}, \tag{29}$$

where consumer surplus is still given by (18), and tax revenue equals

$$TR_i^{FA} = t_i \left[ \frac{x_{ii}}{x_{ii} + x_{ij}} n_i \pi_i^G + \frac{x_{ji}}{x_{jj} + x_{ji}} n_j \pi_j^G \right]. \tag{30}$$

The government in each country thus maximizes (29) subject to (26). In order to illustrate the solution to this maximization problem, we will again use the method of examining how sensitive the transfer prices are to changes in the tax rates. Differentiating equation (26) around $t_i = t_j$ we find that

$$\frac{\partial g_i}{\partial t_i} = -\phi \frac{(1+2n)^2}{[(1+2n)^2 C'' + 4n)]} < 0 \tag{31}$$

and

$$\frac{\partial g_i}{\partial t_j} = \phi \frac{(1+2n)^2}{[(1+2n)^2 C'' + 4n)]} > 0. \tag{32}$$

We see that the signs of $\partial g_i/\partial t_i$ and $\partial g_i/\partial t_j$ are the same under the two tax systems: a higher tax rate in one country encourage firms to use the transfer price as a device

to shift profit to the other country. However, we have already seen that $\phi$ is an increasing function of $\tau$, and from equations (31) and (32) we can therefore deduce that:

**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 the SA system, and is related to the tax elasticity of the transfer price. If the transfer price is highly tax elastic it is very effective as a profit shifting device. The effectiveness of the transfer price as a profit shifting device is given by $\phi$, which gives the impact of a change in the transfer price on the apportionment of profits across countries. From (25), (31) and (32), it is seen that a change in the transfer price has a significant impact on $\phi$ if the foreign subsidiary's share of total sales initially is small, in which case a given change in $g_i$ (and thus in $x_{ij}$) has a large effect on the relative sales abroad. This is true for high levels of trade costs. On the other hand, for low levels of trade costs, the foreign subsidiary's share does not change very much in response to a change in the transfer price. Therefore the tax gain from changing the transfer price is also small, implying that $g_i$ is relatively insensitive to changes in either of the tax rates. Economic integration thus reduces the efficiency of using the transfer price as an instrument for profit shifting, and there is an inverse relationship between trade costs and equilibrium taxes:

**PROPOSITION 4:** *Under Formula Apportionment, other things being equal, equilibrium tax rates are higher the lower the level of trade costs.*

Proposition 2 is illustrated by the downward-sloping tax curve in Figure 3, which is found by solving (29) numerically.

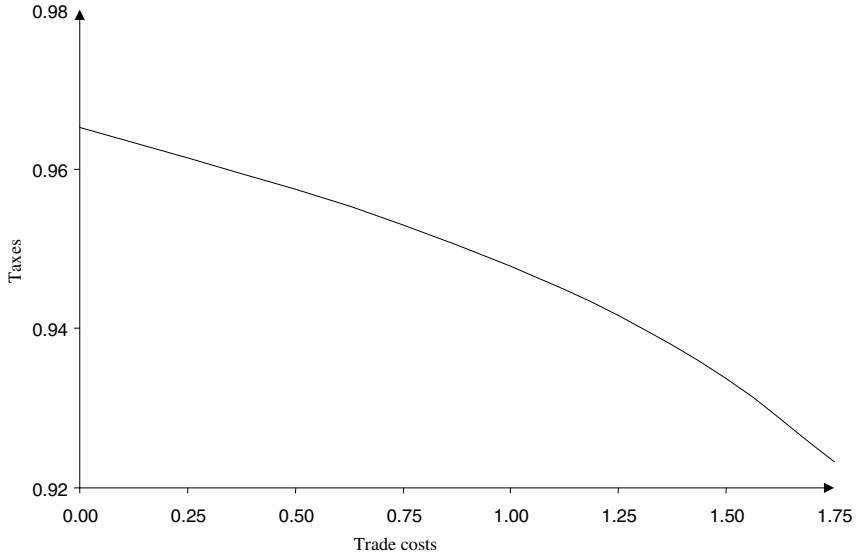


Figure 3: Equilibrium tax rates under Formula Apportionment

# 5 Concluding remarks

This paper explores the interaction between corporate taxation, transfer pricing and welfare. We show that the relationship between these factors depends on degree of economic integration and the choice of tax regime.

One important result that emerges is that the effect of increased economic integration on equilibrium taxes 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. 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; rising consumer surplus and falling tax rates. In contrast, with FA, consumer surplus and tax rates rise. Figure 4 indicates that an SA regime provides the highest welfare level for a low degree of integration (high trade costs), while the FA regime becomes more attractive as integration proceeds. Thus, for a high degree of economic integration, the FA regime may come to dominate the SA regime from a welfare perspective.

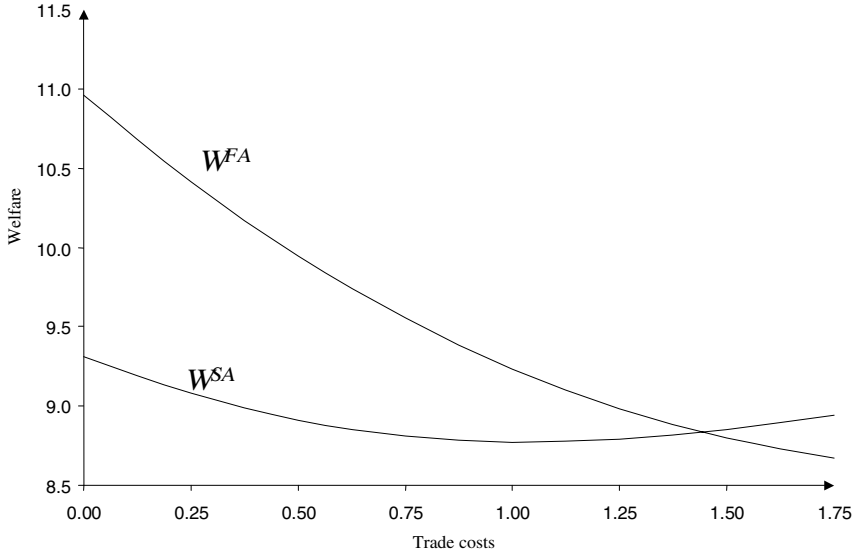


Figure 4: Welfare comparison; SA versus FA

To conclude, we find that the impact of increased economic integration on the intensity of international tax competition hinges on the choice of tax regime. Under Separate accounting increased integration leads to intensified tax competition, while under Formula apportionment increased integration actually reduces the intensity of tax competition. 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 dominates for low degrees of integration, while the FA system becomes dominating as an integration process proceeds. Hence, our results support the view brought forward by many other economists[11] that increased economic integration may call for a substantial reform of the corporate tax system.

# 6 Appendix

*Derivation of equations (21) and (22).*

By differentiating the first-order condition in equation (12) with respect to $t_i$ we

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

find

$$-(x_{ij}^k - \lambda g_i^k - C') + (1 - t_i)\left(\frac{\partial x_{ij}^k}{\partial g_i^k} - \lambda - C''\right)\frac{\partial g_i^k}{\partial t_i} - (1 - t_j)2\lambda\frac{\partial x_{ij}^k}{\partial g_i^k}\frac{\partial g_i^k}{\partial t_i} = 0. \tag{33}$$

Note from equation (12) that around $t_i = t_j$ we have

$$x_{ij}^k - \lambda g_i^k - C' = 2\lambda x_{ij}^k. \tag{34}$$

Inserting for (34) into (33), and using that $\lambda = 2n/(1+2n)$, we find (21). Equation (22), and 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: $C(g_i) = 2g_i^2$.

# References


[1] Basu, K., 1993, Lectures in Industrial Organization Theory, Blackwell.

[2] Bird, R.M., and D.J.S. Brean, 1986, The interjurisdictional allocation of income and unitary taxation debate. *Canadian Tax Journal* 34(6), 1377-1416.

[3] Brander, J., 1995, Strategic trade policy. In Gene Grossman and Ken Rogoff (eds). The handbook of International Economics vol. 3, North-Holland.

[4] Bucks, D.R, and M. Mazerov, 1993, The state solution to the federal government's transfer pricing problem. *National Tax Journal* 46(3), 385-392.

[5] Bucovetsky, S. and J.D. Wilson, 1991, Tax competition with two tax instruments. *Regional Science and Urban Economics,* 21, 333-350.

[6] Bulow, J., J. Geanakopolos and P. Klemperer, 1985, Multimarket oligopoly; strategic substitutes and complements. *Journal of Political Economy* 93, 488-511.

[7] Caillaud, B., B. Julien, and P. Piccard, 1995, Competing vertical structures: precommitment and renegotiation. *Econometrica* 63, 621-646.

[8] Fersthman, C. and K. Judd, 1987, Equilibrium incentives in oligopoly. *American Economic Review* 77, 927-940.

[9] Gabrielsen, T. and G. Schjelderup, 1999, Transfer pricing and ownership structure. *Scandinavian Journal of Economics* 101 (4), 673-688.

[10] Gordon, R. and J.D. Wilson, 1986, An examination of multijurisdictional corporate income taxation under formula apportionment. *Econometrica* 54 (6), 1357-1373.

[11] Haufler, A., and G. Schjelderup, 2000, Corporate tax systems and cross country profit shifting. *Oxford Economic Papers* 52, 306-325.

[12] Kant, C., 1990, Multinational firms and government revenues, *Journal of Public Economics* 42, 135-147.

[13] Keen, M., 1993, The welfare economics of tax co-ordination in the European Community: A survey, *Fiscal Studies* 14, 15-36.

[14] McLure, C.E., 1987, Economic integration and European taxation of corporate income at source: Some lessons from the US experience. In M. Grammie and B. Robinson (eds), Beyond 1992: A European Tax System. London: Institute For Fiscal Studies, 39-51.

[15] Musgrave, P., 1973, International tax base division and the multinational corporation. *Public Finance* 27(4), 394-411.

[16] Nielsen, S. B., P. Raimondos-Møller and G. Schjelderup, 1999, Tax spillovers under separate accounting and formula apportionment, mimeo, EPRU.

[17] Raimondos-Møller, P. and K. Scharf, 1998, Transfer pricing rules when governments compete, mimeo, EPRU.

[18] Schjelderup, G. and L. Sørgard, 1997, Transfer pricing as a strategic device for decentralized multinationals. *International Tax and Public Finance* 4, 277-290.

[19] Schjelderup, G. and A. Weichenrieder, 1999, Trade multinationals and transfer pricing regulation. *Canadian Journal of Economics* vol 33, No. 2, 817-834. (1999).

[20] Shackelford, D. and J. Slemrod, 1998, The revenue consequences of using formula apportionment to calculate U.S. and foreign-source income: A firm-level analysis. *International Tax and Public Finance 5, 41-59.*

[21] Sklivas, S.D., 1987, The strategic choice of managerial incentives. *Rand Journal of Economics* 18, 452-458.

[22] Tanzi, V. and L.A. Bovenberg, 1990, Is there a need for harmonizing capital income taxes within EC countries? In H. Siebert (ed.), *Reforming capital income taxation* (Mohr, Tubingen), 171-197.

[23] Tirole, J., 1988, The Theory of Industrial Organization, Cambridge, Massachusetts: Harvard University Press.

[24] Vickers, J., 1985, Delegation and the theory of the firm. *Economic Journal* 95, 138-147.

[25] Weiner, J.,1996, Estimates of how the unitary tax affects business investment. Manuscript.

[26] D.E. Wildasin, 1988, Nash equilibria in models of fiscal competition, *Journal of Public Economics* 35, 229-240.

[27] Wilson, J.D., 1991, Tax competition with interregional differences in factor endowments. *Regional Science and Urban Economics,* 21, 423-45.

[28] Zodrow, G. and P. Mieszkowski, 1986, Pigou, Tiebout, property taxation and the underprovision of local public goods. *Journal of Urban Economics* 19, 356-370.