Vertical Integrated Enterprises and Transfer Pricing

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Abstract

This paper examines the profit-maximizing strategy of an oligopoly firm within the context of transfer pricing in a regulated environment. The Cournot-Nash equilibrium output and the optimal transfer price are derived for the effective tax and tariff rates chosen by the government. Introducing the penalty schema to derive interior solutions for the transfer price, it is found that a direct consequence of government regulation on the transfer price for the firm is to over invoice. For the exporting firm the transfer price is an important strategic device in its price-setting mechanism. Considering the transfer price regime and the impact of a change in the optimal profit tax policy, we show that from a welfare point of view, the profit shifting under Cournot competition and the profit shifting motive under the strategic transfer pricing effect moves in the same direction. This result suggests major implications for the effectiveness of tax policies in the presence of transfer pricing measured in terms of its effect on domestic welfare.

Keywords: Vertical Integration, Transfer Pricing, Penalty Schema, Tax and Tariff Policy

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1. Introduction

Recent work in the theory of international trade and industrial organisation has shown that depending on tax and tariff schedules, the multinational firm (hereafter the MNF) has the incentive to increase its after-tax profits by shifting taxable income from high tax countries to low tax countries by altering transfer prices. Transfer prices are significant for both taxpayers and tax administration purposes, because they determine in large part the income and expenses, and therefore taxable profits, of associated enterprises in different tax jurisdictions. Changes therefore in the transfer price, that is the price at which intra-firm trade are valued between divisions of a multinational firm can substantially affect the revenue of the government in which it operates. The price that the MNF charge for its internal transactions is not determined by market forces, but that prices are set with the stated objectives of minimizing global tax liabilities, distribute risk and provide incentives for local managers, among others.

To most national governments this behaviour of multinational firms constitutes tax and tariff evasion as the transfer price is potentially a profit shifting device of the MNF in order to save on profit taxes and tariffs. There is well documented empirical evidence to support this claim.[1] To control these manipulations of the transfer price by the MNF many countries regulate transfer pricing by means of the so call arm's- length principle. Thus when the MNF over-invoice (under-invoice) it is the home country (the host country) which wants to control transfer price manipulations by the imposition of a penalty. The multinational firm's optimum transfer price would either be the highest or the lowest possible.[2] These limits on transfer price were determined by government rules and regulations. However regulatory agencies do have the problem of sometimes establishing what constitute a 'fair' transfer price, this is because a substantial part of intra-firm trade is in goods where arm's length prices are not easily established[3]. Given the prominence of the profit shifting argument for government intervention in international trade and the significance of transfer pricing, it is not surprising that there is a substantial and sophisticated literature studying this phenomenon. Several papers have extended Horst

[1] See Weichenrieder (1996), Hines (1999), and Gresik (2001)
[2] Horst (1971).
[3] Markusen (2002)

(1971) model and have shown that the profit shifting motives, in the presence of governmental restraints, directly influence the multinational firm's decision variables, regarding prices, quantities, and production location.[4]

According to Copithorne (1971) firms have two transfer prices which they charge for intra-firm exchanges that is the shadow price based on marginal cost and an external price for tax and tariff authourities. Elitzur and Mintz (1996) examine the role of the transfer pricing rules on tax competition between fully-informed governments, while Bond and Gresik (1996) develop a common-agency theoretical approach in which production cost is unobservable by both the home and the foreign governments and where the emphasis is on trade taxes instead of transfer pricing as a regulatory device to control firm behaviour. In a similar paper Moller and Scharf (2002) rather focus on direct regulation of transfer price and show that strategic transfer pricing regulation leads to excessive taxation that reduces multinational firms output and intra-firm trade. Mansori and Weichenrieder (2001) discuss the effects of transfer pricing on the equilibrium tax rate.

One major problem of the Horst (1971) model is that the multinational firm decision to charge the lowest or highest transfer price results in a corner solution. This paper would introduce a penalty schema which constrains the multinational firm to charge a transfer price in the interior. To achieve this we follow Kant (1988) by assuming that the government have a guideline that the transfer price should be equal to the arm's length price. The probability of imposing a transfer price penalty depends on the divergence between the transfer price charged and the arm's length price. This approach would help show how the transfer price effects may determine whether we have corner or interior solutions. One particular extension which would be most interesting from the perspective of this paper is to assume exogenously determined transfer prices and these are set by government regulations. In this model the comparative static results would be derived to enable us to analyse the optimal transfer pricing policy under Cournot competition, and the strategic interaction effects on the behaviour of the multinational firm under varying tax and tariff rates and the transfer price. Tax and tariff policies which affect the behaviour of multinational firms are designed so as to achieve some policy goals, the aim of this paper

[4] See Samuelson (1982), Eden (1985) and Madan (1992, 2000) for more details

is to examine the effects of government optimal trade policy in relation to import tariffs, profit tax rates and the strategic interaction of firms in the presence of transfer pricing.

The anticipated results are the following. First, the MNF would over invoice in the presence of government regulation to control the transfer price by choosing an optimal transfer price which is more than the marginal cost of production. Second, changes in the tax rates and the tariff rates have a direct and an indirect effect on the nature of competition in the host market. Under strategic interaction considerations, the transfer price is used as a strategic device by the MNF to defuse competition with its rival in the host market. Third, for welfare implications under transfer pricing regime a change in the tax rate results in the profit shifting motive and the transfer pricing effect move in the same direction.

The remainder of the paper is organized as follows. Section 2 presents the basic model framework and then derives the equilibrium transfer price under varying tax and tariff regimes in the absence of a penalty schema. In section 3 we analyse the optimal values of the decision variables of the MNF and the host firm under strategic interaction when firms are quantity setters. Section 4 develops the comparative static analysis of the behaviour of the firms under varying tax and tariff regimes. Section 5 examines the strategic interaction and its effects on host firm behaviour. Section 6 looks at the welfare implications of the government policy instruments. Section 7 provides the conclusions.

2. The Model

The theoretical framework used in the analysis of this section is based on the models of Horst (1971) and Schjelderup and Sorgard (1997). Horst (1971) explores the profit maximization strategy for a monopolistic firm selling in two markets simultaneously in the presence of transfer pricing and how the firm react to a given set of tariff and tax rates. Schjelderup and Sorgard (1997) extended the monopolistic model by introducing competition in the final good market in the host country. According to Schjelderup and Sorgard (1997), in the absence of tax and tariff rates under Cournot competition the MNF would set the transfer price below marginal cost. In the model developed here we introduce the Horst (1971) model by assuming strategic interaction between the MNF subsidiary and the host firm and examine the behaviour of the MNF under varying tax and

tariff rates. By incorporating competition into the Horst (1971) model relates the present study to the strategic trade policy model of Brander and Spencer (1985) where government policies are used to shift above-normal profits from foreign to national firms. This is because the strategic role of the transfer price is similar to the role of export subsidies (taxes) in the strategic trade policy models.

Schjelderup and Sorgard (1997) develop the comparative static results for firms facing Cournot and Bertrand competition to investigate how transfer prices are set. In this model however, we introduce three types of government policy instruments that is the trade policy instrument, the profit taxes and the government regulation on the transfer price. We first examine the effects of each policy instrument on the decision variables of the MNF (output and transfer price). Then we derive the comparative static analysis to assess the direct and indirect impact of a change in government policy in relation to the profit tax, tariff rates and the transfer price on firm behaviour. We further introduce into our model a penalty schema that enables us to derive interior solutions for the transfer price.

Consider a multinational firm with a parent firm located in the home (source) country (*h*) and a wholly owned subsidiary located in the foreign (host) country (*f*). The parent firm produces a final good in both the home country and the foreign country denoted as y and y^* respectively. The final good is sold in the home country yielding a profit $R_h(y)$ at a price $p_h(y)$ with $p_h' < 0$. It is assumed that marginal revenue is positive and decreasing in y : that is, $R_h'(y) > 0$ and $R_h''(y) < 0$, where primes denote partial derivatives. Similarly in the absence of competition y^* is also sold in the foreign country market at a price $p_f(y^*)$ yielding revenue $R^*(y^*)$ with $p_f' < 0$, $R_f''(y^*) < 0$. We assume that the marginal cost of production is increasing in both countries for all positive values of y and y^*, that is $c' > 0$ and $c'' > 0$. The parent firm exports a part of its output to the subsidiary firm in the host country at a transfer price p_t. Let *x* denote the quantity of intra-firm trade between the parent firm and the subsidiary located in the foreign country. In considering the market for the final product, we assume that the two markets are segmented and without loss of

generality we omit the possibility that the final product is also sold in the home and host country.[5]

Horst (1971), in exploring the impact of tariff and tax rates on the profit-maximizing strategy of the firm assumes the MNF to be a monopolist in the two countries. This paper would extend the analysis by introducing oligopolistic competition in the foreign country by assuming that the MNF faces competition from a firm *k* in the foreign country. Firm *k* output is denoted as y_k sold at price $p_k(y_k)$ obtaining revenue $R_k(y_k)$.

It is assumed the MNF faces imperfectly competitive markets and practise price discrimination in the two markets. Let τ and t_i for $i = h, f$ be the *add-valorem tariff* on the intra-firm imports and the income tax imposed in country i respectively, then the profit function of the MNF in both the home country and the foreign country is:

(1) $$\pi_h = R_h(y) - C_h(y + x) + p_t x,$$

(2) $$\pi_f = R_f(y^* y_k) - C_f(y^* - x) - p_t(1+\tau)x,$$

where $p_t(1+\tau)x$ equals the subsidiary import cost including the tariff.

The profit function of firm *k* in the foreign country is represented as follows:

(3) $$\pi_k = R_k(y_k y^*) - C_k(y_k).$$

It is assumed that profit taxation in the home country is based on the source principle and that the net profits of the subsidiary firm are repatriated to the parent firm. The MNF is taxed at the rate t_h at home and t_f of affiliate's profit. A number of countries, for example, the United States offer tax credit for taxes already paid to the foreign governments by the foreign subsidiary. Under this tax credit system two cases have to be considered, that is, $t_h < t_f$ and $t_h \geq t_f$ when there is no penalty for such transfer price manipulation.

[5] Brander and Spencer (1985)

(a) when $t_h < t_f$, the maximum allowable tax credit is equal to the home tax rate on foreign income, $t_h\pi_f$. Thus foreign profits are not taxed in the home country. The global after tax profit of the MNF is written as:

(4) $$\Pi = (1-t_h)\pi_h + (1-t_f)\pi_f$$

Using equations (1) and (2) we can rewrite the net global profit function of the MNF as follows

(5) $$\Pi = (1-t_h)\big(R_h(y) - C_h(y+x)\big) + (1-t_f)\big(R_f(y^*) - C_f(y^*-x)\big) + \big[(t_f - t_h) - (1-t_f)\tau\big]p_t x\,.$$

To examine how the MNF transfer price decisions respond to the changes in tax rate and tariff rate, we differentiate (5) with respect to p_t:

(6) $$\frac{\partial \Pi}{\partial p_t} = \ >(<)\ 0 \ \textit{if} \quad T = \frac{(t_f - t_h)}{(1-t_f)} >(<)\ \tau\,.$$

Equation (6) indicates that *T* which is the relative tax differential between the importing and the exporting country determines the sign of $\partial\Pi/\partial p_t$. If the MNF can manipulate transfer prices, similar to Horst (1971) it follows that when $T >(<) \tau$ the MNF should choose the higher (lowest) transfer price to minimize its tax and tariff payments. Thus the profit tax rate in both the home country and the host country positively or negatively affect the transfer pricing regime. Transfer price in this set up act as a profit shifting device by MNF in the presence of tax and tariff differential rates between countries.

(b) when $t_h \geq t_f$, full credit is given and this is equal to the amount of foreign tax paid by the subsidiary, $t_f\pi_f$. The net rate of taxation on foreign profit that the parent firm pays is $(t_h - t_f)\pi_f$. Then the MNF global tax payment is equal to $t_f\pi_f + (t_h - t_f)\pi_f$. The home country collects $t_h\pi_h$ from local resident firms. The MNF global after tax profit is:

(7) $$\Pi = (1-t_h)(\pi_h + \pi_f)$$

(8) $$\frac{\partial \Pi}{\partial p_t} = -(1-t_h)x\tau \ .$$

Equation (8) shows that the MNF has an incentive to choose the lowest possible transfer price for its intra-firm trade when the foreign taxes are lower than home tax rate, in order to save on tariff cost. In the absence of a penalty for non-arm's length pricing and strategic interaction between firms, transfer pricing constitute an avenue for income shifting. Thus if tax and tariff rates are the only policy instrument available to the government, then the MNF would either over-invoice or under-invoice the transfer price of its intra-firm transfers in order to minimize its tariff and profit tax cost.[6]

Governments are aware of these transfer price abuses by MNFs. There is international consensus that the *arm's length principle* should guide the determination of transfer price for tax purposes. Although the transfer price regulation of most countries varies in its specific details, in most OECD countries, corporate income tax law requires that the transfer price corresponds with the price that two unrelated firms would charge for the same product under similar circumstances[7]. As more firms become highly vertically integrated and custom's valuation of prices is not completely rigid, regulatory agencies do sometimes have the problem of establishing what actually constitute a 'fair' transfer price,[8] and multinational firms are left room to manipulate transfer prices within certain limits.

The United States government in 1990 (Internal Revenue Code section 6662) introduced a transfer price penalty for cases where the MNF transfer price differs significantly from the arm's length price. For the 46 international tax codes investigated 27 of these countries have been found to have explicit transfer pricing penalty legislature modelled on the US legislation.[9] What these tax laws therefore imply is that both the OECD Guideline and the US regulations require that the transfer price charged by MNF in their internal transactions be equal to the 'shadow price' or the arm's length price denoted by $\overline{p}$. In this set up the arm's length price is equal to marginal cost ($\overline{p} = c$). Throughout we assume that this arm length price regime is exogenously given and is set by government regulation.

[6] Raimondos-Moller and Scharf (1996)
[7] OECD (1994)
[8] See, for example, Verlage (1975)
[9] Ernst and Young (2004)

The Penalty Schema

Following Kant (1988) we can make the realistic assumption that there is some probability δ of a penalty of known size α being levied if the transfer price differs from the true cost of production. To simplify the analysis we examine the case where the MNF charges the high transfer price. The properties of the probability function are given as follows: $\bar{p} < p_t < \hat{p}$ which implies $\delta(p_t - \bar{p}) = 0$, for $p_t \leq \bar{p}$, and $\delta(p_t - \bar{p}) = 1$, for $p_t \geq \hat{p}$. Thus $\hat{p}$ is a threshold transfer price where the MNF is penalized with certainty. More specifically we assume that the MNF incurs this cost in addition to the income tax rate *t* on the MNF's profits per unit of intra-firm trade *x*. The deviation cost denoted as ϕ is equal to $\alpha\delta[t(p_t - \bar{p})x]$ where $\delta' > 0$ and $\delta'' > 0$, by this assumption transfer price manipulation below or above the arm's length standard constitutes an additional cost on firm profits and this penalty cost would be larger, the higher the probability of assessment δ, the greater the degree of transfer price manipulation $(p_t - \bar{p})$ and the larger the volume of intra-firm trade *x*. Given the above assumptions the MNF objective function in the presence of the penalty schema is given as:

(9) $$\Pi = [(1-t_h)\pi_h + (1-t_f)\pi_f] - \alpha\delta[t(p_t - \bar{p})x],$$

3. Strategic Interaction under Cournot Competition

Firms in this set-up are assumed to be quantity setters and that Cournot competition prevails in the market for the final good. The MNF chooses the quantities y, y^* and *x* and the transfer price to maximize (9) taking the output of its rival and the prior committed values of government instruments as given. Simultaneously, the host firm chooses its output y_k to maximize (3) taken as given the MNF output of the final good and the government decision variables. The first-order conditions of the strategic interaction model assuming quantity setting competition is as follows:

(10) $$((T-\tau)x) - t_f x\alpha\delta'[t_f(p_t - \bar{p})x] = 0,$$

(11) $$R_h' - C_h' = 0,$$

(12) $$R_f' - C_f' = 0,$$

(13) $$C_f' = C_h' + \tau p_t - T(p_t - C_h') - t(p_t - \bar{p})\alpha\delta'\left[t_f(p_t - \bar{p}\right],$$

(14) $$R_k' - C_k' = 0.$$

The first order conditions (10)-(14) define the equilibrium values of the decision variables of the MNF and the host firm where *T* is the relative differential between the home and host country tax rates. Equation (11) and (12) state that the after tax marginal cost of producing the final good in both the home and the foreign country by the MNF should be equal to the after tax marginal cost. Equation (13) is the condition that determines the amount of intra-firm trade between the MNF located in the home country and the subsidiary located in the host country. This condition equates the marginal cost of production in the host country to the marginal cost of intra-firm trade and this is equal to the MNF's marginal cost of production of the intra-firm exports plus the tariff cost per unit of *x* less the tax advantage of producing in the home country and the marginal cost due to the penalty on non arm's-length pricing. Thus equation (13) is the steering mechanism which binds the final goods markets of the MNF in the two countries. Condition (14) determines the production of the final good by the host country firm which equates the after tax marginal revenue to the after tax marginal cost of production.

Equation (10) defines the equilibrium level of the transfer price. The first term on the left hand side is the marginal gain obtained from tax differential between the home country and the host country and the second term is the marginal cost due to the penalty for non arm's-length pricing. Equation (10) shows that the MNF would want to over-invoice its exports if $T > \tau$ from (6), thus, $p_t > \bar{p}$ implying that $\delta' > 0$. Given that the penalty constitutes an additional cost to the MNF after tax profit, provided this penalty is sufficiently high or that $t_h = t_f$ there is a disincentive for transfer price manipulation by the MNF and consolidated net profit is concave in p_t and X, and $p_t = \bar{p}$. However from

equation (10) it is not optimal for the MNF to charge $p_t \leq \overline{p}$ since the MNF equates the marginal gain in tax arbitrage to the marginal cost of the penalty, that is:

(14') $$\left((T-\tau)x\right) = t_f x\alpha\delta'\left[t_f (p_t - \overline{p})x\right].$$

This implies that $\frac{\partial \Pi}{\partial p_t} = (T-\tau)x > 0$ when $t_f > t_h$. Alternatively when $p_t > \hat{p}$ the MNF is penalized with certainty, and given that the MNF is accessed a higher penalty, the marginal cost (right hand side) of equation (14') is greater than the left hand side. In the situation of an increasing marginal cost due to over invoicing, to minimize the rising cost the MNF would charge a transfer price in the interior, that is, $p_t \in (\overline{p}, \hat{p})$.

The optimal transfer price can be obtained as follows:

(15) $$p_t = \overline{p} + \frac{(\delta')^{-1}}{(1-t_f)t_f{}^2 x\alpha}\left(\left(1-\frac{t_h}{t_f}\right)-\tau\right).$$

In its strategic transfer pricing behaviour, the MNF would over invoice by choosing an optimal transfer price which is more than the marginal cost of production or the arm's length price. In the presence of the penalty the incentive to manipulate the transfer price is reduced, this is because the higher the penalty (α) the less likely the MNF would over invoice because the cost of the penalty rises. The MNF trades off the gains from non-arm's length pricing to the marginal cost of the penalty. In this paper the case $t_h \neq t_f$ is assumed. Thus the opportunity for transfer price manipulation exist, however the penalty provides an additional constraint on the MNF transfer pricing strategy thereby reducing its overall net profit from tax arbitrage, this leads us to proposition 1.

Proposition 1. Under Cournot competition when tax arbitrage exist, and $\delta > 0$, the MNF sets $p_t > c'$.

The economic interpretation of proposition 1 is quite intuitive. The presence of the penalty makes the MNF charge a transfer price that is higher than the arm's length price. It is only

when the MNF is accessed a higher penalty would it move its transfer price towards the arm's length price. The higher the profit tax differential rate between the home country and foreign country the higher the optimal transfer price. The MNF has an incentive to increase the transfer price in order to shift profits from the foreign country to the home country due to the higher foreign profit tax rate. The tariff rate however has the opposite effect on the MNF transfer pricing regime.

Proposition 2. When $t_h = t_f$ the MNF would set $p_t < \tilde{p}$ and ii) choose $p_t = \tilde{p}$ only when $\delta = 0$.

This is quite clear. In the absence of tax arbitrage the only government instrument is the import tariff. To minimize the tariff cost the MNF would choose a lower transfer price for its internal transactions[10].

4. Comparative Static Analysis

To determine the comparative static effects of a change in the tariff rate τ and tax differential rate *T* on y, y^*, *x* p_t and y^k we totally differentiate the first order conditions to get the system of equation in (A.14). Assuming that the second order conditions for profit maximization hold that is: $\Pi_{yy} < 0$, $\Pi_{y^*y^*} < 0$, $\Pi_{y^*y^k} < 0$, $\Pi_{xx} < 0, D > 0$, the following comparative static results are obtained:

(16) $$\frac{dy}{dT} = <0, \quad \frac{dy^*}{dT} = >0 \quad \frac{dx}{dT} = >0, \quad sign\frac{dy^k}{dT} = sign\frac{d^2\Pi}{dy^k dy^*}, \quad sign\frac{dp_t}{dT} = sign(R_f R_k)$$

(17) $$\frac{dy}{d\tau} = >0, \quad \frac{dy^*}{d\tau} = <0 \quad , \quad \frac{dx}{d\tau} = <0, \quad sign\frac{dy^k}{d\tau} = -sign\frac{d^2\Pi}{dy^k dy^*}, \quad sign\frac{dp_t}{d\tau} = -sign(R_f R_k)$$

[10] This is contrary to the established literature where the transfer price is equal to the marginal cost. See Horst (1971)

The imposition of a tariff has a direct effect on the MNF decision variables ($y, y^* and\ x, p_t$) and an indirect effect (strategic effect) on the host country firm's output y^k as the MNF adjust its decision variables in response to a change in τ.

The direct effect of the tariff (τ) on the MNF is to reduce y^*, this is because as the tariff cost per unit of *x* increases, the export cost of *x* to the subsidiary in the foreign country increases. Marginal cost for the intra-firm therefore increases, and this affects the MNF marginal revenue in the production of y^* independent of the transfer pricing regime. From (17) the MNF therefore decreases the production and export of the *x*. Thus a change in the tariff rate raises the affiliates import cost which decreases the import of *x*, and thereby reduce the production of y^*. Giving increasing cost in the intra-firm trade and the production of y^* relative to the marginal cost in producing y in the home country the MNF would be induced to increase the production of y.

A change in the tariff rate τ affects the production and sale of y^k in the host country indirectly through its direct effect on y^*. This is the strategic effect of a change in the tariff rate. And if we define the strategic effect as $\frac{dy^k}{d\tau} = \frac{dy^k}{dy^*}\frac{dy^*}{d\tau}$ (see Tirole 1988 ch.8) the sign of $\frac{dy^k}{d\tau}$ depends on whether the host firm regards the MNF affiliates final good as strategic substitute or strategic complements[11]. Thus the sign of the term $\frac{d^2\pi}{dy^k y^*}$ would be negative in the case of strategic substitute and positive when the final goods in the host country are considered as strategic complement. In quantity competition this term equals the change in firm $k's$ marginal revenue when the subsidiary firm adjust its output in response to a change in the tariff. We know from (17) a change in the tariff rate induce the affiliate of the MNF to reduce the production of y^*. Firm *k* would increase (decrease) its output, if it regards the final goods as strategic substitute (complement).

[11] See Bulow, Geanakoplos and Klemperer (1985)

The import tariff negatively affects the MNF decision on the transfer price. The sign of $\frac{dp_t}{d\tau}$ depends on $R''_f R''_k$. Since by assumption, the two final goods are substitutes, this implies that $R''_f = \frac{\partial^2 \pi}{\partial y^* \partial y^k} < 0$ and $R''_k = \frac{\partial^2 \pi}{\partial y^k \partial y^*} < 0$. The strategic effect alone dictates that the MNF would under invoice when there is a change in tariff rate in order to minimise on tariff cost. In the absence of strategic interaction the profit shifting motive indicates from (6) the MNF to under invoice when $T < \tau$. The profit shifting motive and the strategic interaction effect for the transfer price regime therefore move in the same direction and demands for the MNF to choose a lower transfer price in order to save on tariff cost.

The analysis of the tax effects on the MNF decision variable remains the same as that of the tariff effect as long as the tariff rate exceeds the relative differential in tax rate. Minor changes in the tax rate are likely to have no effect on the firm's strategy. In the event where the relative differential in tax rate exceeds the tariff rate, the effect of an increase in the tax rate in the importing country is opposite to the effect of increasing the tariff rate. To interpret the tax effects, we recall that $T = (t_f - t_h)/(1 - t_f)$ such that T increases as t_f increases or t_h decreases. If the host country tax rate increases, the MNF move up its transfer price and the incentive for profit shifting from the host country is induced. The increase in transfer price makes it advantageous to produce in the host country leading to an increase in both affiliate output and intra-firm exports. Thus the profit tax rate have an effect on both of the MNF's marginal revenue functions, since an increase in the production of both y^* and *x* results in a decrease in the marginal cost of production. The MNF therefore exports more if it can manipulate the transfer price. Hence in the absence of any tariff effects an increase in t_f increases the incentive for over-invoicing by the MNF. Thus the direction the MNF strategically manipulates its transfer price is directly related to the specific government tax policy. The higher the tax rate the higher the transfer price. Alternatively, for a profit maximizing MNF a lower transfer price is optimal for positive values of y if t_h decreases. Marginal profitability of producing y falls and the reductions in y is induced $\frac{dy}{dT} = < 0$. The general effects of the *T* on the MNF and the host firm are presented in (16).

5. Strategic Interaction and Host Firm Behaviour

The preceding analysis has establish that under Cournot competition when tax and tariff rates are equal to zero, the strategic effect alone dictates a transfer price above marginal cost in the presence of a penalty for transfer price manipulation. This section focuses on the competitive behaviour of the host firm in the presence of transfer pricing activity of the MNF. The transfer price set by the MNF affects the profitability of the affiliate firm directly, whereas it affects the local rival firm only indirectly through the changed price or output of the affiliate firm. Thus when transfer prices are observable, firms can use them strategically to impact output (or price) decisions for the final product. The direction of the distortion however depends on the strategic variable in the final good market. We are interested in examining the equilibrium level of y^k (host firm output) when the MNF over invoice or under invoice.

We consider first the high transfer price case. When quantity is the strategic variable, an increase in the transfer price is equivalent to an increase in the marginal cost of the affiliate firm. The direct effect is to lower output of the affiliate firm making it profitable for it to set a high price on its sales in the host country for a given price of its local rival. The best response of the local rival is to also set a high price if it regards the products as strategic complements[12]. The intensity of competition between the affiliate and the rival is diffused and the strategic interactive effects will reinforce each other to the mutual benefit of both firms.

In the case of a lower transfer price, the importing affiliate becomes more aggressive and is able to sell a larger quantity which helps to expand its own market share than it would otherwise in the host country. If quantity is the strategic variable then the best response of the local rival under lower transfer pricing regime of the MNF is to reduce its own sales. This scenario leads to an increase in the affiliate's output and profit and that of the MNF as a whole. In quantity competition, a low transfer price is used to expand own market share whiles within price competition the transfer price is used to defused competition. The ability of the MNF to adjust its profit via transfer prices thus weakens the competitive position of the local rival in the low transfer price regime than in the high transfer price

[12] See Bulow, Geanakoplos and Klemperer (1985)

case. The implication is that the transfer price has a strategic value in addition to being an instrument for profit shifting.

6. The Optimal Domestic Policy

Under transfer pricing considerations, the taxation of MNF has become an issue of public concern. This is because recent work in international trade theory has shown that under Cournot competition in imperfect markets firms have an additional incentive to shift profits through transfer pricing manipulations when tax rates between countries differ. There is also an additional motive for the use of strategic trade policy instruments such as profit tax rate and tariff by competing governments to control such practices of MNFs to improve on domestic welfare. The results of the previous section however suggest that the transfer price regime and the strategic interaction between firms have important implications for the effectiveness of these policies. This section considers profit tax policies.

National welfare of the home country is a function of only the MNF after tax profit and the government's net income. In this set up we do not take into consideration consumer surplus as we assume output markets to be perfectly segmented (Brander and Spencer 1997). The government therefore sets its tax rate in order to maximize national welfare, taking the taxes of the other country as given. The welfare function is represented as follows

(18) $$W = \pi_h + (1 - t_f)\pi_f - \beta(L)$$

Where $\beta' > 0$ is the marginal direct efficiency cost of public funds. The optimal value of t_h satisfies

(19) $$\frac{dW}{dt_h} = \frac{dW}{dy}\frac{dy}{dt_h} + \frac{dW}{dy^*}\frac{dy^*}{dt_h} + \frac{dW}{dx}\frac{dx}{dt_h} + \frac{dW}{dp_t}\frac{dp_t}{dt_h}$$

Noting that $\frac{dy^*}{dt_h}$ = 0 by first order condition (12) we can rewrite (19) as follows

(20) $$\frac{dW}{dt_h} = \left(R_h'(y) - C_h'(y+x)\right)\frac{dy}{dt_h} - (p_t\lambda)\frac{dx}{dt_h} - \left[(1-t_f)\lambda - t_f\right)x\right]\frac{dp_t}{dt_h}$$

The first term is the profit-shifting effect due to a change in the domestic tax rate. The second and the third terms are the tariff cost per unit of the exports and the profit shifting effect due to transfer pricing respectively. We know that an increase in the home profit tax rate positively affect the MNF's exports and the transfer price and negatively affects the MNF home production of the final good. The effect of an increase in the domestic country profit tax rate is to decrease the domestic sale of the final good while the sale of the foreign final good by the affiliate increases (see equation 16). This adjustment shift profits due to Cournot competition from the home country to the foreign country when $P > C_h'$. And under assumption of downward demand function, the change in production of the final good in the home country and foreign country leads to an increase in prices in the home country whiles that in the foreign country declines. The welfare effect via domestic production is therefore to decrease home country welfare. Thus while an increase in home profit tax rate necessary raises the foreign tax revenue through the shift of profit, it may or may not raise revenue of the home country.

The second term, which is the tariff effects on profit tax revenue, is clearly negative. And this follows from the fact that an increase in the home tax rate raises total export to the foreign country, the MNF must pay more tariff duties as a consequence of a higher *x*. Thus per unit tariff cost increases and hence profits are decreased. When the home country sets its profit tax rate optimally, the MNF over invoice, this decrease the MNF's profits belonging to the home country, thus the last term which is the profit shifting effect due to transfer pricing is also negative. In the presence of high profit tax rate, the MNF has an incentive to shift profits from the home country to the host country using the transfer price.

Proposition 3. When $t_h \geq t_f$, profit shifting motive under Cournot competition and the profit shifting under the strategic transfer pricing effect work in the same direction.

7. Conclusion

This paper considers a model of transfer pricing and a multinational firm which engages in Cournot competition with a local rival in the host country. The model analyses the effects of varying tax/tariff rates on the transfer pricing behaviour of the MNF under a penalty schema. The main focus is on direct regulation of the transfer price. It is shown that the institution of a penalty has a substantial impact on the pricing behaviour of the MNF. The optimal choice of the MNF in the presence of the penalty is to set a transfer price above marginal cost of production. Thus transfer price regulation by the government leads to over invoicing with a fall in affiliate firm output.

We studied the implications of government policy instruments, that is, the profit tax rate, and the tariff rate on firm decision variables. The main results are as follows. (1) Changes in the tax rate and the tariff rate have a direct and an indirect impact on the nature of the competition and the degree of substitutability between the final good products. This is because the nature of the strategic interaction in the final good market in the host country has a great influence on the desired choice of the internal transfer price. (2) When the MNF over invoice the optimal behaviour of the host rival firm is to set a high price on its sales if it regards final products as strategic complements. In the under invoicing case sales of the local rival are reduced weakening its competitive position vis-à-vis the MNF. (3) For welfare implications under transfer price considerations a change in the tax rate results in the profit shifting motive and the transfer pricing effect, move in the same direction. Transfer pricing therefore has a tremendous impact on the effectiveness of both the tax and tariff policies. These offer credible reasons for governments to be concerned about transfer price manipulations by MNF. This is because national policies can create incentive for firms to strategically engage in profit shifting by misrepresenting the cost of intra-firm transfers.

Appendix 1

$$\Pi = \left[(1-t_h)\pi_h + (1-t_f)\pi_f\right] - \alpha\delta\left[t_f(p_t - \bar{p})x\right] = 0 \quad \text{(A.1)}$$

$$\frac{\partial \Pi}{\partial p_t} = \left[\left((t_f - t_h) - (1-t_f)\tau\right)x\right] - t_f x\alpha\delta'\left[t_f(p_t - \bar{p})x\right] = 0 \quad \text{(A.2)}$$

$$\frac{\partial \Pi}{\partial y} = (1-t_h)\left(R_h' - C_h'\right) = 0 \quad \text{(A.3)}$$

$$\frac{\partial \Pi}{\partial y^*} = (1-t_f)\left(R_f' - C'\right)_f = 0 \quad \text{(A.4)}$$

$$\frac{\partial \Pi}{\partial x} = \left(-(1-t_h)C_h' + (1-t_f)C_f' + (1-t_h)p_t - (1-t_f)p_t(1+\tau)\right) - t(p_t - \bar{p})\alpha\delta'\left[t_f(p_t - \bar{p})x\right] = 0 \quad \text{(A.5)}$$

$$\frac{\partial \Pi}{\partial y_k} = R_k' - C_k' = 0 \quad \text{(A.6)}$$

Dividing (A.2), (A.3), and (A.4) by $(1-t_f)$, $(1-t_h)$, $(1-t_f)$, and (A.5) by $(1-t_f)$, respectively we obtain the following first order conditions as follows:

$$\left((T-\tau)x\right) - t_f x\alpha\delta'\left[t_f(p_t - \bar{p})x\right] = 0 \quad \text{(A.9)}$$

$$R_h' - C_h' = 0 \quad \text{(A.10)}$$

$$R_f' - C_f' = 0 \quad \text{(A.11)}$$

$$C_f' - C_h' = \tau p_t - T(p_t - C_h') - t(p_t - \bar{p})\alpha\delta'\left[t_f(p_t - \bar{p})x\right] \tag{A.12}$$

$$R_k' - C_k' = 0 \tag{A.13}$$

The comparative static results can be obtained from total differential of the first order conditions to get the following system of equation.

$$\begin{bmatrix} \frac{\partial^2\pi}{\partial y \partial y} & 0 & \frac{\partial^2\pi}{\partial y \partial x} & 0 & 0 \\ 0 & \frac{\partial^2\pi}{\partial y^* \partial y^*} & \frac{\partial^2\pi}{\partial y^* \partial x} & \frac{\partial^2\pi}{\partial y^* \partial y^k} & 0 \\ \frac{\partial^2\pi}{\partial x \partial y} & \frac{\partial^2\pi}{\partial x \partial y^*} & \frac{\partial^2\pi}{\partial x \partial x} & 0 & \frac{\partial^2\pi}{\partial x \partial p_t} \\ 0 & \frac{\partial^2\pi}{\partial y^k \partial y^*} & 0 & \frac{\partial^2\pi}{\partial y^k \partial y^k} & 0 \\ 0 & 0 & \frac{\partial^2\pi}{\partial p_t \partial x} & 0 & \frac{\partial^2\pi}{\partial p_t \partial p_t} \end{bmatrix} \begin{bmatrix} dy \\ dy^* \\ dx \\ dy^k \\ dp_t \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ p_t \\ 0 \\ -x \end{bmatrix} d\tau + \begin{bmatrix} 0 \\ 0 \\ -(p_t - C_h') \\ 0 \\ x \end{bmatrix} dT \tag{A.14}$$

$$\frac{\partial^2\pi}{\partial y \partial y} = R_h'' - C_h'' \qquad \frac{\partial^2\pi}{\partial p_t \partial x} = (T - \tau) - t_f\alpha\delta'(t_f(p_t - \bar{p})x) - t_f{}^2(p_t - \bar{p})\alpha x\delta''\left(t_f(p_t - \bar{p})x\right) \tag{A.15}$$

$$\frac{\partial^2\pi}{\partial y^* \partial y} = 0 \qquad \frac{\partial^2\pi}{\partial y^* \partial x} = C_f'' \qquad \frac{\partial^2\pi}{\partial p_t \partial y} = 0$$

$$\frac{\partial^2\pi}{\partial x \partial y} = -C_h'' \qquad \frac{\partial^2\pi}{\partial x \partial x} = -(C_h'' + C_f'') \qquad \frac{\partial^2\pi}{\partial p_t \partial y^*} = 0$$

$$\frac{\partial^2\pi}{\partial y^k \partial y} = 0 \qquad \frac{\partial^2\pi}{\partial y^k \partial x} = 0 \qquad \frac{\partial^2\pi}{\partial p_t \partial y^*} = 0$$

$$\frac{\partial^2\pi}{\partial y\partial y^*}=0 \qquad \frac{\partial^2\pi}{\partial y\partial y^k}=0 \qquad \frac{\partial^2\pi}{\partial p_t\partial p_t}=-{t_f}^2x^2\alpha\delta''\left[t_f(p_t-\overline{p})x\right]$$

$$\frac{\partial^2\pi}{\partial x\partial p_t}=-(T-\tau)-t_f\alpha\delta'\left(t_f(p_t-\overline{p})\right)-{t_f}^2x\alpha p_t\delta''\left(t_f(p_t-\overline{p})x\right) \qquad \frac{\partial^2\pi}{\partial y^*\partial y^*}=R_f''-C_f''$$

$$\frac{\partial^2\pi}{\partial x\partial y^*}=C_f'' \qquad \frac{\partial^2\pi}{\partial x\partial y^k}=0 \qquad \frac{\partial^2\pi}{\partial y^*\partial y^k}=R_f''$$

$$\frac{\partial^2\pi}{\partial y\partial p_t}=0 \qquad \frac{\partial^2\pi}{\partial y^k\partial y^*}=R_k'' \qquad \frac{\partial^2\pi}{\partial y^k\partial y^k}=R_k''-C_k'' \qquad \frac{\partial^2\pi}{\partial y^*\partial p_t}=0$$

We let $\frac{\partial^2\pi}{\partial p_t\partial x}=\phi$, $\frac{\partial^2\pi}{\partial x\partial p_t}=-\mu$, $\frac{\partial^2\pi}{\partial p_t\partial p_t}=-\beta$. Further letting *D* represent the determinant of the left-hand matrix in (A.14) which is positive by assuming that the stability conditions hold or equivalently that each firm's marginal revenue declines as the output of any other firm rises, the following comparative static effects can be obtained.

$$\frac{dy}{d\tau}=\frac{C_h''\left[\left((R_f''-C_f'')(R_k''-C_k'')\right)-R_f''R_K''\right]\left[-P_t\beta-\mu x\right]}{D}>0 \qquad \text{(A.16)}$$

$$\frac{dy^*}{d\tau}=\frac{-C_h''\left[(R_h''-C_h'')(R_k''-C_k'')\right]\left[-P_t\beta-\mu x\right]}{D}<0$$

$$\frac{dx}{d\tau}=\frac{(R_h''-C_h'')\left[\left((R_f''-C_f'')(R_k''-C_k'')\right)-R_f''R_k''\right]\left[-P_t\beta-\mu x\right]}{D}<0$$

$$\frac{dy^k}{d\tau}=\frac{-R_k''\left[P_t\beta-\mu(-x)\right]C_f''(R_h''-C_h'')}{D}$$

$$\frac{dp_t}{d\tau}=\frac{-R_f''R_k''\left[\left[{C_h}^2x-(R_h''-C_h'')\left[P_t\phi-(C_h+C_f)x\right]\right]\right]-(R_k''-C_k'')\left[\left[(R_h''-C_h'')\left[(R_f''-C_f'')P_t\phi-(R_f''-C_f'')(C_h+C_f)x-{C_f}^2x\right]\right]-{C_h}^2(R_f''-C_f'')x\right]}{D}$$

$$\frac{dy}{dT} = \frac{-C_h''\left[(R_f'' - C_f'')(R_k'' - C_k'') - R_f'' R_K''\right]\left[-(P_t - C_h')\beta - \mu x\right]}{D} < 0 \qquad \text{(A.17)}$$

$$\frac{dy^*}{dT} = \frac{C_f''(R_h'' - C_h'')\left[(R_k'' - C_k'')\left[-(p_t - C_h')\beta - \mu x\right]\right]}{D} > 0$$

$$\frac{dx}{dT} = \frac{-(R_h'' - C_h'')\left[\left[(R_f'' - C_f'')(R_k'' - C_k'') - R_f'' R_K''\right]\left[-(p_t - C_h') - \mu x\right]\right]}{D} > 0$$

$$\frac{dy^k}{dT} = \frac{R_k\left[(p_t - C_h')\beta - \mu(-x)\right]C_f''(R_h'' - C_h'')}{D}$$

$$\frac{dp_t}{dT} = \frac{R_f'' R_k''\left[\left[C_h{}^2 x - \left[(R_h'' - C_h'')\left[(P_t - C_h)\phi - (C_h + C_f)x\right]\right]\right] - (R_k'' - C_k'')\left[\left[-(R_h'' - C_h'')\left[(R_f'' - C_f'')(P_t - C_h)\phi - (R_f'' - C_f'')(C_h + C_f)x - C_f{}^2 x\right]\right] - C_h{}^2(R_f'' - C_f'')x\right]}{D}$$

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