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TRANSFER PRICING AND THE NATURE OF THE SUBSIDIARY FIRM

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ABSTRACT: This paper shows that with subsidiaries of different nature due to locational characteristics, the multinational firm not only charges different transfer prices, but also supplies different levels of the intermediate input to the downstream branch. In particular, interior transfer prices are possible. In addition, we also conduct several interesting comparative statics analysis.

JEL Classification Codes: F2, P5

Key Words: Transfer Pricing, Subsidiary Control, Labor Unions, Labor–Managed Firms, Joint Ventures

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1. Introduction

Most economic analysis of transfer pricing concentrates on the case of complete parent firm control [see Copithorne (1971), Horst (1971), Eden (1978, 1983, 1985) and Samuelson (1982), etc.]. The parent maximizes joint net profits from different subsidiaries and corporate taxes induce transfer prices to be set equal to either an upper or lower bound exogenously imposed by regulating governments. However, some authors realize that in many instances, affiliate control is also important in order to foster greater divisional autonomy and to improve profit performance [see for example, Diewert (1985), Katrak (1983), Stoughton and Talmor (1994)]. In such a scenario, the parent firm as well as the subsidiaries share the decision making process. The parent thus has to design transfer prices which can take into account of the decisions made by the subsidiaries. It may even be the case that the transfer price itself is an outcome determined by bargaining between the parent and the subsidiaries [Stoughton and Talmor, and Chalos and Haka (1990)].

In practice, multinational corporations (MNCs) can have subsidiaries in markets that are very different in nature. For instance, in many less developed countries (LDCs), there exists upper limits on foreign ownership of businesses. Subsidiaries in the LDCs may take the form of international joint ventures; when Japanese automobile makers set up production facilities in the U.S., they have to negotiate with the UAW (United Auto Workers Union). Such subsidiaries may take the form of unionized firms; still some other subsidiaries may take the form of labor managed firms (e.g., firms in the former Yugoslavia, or some believe, Japan).

The objective of the present paper is to investigate when the subsidiary can make some production decisions on its own, at what level will the parent charge the transfer price. We find that under different market structure, the parent firm will set the transfer price differently in order to influence the decisions of the subsidiary. In particular, we show that with a profit maximizing subsidiary, the parent firm usually charges two types of transfer price: an upper or a lower limiting price depending on the profit tax rates; with a joint-venture (JV) subsidiary, the same results hold, but the selection criteria differ, since the JV subsidiary is not wholly owned by the MNC parent; with a unionized subsidiary, there exists three types of transfer prices: the upper price, the lower price, and one that is in-between; with a labor managed subsidiary, we again find three types of transfer prices, but the exact levels are different. Thus in some cases, we obtain transfer prices as interior solutions, instead of the corner solutions as always obtained in the case of complete parent control.[1] We also demonstrate that the level of the intermediate input supplied by the MNC differs in each case. In addition, we conduct some interesting comparative statics analysis under different market structure.

Section 2 establishes four mini-models of transfer price determination, in which the subsidiary is located in four different market structures, and section 3 concludes.

2. The Model

Consider the case of a MNC consisting of two subsidiaries, located in two different countries 1 and 2 respectively. The upstream branch produces one intermediate input, with a gross profit function of

$$\pi_1 = mx - c(x) \tag{1a}$$

where m is the transfer price of selling the intermediate input to the downstream branch, x is the quantity of the intermediate input, and c(x) is the cost of producing x, with $c'>0$ and c'' non-negative. The downstream branch uses both the intermediate input and labor to produce the final output. Its gross profit function can be written as

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[1] Kant (1988) also obtains interior transfer prices, but his analysis is based on uncertainty. Donnenfeld and Prusa (1990), and Stoughton and Talmor (1994) analyzed the information asymmetry aspect of transfer pricing.

$$\pi_2 = r(q) - mx - [w-\Phi(x)]q \tag{1b}$$

where q is the quantity of the final good, r(q) is the revenue function, and w is the unit wage cost. To produce one unit of the final good, exactly one unit of labor is needed by an appropriate choice of units. Thus q is also equal to the amount of labor employed. When the intermediate input is used, productivity increases. We model this as a reduction in the unit cost of production, $\Phi(x)$, with $\Phi_x>0$.

The profit of the parent firm is a sum of the joint net profits from the two subsidiaries, which can be written as

$$\pi = (1-t_1)\pi_1 + (1-t_2)\pi_2 \tag{2}$$

where t_1 and t_2 are the profit tax rates in the two respective countries.

To analyze the phenomenon of affiliate control and the different structure the subsidiary firm can take, we assume that the downstream branch can make some independent decisions in the production process. Specifically, the downstream branch decides the level of the final output (and the amount of labor to be hired), while the parent firm determines the transfer price and the level of the intermediate input. In order to let the parent's decision affect that of the subsidiary, we assume a two stage game, with the parent being the leader, choosing in the first stage, and the subsidiary the follower, choosing in the second stage. Thus the choice the subsidiary makes, q, is a function of the parent's choices, m and x.

In the remainder of the paper, we use the basic model to investigate the determination of the transfer price when the downstream subsidiary is organized under different market structure. In order to ensure consistency, all mini-models are solved backwards, i.e. we solve the subsidiary's problem in the second stage first, substitute the solution into the parent firm's problem in the first stage game and then solve it.

2.1 Profit Maximizing Subsidiary

First, suppose that the downstream branch is a regular profit maximizing subsidiary. We use this case as a bench–mark. Then in the second stage of the decision game, the subsidiary chooses the quantity of the final output to maximize its own profit (net of the profit tax), yielding the following first order condition (FOC)

$$r_q + \Phi(x) - w = 0 \tag{3}$$

which gives the optimal final output as a function of the unit wage cost and the amount of intermediate input used. Total differentiation of (3) yields $dq/dx>0$ and $dq/dw<0$, which implies that an increase in the intermediate input (respectively the wage cost) raises (respectively reduces) the level of the final output.

In the first stage of the game, the parent firm determines the transfer price and the amount of the intermediate input to be produced. Maximizing (2) with respective to m and x, we obtain respectively

$$\pi_m = (t_2-t_1)x \tag{4a}$$

$$\pi_x = (1-t_1)\ \partial\pi_1/\partial x + (1-t_2)\ \partial\pi_2/\partial x = 0 \tag{4b}$$

where $\partial\pi_1/\partial x = m-c_x$, and $\partial\pi_2/\partial x = q\Phi_x-m$.

Condition (4a) is positively signed if $t_2>t_1$, and negatively signed if $t_2<t_1$. Accordingly, the optimal transfer price chosen by the parent firm is the upper bound or the lower bound set by respective governments. The is a result obtained by the classical literature on transfer pricing [see Copithorne (1971) and Host (1971)]. Here we see that it holds even in the case when the downstream subsidiary determines independently the quantity of the final output.

2.2 Unionized Subsidiary

In this section, we analyze the case in which the downstream branch is unionized.

As is common in the labor–management models, wages are determined through negotiations between the subsidiary and the labor union. Let the union's utility be represented by the following function [see Brander and Spencer (1988)]

$$u(w,q) = q\xi(w) + (N-q)\xi(n) \tag{5}$$

where N is the total membership of the union and $\xi_w(w)>0$. While q members receive the negotiated wage w, the rest of the members receives the wage n in the residual sector. Thus n can be interpreted as the reservation wage or unemployment compensation, which is treated as a constant here.

Following Brander and Spencer, we model the negotiation between the subsidiary and the union as a cooperative Nash bargaining game [Nash(1953)], and that bargaining is for the wage rate only.[2] If bargaining breaks down, on the one hand, no union workers are hired and union utility goes down to $u_0=N\xi(n)$; On the other hand, the subsidiary does not produce any output. But it has to incur the cost of buying the intermediate input. Thus the net profit of the subsidiary if bargaining breaks down is $\pi_0=-mx$.

Given the above bargaining structure, the Nash product, which is a product of the parties' payoffs, net of the opportunity costs at the threat point (if bargaining breaks down), can be written as

$$G(w) = (u-u_0)\ [(1-t_2)\pi_2 - \pi_0] \tag{6}$$

where $(1-t_2)\pi_2$ is the subsidiary's net profit.

In the second stage of the game, the downstream branch negotiates with the labor union the wage rate and it also determines the quantity of the final output. Maximizing (6) with respect to w yields

$$\xi_w[(1-t_2)\pi_2 - \pi_0] -(1-t_2)(u-u_0) = 0 \tag{7}$$

[2] McDonald and Solow (1981) show that bargaining for wage alone is not efficient and that the two parties can be made better off if both wage and employment are negotiated. However, Clark and Oswald (1993) argue that unions put more weight on pay than on employment. Furthermore, many observe that in practice, labor-management bargaining is usually for wages, while employment is determined by the firm unilaterally.

Condition (7) gives implicitly the negotiated wage rate as a function of the transfer price m and the intermediate input x. And maximizing the subsidiary's net profit with respect the q, we obtain condition (3) again.

Totally differentiating conditions (3) and (7), and assuming that the second order conditions for a maximum are satisfied, i.e. $\Delta = G_{ww} r_{qq} - G_{wq} r_{qw} > 0$, where $G_{ww} = \xi_{ww}[(1-t_2)\pi_2 - \pi_0] - 2(1-t_2)q\xi_w < 0$, $G_{wq} = -(1-t_2)[\xi(w)-\xi(n)] < 0$, $r_{qq} < 0$, and $r_{qw} = -1$, then we obtain the following conditions

$$dw/dm = -t_2 x\xi_w r_{qq}/\Delta > 0 \tag{8a}$$

$$dq/dm = -t_2 x\xi_w/\Delta < 0 \tag{8b}$$

$$dw/dx = \{-[(1-t_2)q\Phi_x+mt_2]\xi_w r_{qq} + \Phi_x G_{wg}\}/\Delta \tag{8c}$$

$$dq/dx = -\{[(1-t_2)q\Phi_x+mt_2]\xi_w + \Phi_x G_{ww}\}/\Delta \tag{8d}$$

Condition (8a) implies that an increase in the transfer price raises the negotiated wage rate. This arises because if m increases, then the downstream subsidiary will use labor to substitute for the now more expensive intermediate input. The union will take advantage of this opportunity and raise the negotiated wage in the bargaining game. Condition (8b) says that as a result of an increase in the transfer price, the net profit of the subsidiary falls and thus it chooses to produce less final output.

The signs of conditions (8c) and (8d) are ambiguous. However, if Φ_x is large, i.e. the marginal contribution of x to the final output is large, then (8c) < 0 and (8d) > 0, implying that an increase in x reduces the negotiated wage rate and increases the final output. The wage rate decreases because labor is substituted by the intermediate input.

In the first stage, the parent firm chooses the transfer price and the level of the intermediate input to maximize total net profits, realizing that the negotiated wage and the final output depend on m and x. The FOCs are

$$d\pi/dm = \pi_m + \pi_w dw/dm \tag{9a}$$

$$d\pi/dx = \pi_x + \pi_w dw/dx = 0 \tag{9b}$$

where $\pi_m = (t_2-t_1)x$, $\pi_w = -(1-t_2)q$, and $\pi_x = (1-t_1)\ \partial\pi_1/\partial x + (1-t_2)\ \partial\pi_2/\partial x$.

Condition (9) contrasts the case when the downstream subsidiary is a profit maximizing branch. Compared with conditions (4a) and (4b), conditions (9a) and (9b) each has one extra term, which takes into account respectively the effects of m and x on the negotiated wage rate. Thus the transfer price and the level of the intermediate input in the two cases will be different.

To be more specific, if $t_2<t_1$, then condition (9a) is negatively signed, and the transfer price chosen will be the lower bound, the same as in the profit maximizing case; if $t_2>t_1$, then there are two cases, since the sign of (9a) can be either positive or zero: if positive, then the transfer chosen is the upper bound; if zero, then the transfer price chosen is lower than the upper bound and higher than the lower bound, i.e. an interior solution.

By condition (9b), if Φ_x is large (respectively small), then the optimal level of x is higher (respectively lower) than the case of a profit maximizing subsidiary.

2.3 Labor–Managed Subsidiary

Now consider the case when the downstream subsidiary is a labor–managed (LM) branch. In LM firms, instead of profits, average income per worker is maximized.[3] Let the average income per worker in the downstream subsidiary be

$$I = (1-t_2)\pi_2/q \tag{10}$$

Differentiating with respect to q to give

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[3] See Ward (1958) and Vanek (1970).

$$q \; \partial\pi_2/\partial q \; - \pi_2 = 0 \tag{11}$$

where $\partial\pi_2/\partial q = r_q + \Phi_x - w$. Condition (11) gives the optimal level of the final output as a function of m and x in the case of the LM subsidiary. Totally differentiating it to yield

$$dq/dx = -qr_{qq}/m > 0 \tag{12a}$$

$$dq/dm = -qr_{qq}/x > 0 \tag{12b}$$

Condition (12a) states that an increase in the use of the intermediate input raises the final output, ceteris paribus. Condition (12b) implies that an increases in the transfer price will also raise the final output. This may seem counter intuitive by casual observation. However, it is well known that the LM firm tends to have many perverse relations.[4] In the present model, it implies that when the transfer price increases, the cost of production for the subsidiary also rises accordingly. Average income maximization requires that the membership be increased so that the burden of cost can be shared more widely. Consequently the level of final output rises.

In the first stage, again the parent firm chooses m and x to maximize total net profits, taking into account that q is a function of m and x, which yields

$$d\pi/dm = \pi_m + (1-t_2) \; \partial\pi_2/\partial q \; dq/dm \tag{13a}$$

$$d\pi/dx = \pi_x + (1-t_2) \; \partial\pi_2/\partial q \; dq/dx = 0 \tag{13b}$$

where π_m and π_x are given under condition (9), and $\partial\pi_2/\partial q = \pi_2/q$ from (11).

Now we compare condition (13) with conditions (4) and (9). By condition (13a), if $t_2 > t_1$, the sign of (13a) is positive, then the transfer price chosen will be the upper bound, the same as in the profit maximizing case; if $t_2 < t_1$, then there are

[4] See Ward (1958) and Vanek (1970). For example, when output price increases, the LM firm's supply decreases, thus generating the downward sloping supply curve.

two cases, since the sign of (13a) can be either negative or zero: if negative, then the transfer chosen is the lower bound; if zero, then the transfer price chosen is between the upper bound and the lower bound, i.e. an interior solution again.

By condition (13b), the level of the intermediate input is higher in the LM case than in the profit maximizing case, since the second term in (13b) is positive. However, we can not tell whether this level of the intermediate input is higher or not than that in the case of the unionized subsidiary.

2.4 Joint Venture Subsidiary

Finally we consider the case when the downstream branch is a joint venture with a different owner. We suppose that the level of the final output is determined by negotiations between the JV partners. If bargaining breaks down, then no final output is produced. Hence the threat point is zero for both JV partners. Also assume that share s of the JV profit belongs to the downstream subsidiary, and share 1–s goes to the other partner, where s is determined exogenously. The Nash product of the bargaining game for q is

$$H(q) = \{s(1-t_2)\pi_2\}\{(1-s)(1-t_2)\pi_2\} \tag{14}$$

Maximizing the Nash product with respect to q, we obtain

$$r_q + \Phi(x) - w = 0 \tag{15}$$

which is the same as condition (3). It gives the final output as a function of x in the JV case.

With a JV subsidiary, the parent's total net profit is

$$\pi^{jv} = (1-t_1)\pi_1 + s(1-t_2)\pi_2 \tag{16}$$

since $(1-s)(1-t_2)\pi_2$ is the profit of the JV partner, which does not belong to the MNC. The FOCs to maximize (16), choosing m and x, are

$$d\pi^{jv}/dm = Tx \tag{17a}$$

$$d\pi^{jv}/dx = (1-t_1)\ \partial\pi_1/\partial x + s(1-t_2)\ \partial\pi_2/\partial x = 0 \qquad (17b)$$

where $T=(1-t_1)-s(1-t_2)$, and $\partial\pi_1/\partial x$ and $\partial\pi_2/\partial x$ are given under condition (4). Condition (17) is a little different from condition (4). While (17a) implies that the transfer price chosen by the parent firm will be either the upper bound or the lower bound, the importance of the host country's profit tax rate is downgraded according to the JV share of the subsidiary. The transfer price is either the upper limiting price or the lower limiting price if T is positive or negative. Condition (17b) says that in choosing x, the parent firm takes into account that the subsidiary is a JV and only proportion s of the JV profit belongs to the MNC. Therefore, the transfer price and the level of the intermediate input produced in this case differ from those in other cases.

3. Conclusions

Multinationals operate in markets that are different in nature. This paper extends the classical literature on multinational firms and transfer pricing. We showed that with subsidiaries in different markets, the MNC charges transfer prices differently, not just limited to the boundary prices imposed by governments. In particular, interior solutions are possible. We also found that the MNC supplies different levels of the intermediate input to the downstream subsidiary in different markets. Hopefully the above analysis has shed light on some issues of transfer pricing that were ignored in the literature.

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