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Profit Share and Partner Choice in International Joint Ventures

By

Litao Zhong ^a and Sajal Lahiri ^b

ABSTRACT

This paper suggests a new approach to the determination of profit allocation between the partners in joint ventures. We also examine the issue of partnership choice. The foreign firm would be willing to give more than half of profits to its partner, and it would like to choose the more efficient firm. However, the host government, under certain situation, may persuade the foreign firm, by a suitable lump-sum transfer, to form partnership with the less efficient firm.

JEL Classifications: F1, F2

Keywords: Joint ventures, profit sharing, partner choice, oligopoly, technology transfer.

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1 Introduction

The importance of international joint venture (IJV) as a mode for entering a foreign market cannot be understated. For example, more than a third of foreign investment China now takes the form of IJV (Folta, 2005). The high incidence of IJVs is also reflected in a large number of academic papers on IJVs (see, for example, Al-Saadon and Das, 1996; Asiedu and Esfahani, 2001; Darrough and Stoughton, 1989; Harrigan, 1984; Svejnar and Smith, 1984). The existing literature considers many issues, but not that of partner choice.

This paper contributes to the emerging literature by first developing a theoretical model in which the foreign firm makes an attractive offer to a potential partner which has no bargaining power, and this way extracts a favorable tax/subsidy outcome from the host government. We then consider the issue of the formation of partnership when there are more than one potential partners. We find that, depending on the degree of technology transfer in an IJV, the equilibrium partnership could be with either with the more efficient or the less efficient domestic firm.

The paper is organized as follows. Section 2 develops the theoretical framework. Section 3 examines the multinational firm's partner choice. Concluding remarks are made in section 4.

2 The Model

A multinational corporation, labelled firm F , with constant unit or marginal cost c_F , wishes to enter a country's market via forming a joint venture (IJV) with one of two local firms with marginal costs c_A and c_B . We assume that $c_F < c_A < c_B$, i.e., firm F is more efficient than firm A which in turn is more efficient than firm B . The host government uses the tax/subsidy policy to influence the nature of IJV. The foreign firm offers a contract in the form of a share of profits to one domestic firm. That firm can only take or leave that offer.

The model is formulated in terms of a three-stage game. We first specify the the model assuming that the IJV takes place first with firm A . The analysis will be analogous if the IJV is with firm B . In stage one, firm F decides the optimal profit share it offers to a domestic firm

by maximizing its share of profits, without any bargaining and tries to maximize its own profit. In stage two, the host government decides on the level of output tax/subsidy. Finally, in the third stage a Cournot oligopoly game is played between the IJV and the other domestic firm for deciding output levels. The model is solved with backward induction to achieve a sub-game perfect equilibrium.

We assume that the marginal cost of the IJV is a convex combination of the two partner firms. That is,

$$c_{J1} = \theta c_A + (1 - \theta)c_F, \quad 0 \leq \theta \leq 1, \quad (1)$$

where the subscript 1 refers to case 1 (partnership with firm A) and $1 - \theta$ represents the degree of technology transfer in the IJV from firm F .

Assuming that the two firms produce a homogeneous good, the demand function is

$$D_1 = \alpha - \beta P_1, \quad (2)$$

D_1 and P_1 are respectively total demand and price of the good respectively.

The market-clearing condition is

$$D_1 = q_{J1} + q_B, \quad (3)$$

where q_{J1} is the output of the IJV and q_B is the output of firm B .

From equations (2) and (3), the inverse demand function is obtained as

$$P = a - b(q_{J1} + q_B), \quad (4)$$

where $a = \alpha/\beta$, and $b = 1/\beta$.

Starting with stage 3 of the game, the problems facing the IJV and firm B are given by

$$\max_{q_{J1}} \pi_{J1} = (P - c_{J1} - t_1)q_{J1}, \quad \max_{q_B} \pi_B = (P - c_B)q_B,$$

where t_1 denotes the rate of output tax imposed by the host government on the IJV.

From the first order conditions of the above problems are

$$q_{J1} = (a - 2t_1 - 2\theta c_A - 2c_F + 2c_F\theta + c_B)/(3b), \quad q_B = (a + t_1 + \theta c_A + c_F - \theta c_F - 2c_B)/(3b). \quad (5)$$

In stage 2, the host government sets the optimal tax to maximize the national welfare, taking into account output response functions in (5):

$$\max_{t_1} W_1 = s_1\pi_{J1} + \pi_B + t_1q_{J1} + CS_1,$$

where s_1 is the share of firm A in the IJV profits. The first and the second terms are profits of firm A and firm B respectively, the third term is tax revenue, and the last term is consumers' surplus.

The solution of the above problem yields

$$t_1 = (3a - 3c_A\theta - 3c_F + 3c_F\theta - 4s_1a - 4s_1c_B + 8s_1c_A\theta + 8s_1c_F - 8s_1c_F\theta)/(9 - 8s_1), \quad (6)$$

whence we find the relationship between the tax rate and the profit-share parameter s_1 :

$$dt_1/ds_1 = -12(a + 3c_B - 4c_A\theta - 4c_F + 4c_F\theta)/(9 - 8s_1)^2 < 0. \quad (7)$$

That is, if firm F gives a larger share of IJV profits to its domestic partner, the government lowers the tax rate.

Finally, in stage 1 firm F decides on s_1 by maximizing its share of profits:

$$\max_{s_1} \pi_{F1} = (1 - s_1)\pi_{J1}, \quad (8)$$

taking into account reaction functions from stages 2 and 3, and this gives

$$s_1 = 7/8.$$

Substituting this solution into (5) and (6), we get

$$\begin{aligned} t_1 &= (8\theta c_A + 8c_F - a - 8c_F\theta - 7c_B)/4 = (-2bq_{J1} - 4(c_B - c_{J1}))/4 < 0, & (9) \\ q_{J1} &= (a - 4\theta c_A - 4c_F + 4c_F\theta + 3c_B)/(2b), \quad q_B = (a + 4\theta c_A + 4c_F - 4c_F\theta - 5c_B)/(4b). & (10) \end{aligned}$$

The analysis is similar to the case where firm F picks firm B as the partner. The marginal cost of the IJV is then:

$$c_{J2} = \theta c_B + (1 - \theta)c_F, \quad 0 \leq \theta \leq 1;$$

and solution of all the variables can be analogously solved as:

$$s_2 = 7/8, \quad t_2 = (8\theta c_B + 8c_F - a - 8c_F\theta - 7c_A)/4 = (-2bq_{J2} - 4(c_A - c_{J2}))/4 < 0, \quad (11)$$

$$q_{J2} = (a - 4\theta c_B - 4c_F + 4c_F\theta + 3c_A)/(2b), \quad q_A = (a + 4\theta c_B + 4c_F - 4c_F\theta - 5c_A)/(4b). \quad (12)$$

Three interesting points need to be noted. First, no matter whether firm F chooses firm A or firm B , it offers the same share to the domestic partner. Second, the optimal share offered is larger than 50%. This result is interesting since the domestic firm has no bargaining power. The foreign firm knows that by committing a higher profit share to the domestic partner, it can induce the host government to impose a lower tax on the IJV. Finally, the optimal policy for the host government is to subsidize the IJV no matter which firm the IJV is formed with. The presence of endogenous profit share makes the sign of the optimal tax is negative since by doing so the government can induce the foreign firm to pass on a larger share of IJV profits to the domestic partner.

We conclude this section by showing that the host government offer a higher subsidy if IJV is formed with the more efficient firm. Formally,

Lemma 1 *The host government offers a better tax/subsidy to the IJV when Firm F chooses the more efficient firm as a partner.*

Proof: From (9) and (11) we get $t_1 - t_2 = (c_A - c_B)(7 + 8\theta)/4$. Thus, $c_B > c_A \iff t_1 < t_2$. \square

The intuition behinds this proposition is that the consumers enjoy a higher surplus if the IJV is formed with the more efficient firm.

3 Partner Choice

In this section, we want to address the following questions: Which of the two firms would the foreign firm like to choose as a partner? Will the chosen domestic firm accept the offer? Which of

the two firms does the host government prefer the foreign firm to choose as a partner? The answer to the first question is given in the following proposition.

Proposition 1 *The foreign firm prefers to the more efficient domestic firm as its partner in the IJV.*

Proof:

$$\pi_{F1} - \pi_{F2} = (1 - s_1)\pi_{J1} - (1 - s_2)\pi_{J2} = b(q_{J1}^2 - q_{J2}^2)/8,$$

where from (10) and (12) we have $q_{J1} - q_{J2} = (4\theta + 3)(c_B - c_A)/(2b)$.

$$\text{Thus, } \pi_{F1} > \pi_{F2} \iff c_B > c_A. \quad \square$$

The foreign firms prefers the more efficient firm to be its partner mainly for two reasons. First, this way the IJV will be more efficient and therefore make more profits, and second it will extract a higher subsidy from the host government (lemma 1).

We shall now show that the domestic firms are always willing to join the IJV. Formally,

Proposition 2 *Both domestic firms would like to join the IJV.*

Proof: The difference in profits for firm A in the two scenarios is $s_1\pi_{J1} - \pi_A = b((7/8)q_{J1}^2 - bq_A^2)$, and since $\sqrt{(7/8)} q_{J1} - q_A > (3/4) q_{J1} - q_A$ and $(3/4)q_{J1} - q_A = (a - 12\theta c_A - 20c_F + 20c_F\theta + 9c_B - 8\theta c_B + 10c_A)/(8b) = f(\theta)$ (say), the proposition is proved if we can show that $f(\theta)$ is always positive. In fact, $8b f'(\theta) = 12(c_F - c_A) + 8(c_F - c_B) < 0$ and $8b f(1) = 2bq_{J1}|_{\theta=1} + 2(c_A - c_B) = 2bq_{J2}|_{\theta=1} + 5(c_B - c_A) > 0$, irrespective of the relative efficiencies of firms A and B. Thus, for all values of θ such that $0 \leq \theta \leq 1$, we have $f(\theta) > 0$. \square

Finally, how can the host government influence the nature of the IJV? This is the question that we now turn to. For this, we first define the host country welfare levels — W_1 and W_2 —, and global welfares — GW_1 and GW_2 —, under the two scenarios. Now, we compare the welfare levels of the country under the two scenarios, i.e., when the partnership is formed with firm A and firm

B respectively. These two welfare levels are given by:

$$\begin{aligned} W_1 &= s_1\pi_{J1} + \pi_B + t_1q_{J1} + CS_1, & W_2 &= s_2\pi_{J2} + \pi_A + t_2q_{J2} + CS_2, \\ GW_1 &= \pi_{J1} + \pi_B + t_1q_{J1} + CS_1, & GW_2 &= \pi_{J2} + \pi_A + t_2q_{J2} + CS_2, \end{aligned}$$

where CS_i is the consumers' surplus in scenario i ($i = 1, 2$). From the above, we derive:

$$\begin{aligned} 16b(W_1 - W_2) &= (c_B - c_A)((15 - 16\theta^2)(c_A + c_B) + 32\theta^2c_F + 8\theta(a - c_F) - 6a - 24c_F), \\ 32b(GW_1 - GW_2) &= 3(c_B - c_A)((13 - 16\theta^2)(c_A + c_B) + 32\theta^2c_F + 8\theta(a - c_F) - 2a - 24c_F), \\ GW_1 - GW_2 &= 3(W_1 - W_2)/2 + 3(c_B - c_A)(2a - c_B - c_A)/(16b). \end{aligned} \quad (13)$$

From the first two equations it can be that

$$\begin{aligned} W_1 > W_2 &\iff \theta > \theta^* = \frac{a - c_F - \sqrt{K}}{4(c_A + c_B - 2c_F)}, \\ GW_1 > GW_2 &\iff \theta > \theta^{**} = \frac{a - c_F - \sqrt{K + 2(c_A + c_B - 2c_F)(2a - c_A - c_B)}}{4(c_A + c_B - 2c_F)}, \end{aligned}$$

where $K = 49c_F^2 + 10ac_F + a^2 + 15(c_A^2 + c_B^2) - 6a(c_A + c_B) + 30c_Ac_B - 54c_F(c_A + c_B)$. Clearly, $\theta^{**} < \theta^*$.

The reason why the host government may prefer the IJV partnership to be formed with the less efficient firm when θ is sufficiently low is that in this case the technology transfer is high and the average efficiency level of the industry (and thus the consumers' surplus) will be higher if the foreign firm forms a partnership with the less efficient firm than with the more efficient one.

We can now consider three cases. First, when $\theta > \theta^*$ both the foreign firm and the host government will prefer an IJV with the more efficient firm, and the latter is happy to join in. Second, when $\theta^{**} < \theta < \theta^*$, the host government would prefer the partnership to be with the less efficient firm where as the foreign firm prefers the more efficient one. However, since $GW_1 > GW_2$ in this case, the foreign firm would be able to make a lump-sum payment to the host government so that both parties are happy with a partnership with the more efficient firm. Finally, when $\theta < \theta^{**}$, the host government and the foreign firm will have opposite interests as above, but since

$GW_2 > GW_1$ in this case, the host government would be able to make a lump-sum payment to the foreign firm so that both parties are happy with a partnership with the less efficient firm. Formally,

Proposition 3 *(i) If $\theta > \theta^*$, the MNC will form an IJV with the more efficient domestic firm, and the host government is happy with the outcome, (ii) if $\theta^{**} < \theta < \theta^*$, the MNC can form an IJV with the more efficient domestic firm by making a lump-sum transfer to the host government, and (iii) if $\theta < \theta^{**}$, the host government can induce the MNC to form an IJV with the less efficient domestic firm by making a lump-sum transfer to the MNC.*

4 Conclusion

In this paper, we develop a three-stage game to analyze how an IJV allocates profits between the partners. However, the MNC has a choice between forming an IJV partnership with one of two cost-asymmetric firms. The foreign firm takes the leadership of the IJV and is solely responsible for deciding the optimal profit share. However, the domestic partner receives more than 50% share of profits from the IJV. This is because the host government offers a subsidy to the IJV and this subsidy can be affected by the foreign firm by manipulating the sharing of profits. We show that the foreign firm always prefers the more efficient domestic firm as a partner. However, the host government may prefer the partnership to be with the less efficient firm when the level of technology transfer in the IJV is sufficiently high. In the latter case, by allowing for lump-sum transfer, we characterize two situations when the partnership will be with the more and the less efficient firm respectively, in a mutually beneficial manner.

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