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Foreign equity caps for international joint ventures

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Abstract

We analyze foreign equity caps for international joint ventures. We develop a partial equilibrium model in which foreign equity caps are determined endogenously and find an interesting property, named a welfare indifference property; i.e., maximization of domestic welfare and that of world welfare are indifferent for the host government. This property also implies that the government is indifferent to the distribution of a JV's profit.

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1 Introduction

International joint ventures (IJVs) have been observed in industries with imperfectly competitive markets. For these IJVs, some less developed countries have enforced foreign equity caps, which sets a ceiling on the ownership share of foreign firms. For instance, Thailand limits foreign ownership share to less than 50% for IJVs in 43 industries (JETRO, 2002).

In spite of such observations, there are few papers dealing with foreign equity caps for IJVs.[1] In this paper we develop a simple partial equilibrium framework in which foreign equity caps are determined endogenously and find an interesting property where a host government uses the foreign equity cap as an instrument to determine the optimal market structure. The host government first determines the foreign equity cap level, and then firms determine whether they set up a joint venture (JV). If they agree to set up a JV, their ownership shares are obtained through Nash bargaining. Similar to Abe and Zhao (2002), we assume that if firms disagree, they will compete in the market in a Cournot fashion. In this setting, we show that given model parameters, two possible equilibria exist. One of these provides a foreign equity cap that practically prohibits IJVs, while the other allows firms to set up IJVs. Furthermore, we show the *welfare indifference property*, *i.e.,* maximization of domestic welfare and that of world welfare are indifferent for the host government. The optimal foreign equity cap level is thus same in the both maximization problems. This property also implies that the government is indifferent to the distribution of a JV's profit.

The reminder of the paper is organized as follows. Section 2 provides a basic model. Section 3 solves the game, obtains the equilibrium foreign equity caps, and explains the welfare indifference property. Section 4 concludes.

2 The Model

Consider two countries; a less developed country and a developed country. Since this paper focuses on the policy implemented by the government in the less developed country, we label the former country h (*home* or *host country*), and the latter country f (*foreign country*). Each country has a firm, firms h and f, respectively, that produces homegeneous products. The product market is located in country h. The inverse demand function for the market

[1]Svejner and Smith (1984) consider foreign equity caps for IJVs in an industry with vertical production and show that the policy may be ineffective because of transfer pricing. Das and Katayama (2003) show that foreign equity caps reduce welfare in the host country under imcomplete information. The focus of these papers is quite different from ours.

is given by

$$P = P(X) \quad with \quad P' < 0, \tag{1}$$

where P and X are price and total quantity of the product, respectively.

There are two possible equilibrium market structure. In the first, the firms set up a JV (*JV monopoly*) and $X = X_{JV}$, where X_{JV} is the output produced by the JV. In the second, they compete in a Cournot fashion (*Cournot duopoly*) and $X = x_h + x_f$, where x_i is the output produced by firm i $(i = h, f)$. In the latter case, firm f incurs a trade cost while exporting.

In setting up the JV, firms determine their ownership shares through Nash bargaining. Let $\beta \in [0, 1)$ be the ownership possessed by firm f.[2] The host government can regulate firm f's ownership share using a foreign equity cap, $\delta \in [0, 1)$.[3]

We consider a three-stage game, where in the first stage, the government in country h sets a foreign equity cap level, δ. In the second stage, given the foreign equity cap, firms h and f decide whether to set up a JV and determine their ownership shares or to compete in the market as distinct firms. In the third stage, given the market structure (*i.e.,* JV monopoly or Cournot duopoly), firms produce and supply the products.

Production uses labor and firms have different technologies. The cost functions for firm h and f are provided as follows:

$$C_h = C(x_h; \gamma_h, w_h) \tag{2}$$

$$C_f = C(x_f; \gamma_f, w_f, \tau), \tag{3}$$

where γ_i is a technology paramater, w_i is a wage level, and τ is trade cost $(i = h, f)$. Assume that these cost functions (2) and (3) satisfy the following relationships; $C(0) = 0$, $C' > 0$, $C'' \geq 0$, $\partial C_i / \partial \alpha_i > 0$, $\forall \alpha_i = \gamma_i, w_i$ $(i = h, f)$, and $\partial C_f / \partial \tau > 0$. In this paper, a smaller γ corresponds to a higher techonlogy. Assume that the firm in the developed country (firm f) has superior technology; *i.e.,* $\gamma_h > \gamma_f$, and that the wage in the less developed country is lower; *i.e.,* $w_h < w_f$. When a JV is set up, it can exploit firm f's superior technology and country h's lower wage. Therefore, the JV's cost function is given by[4]

$$C_{JV} = C(X; \gamma_f, w_h). \tag{4}$$

[2]In our model, we exclude the possibility that other investors possess ownership rights in the JV.

[3]Note that if β, which is determined through Nash bargaining, is greater than δ, β is regulated, while if β is smaller than or equal to δ, it is allowed, because a foreign equity cap permits a smaller foreign ownership level than the requirement.

[4]Note that $X = X_{JV}$ because the JV is a monopolist.

Since the JV has a better production environment, the JV's marginal cost is lower than each firm's; *i.e.,* $\partial C_i/\partial x_i > \partial C_{JV}/\partial X$, $\forall i = h, f$.

3 Foreign Equity Caps

We now solve the game using backward induction. In the third stage, we have two market structures; (i) Cournot duopoly; and (ii) JV monopoly. We find the respective equilibrium for each market structure.

First, consider the case of Cournot duopoly. From equations (1), (2) and (3), the profit functions are

$$\pi_h = P(X)x_h - C_h, \tag{5}$$
$$\pi_f = P(X)x_f - C_f, \tag{6}$$

where π_i $(i = h, f)$ is firm i's profit. The first order conditions for equations (5) and (6) are

$$P(X) + P'(X)x_h - \frac{\partial C_h}{\partial x_h} = 0, \tag{5'}$$
$$P(X) + P'(X)x_f - \frac{\partial C_f}{\partial x_f} = 0. \tag{6'}$$

The second order condition is assumed to be satisfied.[5] From equations (5') and (6'), we obtain Cournot outputs x_h and x_f, and substituting them back into equations (5) and (6), and find the profits π_h and π_f under Cournot duopoly.

Next, consider the JV monopoly. From equations (1) and (4), the JV's profit is given by

$$\Pi = P(X)X - C_{JV}. \tag{7}$$

The first order condition for equation (7) is

$$P(X) + P'(X)X - \frac{\partial C_{JV}}{\partial X} = 0, \tag{7'}$$

which determines the equilibrium output under JV monopoly, X. Then, we find JV's equilibrium profit, Π.

[5] We assume the inverse demand function (1) is not too convex for the second order condition to be satisfied. This condition guarantees the stability and uniqueness of the Nash equilibrium.

Now, consider a Nash bargaining in the second stage. The problem both firms face is[6]

$$\max_{\beta}\{\beta\Pi - \pi_f\}\{(1-\beta)\Pi - \pi_h\} \tag{8}$$

$$s.t. \qquad \beta\Pi \geq \pi_f \tag{9}$$

$$(1-\beta)\Pi \geq \pi_h \tag{10}$$

$$\delta \geq \beta. \tag{11}$$

Constraints (9) and (10) require that profit distributed to firm i from the JV be greater than firm i's profit under Cournot duopoly ($i = h, f$). That is, these are participation constraints. From equations (9) and (10), we obtain the threshold ownership shares of the JV for firms f and h as

$$\underline{\beta} \equiv \frac{\pi_f}{\Pi} \quad \text{(for firm } f) \quad \textit{and} \quad \overline{\beta} \equiv \frac{\pi_h}{\Pi} \quad \text{(for firm } h). \tag{12}$$

Define $\tilde{\beta}$ as the unconstrained solution of equation (8),

$$\tilde{\beta} \equiv \frac{1}{2} + \frac{\pi_f - \pi_h}{2\Pi}. \tag{13}$$

For both firms to agree to participate in the JV, $\tilde{\beta}$ must be in the interval $(\underline{\beta}, \overline{\beta})$. Note that this condition is equivalent to $\Pi > \pi_h + \pi_f$. Recall that δ is determined by the host government in the first stage. Depending on the level of δ, we have three cases for the equilbrium ownership share β^*.

Lemma 1
(i)If $\delta \geq \tilde{\beta}$, a JV is set up and the equilibrium ownership share is $\beta^* = \tilde{\beta}$.
(ii) If $\delta \in [\underline{\beta}, \tilde{\beta})$, a JV is set up and the equilibrium ownership share is $\beta^* = \delta$.
(iii) If $\delta < \underline{\beta}$, a JV is not set up and Cournot duopoly is realized.

Proof. *Suppose that $\delta > \tilde{\beta}$. Then, constraint (11) is not binding. The equilibrium ownership share is $\beta^* = \tilde{\beta}$. Next, suppose that $\delta \in [\underline{\beta}, \tilde{\beta})$. Constraint (11) is then binding and the equilibrium ownership share is $\beta^* = \delta$. Finally, if $\delta < \underline{\beta}$, constraint (9) is not satisfied and Cournot duopoly is thus realized. No equilibrium ownership share β^* exists.* ■

In the first stage, the government in country h determines the foreign equity cap level δ in order to maximize domestic welfare. For the market

[6]For simplicity, we assume that both firms have equal bargaining power.

structure $j = CD$ (Cournot duopoly), JV (JV monopoly), welfare in country h is given by

$$W^{CD} = CS^{CD} + \pi_h, \tag{14a}$$

$$W^{JV} = CS^{JV} + (1-\beta)\Pi, \tag{14b}$$

where $CS^j = \int_0^{X^*} P(X)dX - P(X^*)X^*$ is the consumer surplus in country h, and X^* is the equilibrium output ($j = CD, JV$). Note that the consumer surplus is independent of ownership share β for any market structure. From Lemma 1, market structures depend on the value of δ. Thus, equations (14a) and (14b) are rewritten as

$$W^{CD} = CS^{CD} + \pi_h \qquad \text{if} \quad \delta \in [0, \underline{\beta}) \tag{15a}$$

$$W^{JV} = CS^{JV} + (1-\delta)\Pi \qquad \text{if} \quad \delta \in [\underline{\beta}, \tilde{\beta}] \tag{15b}$$

$$W^{JV} = CS^{JV} + (1-\tilde{\beta})\Pi \qquad \text{otherwise.} \tag{15c}$$

Only equation (15b) is a decreasing function of δ. From (15a) - (15c), we find that the welfare function W is not continuous at $\delta = \underline{\beta}$ and continuous at $\delta = \tilde{\beta}$ (see Figure 1 and 2). We then have two possible solutions for the equilibrium foreign equity cap level δ^*. If $W^{JV}(\delta = \underline{\beta}) > W^{CD}$, the government sets $\delta^* = \underline{\beta}$ to maximize domestic welfare (see Figure 1). On the other hand, if $W^{JV}(\delta = \underline{\beta}) < W^{CD}$, the government chooses $\delta^* \in [0, \underline{\beta})$ and eliminates the possibility of a JV being set up (see Figure 2).

Proposition 1
If $W^{JV}(\delta = \underline{\beta}) < W^{CD}$, a host government chooses $\delta^* \in [0, \underline{\beta})$ and the market structure is a Cournot duopoly. If $W^{JV}(\delta = \underline{\beta}) > W^{CD}$, the government chooses $\delta^* = \underline{\beta}$, and the market structure is JV monopoly.

Choosing $\delta^* \in [0, \underline{\beta})$ is in effect the same as prohibiting IJVs. Then, in the former case, a host government maximizes domestic welfare by fostering competition in the market. In contrast, $\delta^* = \underline{\beta}$ is a threshold ownership share for firm f to set up a JV (see equation (12)). Thus, in the latter case, the government allows firms to set up a JV and provides the domestic firm with the maximum ownership share.

Proposition 1 provides a condition that separates the two equilibrium market structures implying that a foreign equity cap is an instrument the government can use to influence market structure (JV monopoly or Cournot duopoly). Suppose the host government chooses $\delta^* = \underline{\beta}$. Substituting equation (12) into equation (14b), welfare in country h is then

$$W^{JV}(\delta^* = \underline{\beta}) = CS^{JV} + (1-\underline{\beta})\Pi = CS^{JV} + \Pi - \pi_f. \tag{16}$$

Next, supposing that the government chooses $\delta^* \in [0, \underline{\beta})$, welfare is then obtained by equation (15a). The host government chooses Cournot duopoly (*resp.* JV monopoly) if W^{CD} is greater (*resp.* smaller) than W^{JV}. Substituting (15a) and (16) into this condition and rearranging, we find that the condition for the government to choose Cournot duopoly is equivalent to[7]

$$CS^{CD} + \pi_h + \pi_f > CS^{JV} + \Pi. \tag{17}$$

The left hand side and right hand side of equation (17) are world welfare under Cournot duopoly and JV monopoly, respectively.

Proposition 2
A host government chooses a foreign equity cap level $\delta^* \in [0, \underline{\beta})$ (resp. $\delta^* = \underline{\beta}$) if world welfare under Cournot duopoly is greater (resp. smaller) than that under JV monopoly.

Proposition 2 is a little bit surprising. As shown in equations (14a) and (14b), the host government concerned with domestic welfare, not firm f's profit. Equation (17) shows, however, that the government prohibits to a JV if world welfare under Cournot duopoly, which includes firm f's profit, is greater than that under JV monopoly. Otherwise, the government chooses a foreign equity cap level equal to the threshold ownership share for firm f.[8] This result illustrates a *welfare indifferece property*, which means that maximization of domestic welfare and that of world welfare are indifferent for the host government. Katrak (1983) considers perfectly competitive markets and a given exogenous market structure, and shows that a foreign equity cap leads to a reduction of foreign ownership share, which corresponds to an increase in national welfare. The distribution of a JV's profit is thus crucial for national welfare. In contrast, our model focuses on an imperfectly competitive market and the host government's optimal policy corresponds to that of determining the optimal market structure. Then, the distribution of a JV profit is no longer crucial. Therefore, enforcing a foreign equity cap, the host government considers world welfare level rather than the distribution of a JV's profit, even if its aim is to maximize domestic welfare.

[7]Since the JV has a better production environment (see equations (2), (3), and (4)), marginal cost under JV is smaller than that under Cournot duopoly. Thus, the inequality in (17) may be reversed in some cases.

[8]It is confirmed that both cases exist. We consider a example with linear demand $P = a - bX$, and cost functions $C_h = \gamma_h w_h x_h$, $C_f = \tau\gamma_f w_f x_f$ and $C_{JV} = \gamma_f w_h X$. Given $a = 6$, $\tau = 1$, $\gamma_f = 0.5$, $\gamma_h = 2$, $w_f = 2$ and $w_h = 0.5$, $W^{CD} - W^{JV} = -3.72 < 0$. The government then chooses $\delta^* = \underline{\beta} = 0.34$. On the other hand, given $a = 18$, $\tau = 1$, $\gamma_f = 0.5$, $\gamma_h = 2$, $w_f = 2$ and $w_h = 0.5$, $W^{CD} - W^{JV} = 7.85 > 0$. The government then chooses $\delta^* \in [0, \underline{\beta})$, where $\underline{\beta} \approx 0.4$.

4 Conclusion

We have considered the role of foreign equity caps in less developed countries. Our focus is, in particular, on foreign equity caps for international joint ventures, which few papers examine. Choosing a foreign equity cap level that maximizes domestic welfare, a host government can affect the market structure; Cournot duopoly or JV monopoly. We explain the welfare indifference property, which implies that world welfare is critical in the determination of a market structure, even if a government aims to maximize domestic welfare. The host government is not concerned with ownership share of the domestic firm. This result contrasts with that of Katrak (1983). If world welfare under Cournot competition is greater than that under JV monopoly, the host government sets the foreign equity cap level that prevents international joint ventures. In contrast, if world welfare under JV monopoly is greater, the government sets the foreign equity cap level at the threshold ownership level for foreign firms and enjoys JV's production advantage. The latter case is possible because the JV tends to have a production advantage, *i.e.,* superior technology and lower wage, and therefore output under monopoly may be greater than that under duopoly.

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Figure 1: The case of $\delta^* = \underline{\beta}$

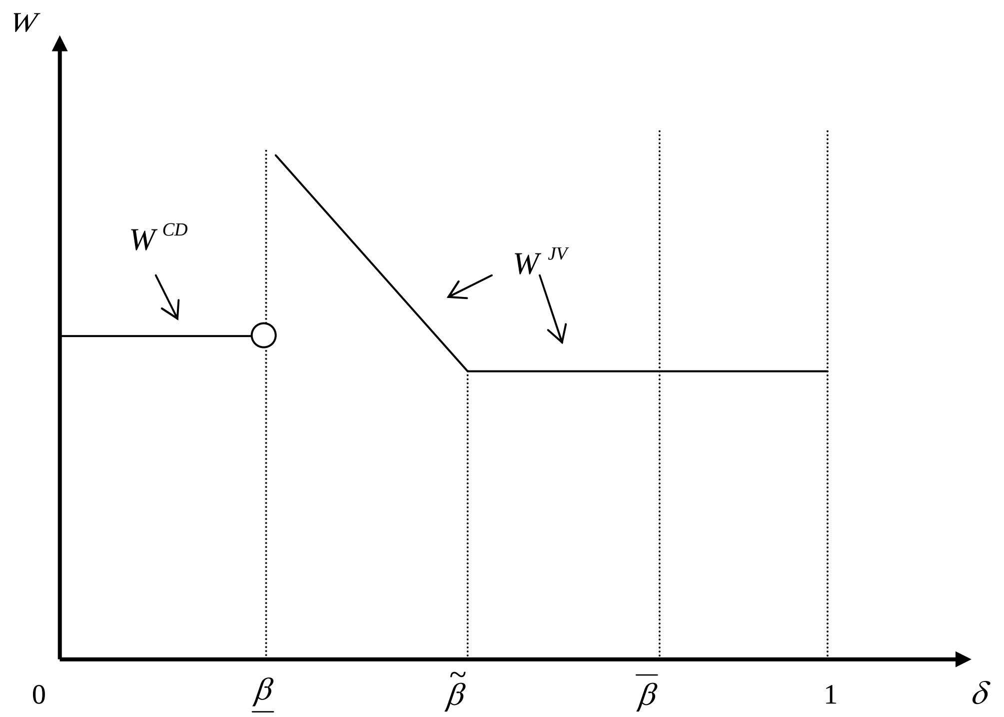

Figure 2: The case of $\delta^* \in [0, \underline{\beta})$