International Joint Ventures: A Welfare Analysis

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We examine the welfare implications of joint venture formation between an MNC and a firm from a less developed country (LDC). For symmetric firms greater the market size, greater is the incentive for joint venture formation. Moreover, joint venture formation is welfare reducing for both high, as well as low levels of demand. However, if the MNC is more efficient compared to the LDC firm then the results are different. We find that smaller the market size greater the incentive for joint venture formation. Moreover, joint venture formation is welfare enhancing for both high, as well as low levels of demand.

Key words: Joint ventures; Synergy; Moral hazard; Welfare


1 INTRODUCTION

Joint ventures are of special interest to less developed countries (LDCs) interested in fostering foreign direct investments in their countries. Since the 1980s many LDCs have been pursuing a policy of domestic liberalization. One of the goals behind such policies is to attract foreign multinational companies (MNCs) to invest in the domestic economy. Many LDCs are actively trying to promote joint ventures as a vehicle for such foreign participation. In India, for example, whereas foreign firms were not allowed to hold majority shares in joint ventures earlier, now, except in certain sectors like power, they are allowed to do so. The process of getting out of joint ventures has also been simplified. Moreover, many new sectors are in the process of being opened to foreign investment, including joint ventures. All these should make joint venture formation much more attractive for foreign MNCs.

In the last two decades the rate of joint venture formation in the LDCs has increased dramatically. There are several studies that examine the question of joint venture formation. Among empirical studies we can mention Hergert and Morris (1988) and Pekar and Allio (1994). While theoretical studies include, among others, Al-Saadon and Das (1996), D’Aspremont and Jaquemin (1988), Bardhan (1982), Chan and Hoy (1991), Chao and Yu

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For the policy makers, however, the most relevant questions concern the welfare implications of such ventures. Somewhat surprisingly the welfare aspect of joint venture formation has received relatively little theoretical attention. (One exception is Singh and Bardhan (1991) who examine government policy when more than one multinational is competing for entry.) In this paper we make a modest beginning in analyzing the welfare implications of joint ventures between MNCs and domestic firms from less developed countries and relate them to the size of the market demand, as well as the cost structures of the parent firms.

We develop a theory of joint venture formation that relies on synergy among the partner firms. In joint ventures involving a foreign multinational and an LDC firm, it has often been observed that the MNC provides the superior process and product technology, management knowhow, capital, access to finance etc., while the domestic firm provides a knowledge of local politics and government regulations, access to distribution channels and local markets etc. Thus the joint venture can produce much more efficiently compared to either one of the parent firms. (See Miller et al. (1996)). In the Indian context, in the alliance between Hewlett and Packard (HP) and HCL in computers, HP hoped for a quick access to the Indian market, while HCL hoped to utilize HP’s competence in business processes, production and quality maintenance. (See Business India (1992)). Dymsza (1988) provides several case studies that support this viewpoint.

Furthermore, we assume that joint venture formation involves some coordination costs arising out of moral hazard problems. Such costs arise because the input levels in the joint venture are not verifiable in a court, so that it is not possible to write contracts that are contingent on these variables. Thus both the firms have an incentive to free-ride on its partner. An indirect evidence of such coordination costs is provided by Hergert and Morris (1988) who find that 81% of all joint ventures studied by them involve only two firms. Other papers that deal with the moral hazard problem in joint ventures include Das (1998) and Roy Chowdhury and Roy Chowdhury (2001a).

We find that the results are critically dependent on whether the cost structures of the firms are symmetric or not. If the firms are symmetric then the incentive for joint venture formation is increasing in the market size. Moreover, joint venture formation is likely to be welfare reducing if the domestic demand is either very high, or very low. Whereas if the MNC is more efficient compared to the domestic firm, so that the firms are asymmetric, then the incentive for joint venture formation is decreasing in market size. Moreover, joint venture formation is likely to be welfare enhancing if the domestic demand is either very low, or very high.

The rest of the paper is organized as follows. The next section examines the incentive for joint venture formation, first when the firms are symmetric, next when they are asymmetric. Section 3 examines, for both the cases, the welfare implications of joint venture formation. Finally, Section 4 concludes.

2 THE MODEL

In the first sub-section we consider the model with symmetric costs, while the case of asymmetric costs is taken up in the following sub-section.
2.1 Symmetric Costs

The market comprises two firms, one multinational (denoted firm 1) and one domestic (denoted firm 2). For simplicity we assume that the demand function is linear in the level of price, i.e.

\[ q = a - p, \]  

where \( a \) is an index of market size. In order to ensure that the output levels under various market configurations are positive we assume that \( a \) is not too small in the sense that \( a \geq \tilde{a} = \max\{4, 4\beta - 2\} \).

There are two factors of production, capital (\( K \)) and labor (\( L \)). The production function of both the firms are taken to be identical and of the form,

\[ q = (KL)^{1/2}. \]  

While, for expositional simplicity, we talk of just capital and labor, in reality both these variables are multi-dimensional. Capital, for example, is a shorthand for other variables like technological knowhow and management expertise, while labor is a shorthand for other variables like knowledge of local conditions and access to distribution channels.

Let the per unit wage and rental cost for the MNC be \( w^m \) and \( r^m \) and that for the domestic firm be \( w^d \) and \( r^d \). We assume that the multinational firm has cheaper access to capital, while the domestic firm has cheaper access to labor. Thus

\[ r^m < r^d, \quad w^m > w^d. \]  

Furthermore, these costs are symmetric in the sense that

\[ r^m = w^d = 1, \quad r^d = w^m = \beta^2, \]  

where \( \beta > 1 \).

Depending on the expected profits the firms can either form a joint venture, or pursue Cournot competition. In case of joint venture formation the partner firms jointly decide on the aggregate level of output. Under Cournot competition the firms simultaneously decide on their output levels.

First consider the case where there is joint venture formation. Joint venture profits are assumed to be equally shared between the parent firms. There are two ways of interpreting this. First, we can assume that the government exogenously fixes the profit sharing rule. Alternatively, we can assume that the profit sharing rule is the outcome of some bargaining process. Since the model is completely symmetric most bargaining solutions would yield a equal profit sharing rule.

Under a joint venture the MNC supplies capital and the domestic firm supplies labor, so as to take advantage of the synergistic effects. However, because the levels of inputs are non-verifiable, the partner firms cannot write a contract over the amounts of inputs. Hence the contract only specifies that the gross profit is to be equally divided among the partner firms. The input costs are borne by the firm that supplies the input. We solve for the Nash equilibrium of the game where the MNC and the domestic firm simultaneously decide on how much capital and labor, respectively, to supply. Straightforward calculations show that, \( J \), the net profit of each firm in equilibrium equals \( a(a - 4)/8 \).
We then examine the outcome under Cournot competition. A straightforward reaction function approach shows that the profit level of each firm under Cournot equilibrium, \( \bar{P} \), would be \( (a - 2\beta)^2/9 \).

Obviously both the firms opt for a joint venture provided their profit under a joint venture, \( \bar{J} \), exceeds their profit from Cournot duopoly, \( \bar{P} \). Proposition 1 below examines the impact of a change in market size, \( a \), on the incentive for joint venture formation.

**PROPOSITION 1** Let \( a \) denote the market size for which the firms are indifferent between joint venture formation and Cournot competition.

(i) Suppose that for the minimum feasible level of demand (i.e. \( a = \bar{a} \)), both the firms opt for Cournot competition. Then, there is Cournot competition whenever market size is small (in the sense that \( \bar{a} \leq a < x \)). There is joint venture formation otherwise.

(ii) Suppose that for the minimum feasible level of demand (i.e. \( a = \bar{a} \)) both the firms opt for joint venture formation. Then, irrespective of market size, there is joint venture formation.

Thus greater the market size \( a \), greater are the chances that a joint venture is going to form. Before explaining the intuition behind Proposition 1 we need to introduce three concepts, the moral hazard effect, the rent dissipation effect and the synergistic effect.

The moral hazard effect is an index of the reduction in joint venture profits due to the presence of moral hazard. We measure this as the difference between monopoly profits (when there are no moral hazard problems) and joint venture profits (when moral hazard effects are present) i.e. \( [(a - 2)^2/4 - a(a - 4)/4] \). The rent dissipation effect measures the fall in aggregate profits due to Cournot competition. We measure it as the difference between monopoly and aggregate Cournot profits (under the assumption that under both market forms all the firms are efficient) i.e. \( [(a - 2)^2/4 - 2(a - 2)^2/9] \). Finally, the synergistic effect i.e. \( [2(a - 2)^2/9 - 2(a - 2\beta)^2/9] \) measures the difference that access to cheap inputs makes to aggregate Cournot profits.

Observe that the expression \( 2J - 2P \), the difference between aggregate profits under a joint venture and Cournot competition, can be decomposed as the sum of the rent dissipation and the synergistic effect minus the moral hazard effect. Thus while the synergistic effect and the rent dissipation effect favors joint venture formation, the moral hazard effect favors Cournot competition. It is easy to see that both the rent dissipation and the synergistic effects are increasing in \( a \), the market size. With an increase in market size the equilibrium level of output increases so that the firms can exploit the synergistic gains to a greater extent, hence the synergistic effect is increasing in \( a \). Moreover, with an increase in \( a \) the monopoly output increases at a greater rate compared to the individual Cournot outputs. This is sufficient to ensure that the monopoly profits increase at a greater rate compared to aggregate Cournot profits. Hence the rent dissipation effect is also increasing in market size. Finally, the moral hazard effect is independent of the demand level. Hence the result follows.

### 2.2 Asymmetric Costs

In this sub-section we analyze the case where the MNC is much more efficient compared to the domestic firm.

For simplicity we focus on the extreme case where the capital cost is infinity for the domestic firm. Thus in the absence of joint venture formation the domestic firm is not going to produce at all (this follows from the nature of the production function), and the foreign firm is going to become a monopolist. This assumption may be realistic in many international
joint ventures. Formally, in this case \( r^m = w^m = 1, w^m = \beta^2, r^d = \infty \). We find that in this case the results are dramatically reversed.

Let us begin by analyzing the outcome when the MNC is a monopolist in the domestic market. Clearly, the monopoly level of profit is \( (a - 2\beta)^2/4 \). The profit of the domestic firm is obviously zero.

We then consider the outcome under joint venture formation. We assume that the sharing rule is exogenously given by the government. Let \( d \) denote the share of the MNC firm, where \( d \sim \frac{a}{\beta} \). (In Roy Chowdhury and Roy Chowdhury (2001b) we briefly consider a model where the sharing rule is endogenous to the problem.) For technical reasons we assume that market size is not too small (in the sense that the demand parameter is at least \( \max\{a', \bar{a}\} \)), where \( a' = 1/(1 - \delta)(2\beta - (\delta/(1 - \delta))^{1/2}) \). Straightforward calculations show that the profit level for the MNC firm is given by \( (a/2)[a\delta/2 - (\delta/(1 - \delta))^{1/2}] \).

Proposition 2 below examines the impact of a change in market size \( a \) on the incentive for joint venture formation.

**Proposition 2.** Let \( \bar{a} \) denote the market size for which the MNC is indifferent between joint venture formation and being a monopolist.

(i) Suppose that for the minimum feasible level of demand (i.e. \( a = \max\{a', \bar{a}\} \)) the MNC prefers joint venture formation to being a monopolist. Then there is joint venture formation provided market size is small (in the sense that \( \max\{a', \bar{a}\} \leq a \leq \bar{a} \)). There is MNC monopoly otherwise.

(ii) Suppose that for the minimum feasible level of demand (i.e. \( a = \max\{a', \bar{a}\} \)) the MNC prefers to be a monopolist. Then, irrespective of market size, there is MNC monopoly.

It is easy to see why the result holds. Notice that under both the market configurations there is effectively just one firm in the market. Thus the rent dissipation effect is absent in this case. Next observe that the difference between joint venture and monopoly profits can be expressed as the difference between the synergistic effect \( (a - 2\beta)^2/4 - (a - 2\beta)^2/4 \) and the moral hazard effect \( (a - 2\beta)^2/4 - (a/2)[\delta/2 - (\delta/(1 - \delta))^{1/2}] \). It turns out that in this case both the moral hazard, as well as the synergistic effect is increasing in \( a \).

Why is the moral hazard effect increasing in this case? Note that now the benchmark involves monopoly, rather than Cournot competition as was the case earlier. Since, with an increase in \( a \), monopoly profits increase at a faster rate compared to that under Cournot competition, the result follows.

Thus there are two offsetting effects of a change in \( a \). However, with an increase in \( a \) the synergistic effect becomes relatively insignificant, in the sense that the difference \( \beta - a \) becomes very small. Thus for \( a \) large the moral hazard effect dominates. Hence the result.

Note that in this case a low level of demand favors joint venture formation, while a high level of demand favors MNC monopoly. Thus the effect of an increase in the demand level is exactly the opposite of what we obtained for the symmetric case (Proposition 1). Thus Propositions 1 and 2 together provide an empirically testable prediction of our theory.

### 3 WELFARE ANALYSIS

We then examine some welfare implications of joint venture formation.
3.1 Symmetric Costs

We first consider the case when the firms are symmetric. We assume that the MNC repatriates the whole of its profits. Thus welfare equals consumers’ surplus plus the profit of the domestic firm.

We begin by arguing that if the market size $a$ is large enough, then consumers’ surplus under a joint venture is less than that under Cournot competition. The intuition is as follows. Due to competition the output level under Cournot duopoly tends to be greater than that under a joint venture. However, the synergistic effect tends to overturn this effect, while the moral hazard effect tends to reinforce this. The condition that $a$ is large compared to $\beta$, however, ensures that the synergistic effect is not too large, hence the result.

We then argue that for $a$ large, the welfare under Cournot competition exceeds that under a joint venture. The intuition is as follows. Consider the sum of consumers’ surplus and the profit of the domestic firm. It is clear that this sum is increasing in the level of aggregate output. We first consider the case when joint venture formation involves no synergistic effects. Clearly Cournot competition welfare dominates joint venture formation if and only if the output level under Cournot competition exceeds that under joint venture. From our earlier analysis we know that this is going to be the case whenever $a$ is large. Next consider the case when synergistic effects are present. In this case the analysis needs to take this into account. However, for $a$ large, the synergistic effect is relatively small. Thus the output effect dominates and hence the result follows.

We then examine the welfare effects when $a$ is small in the sense that the aggregate Cournot profits exceed aggregate joint venture profits. We argue that this is sufficient to establish that the consumers’ surplus under Cournot competition exceeds that under a joint venture. The intuition is as follows. The fact that Cournot competition is more profitable than joint venture formation implies that, because of moral hazard problems, the output level under the joint venture is much less than the optimum. In our model this is sufficient to ensure that the output level under a joint venture is less than the aggregate output under Cournot competition. Hence the result.

Summarizing the above discussion we obtain Proposition 3.

**Proposition 3.**

(i) If market size is large (in the sense that $a > 8\beta - 6$), then the consumers’ surplus under Cournot competition exceeds that under a joint venture.

(ii) If market size is large, Cournot competition welfare dominates joint venture formation.

(iii) Suppose that market size is small in the sense that the firms opt for Cournot competition. Then Cournot competition welfare dominates joint venture formation.

Thus for both $a$ large and $a$ small, Cournot competition welfare dominates joint venture formation.

Putting Propositions 1 and 3 together we find that if the market size is large, then a joint venture is likely to form but this is welfare reducing. Thus in this case some policies aimed at discouraging joint venture formation may be warranted. Whereas if market size is small than Cournot competition is likely to occur. Furthermore, Cournot competition welfare dominates joint venture formation. Thus in this case policy intervention is not warranted.

3.2 Asymmetric Costs

In this sub-section we show that the welfare implications are dramatically different if the firms are asymmetric.
To begin with we argue that consumers’ surplus under joint venture formation exceeds that under MNC monopoly if and only if the cost parameter, $\beta$ is large enough. Intuitively speaking the fact that $\beta$ is high implies that the synergistic effects under joint venture formation is large, which is what drives this result.

We then argue that if market size $a$ is large, the welfare under joint venture formation exceeds that under MNC monopoly. As the demand parameter $a$ increases, the profit of the domestic firm under a joint venture increases at an increasing rate. The difference in consumers’ surplus between MNC monopoly and joint venture formation, however, increases at a constant rate. Hence the result.

Finally we argue that if the demand level is low, in the sense that the firms opt for joint venture formation, then joint venture formation welfare dominates MNC monopoly. The intuition is as follows. Since joint venture profits are greater than monopoly profits, this in turn implies that the output level under a joint venture cannot be too small compared to that under MNC monopoly. Thus the difference in consumers’ surplus cannot be too large. Since welfare under joint venture also includes an additional effect in the form of the profit of the domestic firm, this additional effect is sufficient to offset any small difference in consumers’ surplus.

Summarizing the above discussion we obtain our next proposition.

**Proposition 4.**

(i) Consumers’ surplus under joint venture formation exceeds that under MNC monopoly if and only if the synergistic effect is large (in the sense that $\beta > a/2 - [a^2/4 + 1/\delta(1 - \delta) - a/\delta(1 - \delta)]^{1/2})^{1/2}$.

(ii) If the market size $a$ is large, joint venture formation welfare dominates monopoly by the MNC.

(iii) Suppose that the firms opt for joint venture formation. Then joint venture formation welfare dominates MNC monopoly.

Thus if the demand level is either low or high, then joint venture formation is welfare enhancing. These results are the opposite of what we obtained for the case when the firms were symmetric.

Next putting together Propositions 2 and 4 we find that for low levels of demand a joint venture is likely to form. Moreover, it is welfare enhancing. Whereas, for high levels of demand the outcome is likely to be MNC monopoly, which is welfare reducing. Again policy intervention appears to be called for only if the demand level is high.

Finally let us observe that the more asymmetric the costs are, lower is the welfare level under duopoly as it is closer to the monopoly outcome. This is why the welfare implications under symmetric and asymmetric costs are quite different.

### 4 Conclusion

In this paper we examine the incentive for joint venture formation between MNCs and domestic firms from LDCs, as well as the possible welfare implications. We find that the results are critically dependent on whether the firms are symmetric or not.

For symmetric firms the incentive for joint venture formation is increasing in the level of demand. If, however, the MNC is more efficient compared to the domestic firm then the incentive for joint venture formation is decreasing in the level of demand. This is an empirically testable prediction of our theory.
The welfare implications are similarly dependent on whether the firms are symmetric or not. If the firms are symmetric then joint venture formation is welfare reducing for both high, as well as low levels of demand. Whereas if the firms are asymmetric then joint venture formation is welfare enhancing for both high, as well as low levels of demand.

These results suggest that any policy prescription must be industry specific. Government intervention appears to be called for if the market size is large. The form of the intervention, however, is dependent on the structure of the industry concerned. Suppose that the industry is such that, overall, the LDC firms are as efficient as foreign firms. In that case, for a high level of demand, a joint venture is likely to form, which, however, is welfare reducing. Thus in this case policies discouraging joint venture formation appear to be called for. Next suppose that the industry is one where the LDC firms are much less efficient compared to the foreign firms. Then, for a high level of demand, the outcome is likely to be MNC monopoly, which is welfare reducing. Thus in this case policies encouraging joint venture formation appear to be called for. However, if market size is small, then we find that whenever joint venture formation is more profitable, it is also likely to be better in terms of welfare, whereas if it is less profitable, then it is also likely to be worse in terms of welfare. Thus no policy intervention appears to be required.

We then briefly examine the optimal policy programme when there are no restrictions on the policies that the government can pursue. We can show that a policy programme consisting of a per unit production subsidy, coupled with a lump-sum taxation on the MNC can achieve the first best. Moreover the first best outcome involves joint venture formation. Intuitively speaking the role of the production subsidy is to take care of the moral hazard problem, while joint venture formation ensures that the synergistic effects are not lost. Finally, lump-sum taxes on the MNC ensure that profits do not go out of the country.

Finally, the assumption that the LDC government can pursue a full range of first-best policy instruments may not be very realistic. In particular, international pressure may prevent the government from using differential taxation policies with respect to the MNC. In that case the production subsidies may have to be less than the first best level, as some of this subsidy will accrue to the MNC and will be repatriated away. It would be interesting to look at the optimal policies in this case. However, a complete analysis of more realistic scenarios would be lengthy and must await another paper.

References
5 APPENDIX

Proof of Proposition 1 Let $J_i$ represent the profit of the $i$-th firm under a joint venture. Then
\[
J_1 = \frac{1}{2}[a - (KL)^{1/2}(KL)^{1/2} - r^mK] \quad \text{and} \quad J_2 = \frac{1}{2}[a - (KL)^{1/2}(KL)^{1/2} - w^dL].
\]
The reaction functions of the two firms are 
\[
\hat{\alpha} \frac{J_1}{\partial K} = \frac{1}{2}[(a/2)(L/K)^{1/2} - L] - r^m = 0 \quad \text{and} \quad \hat{\alpha} \frac{J_2}{\partial L} = \frac{1}{2}[(a/2)(K/L)^{1/2} - K] - w^d = 0.
\]
The symmetric equilibrium where $K = L$ involves $\hat{q} = \hat{K} = \hat{L} = (a - 4)/2$. The net profit of each firm in equilibrium, $\hat{J}$, equals $a(a - 4)/8$.

Let $P_i = (a - q_1 - q_2)q_i - 2\beta q_i$ denote the profit level of the $i$-th firm under Cournot competition. A standard reaction function approach yields that the equilibrium output level for both the firms under Cournot competition would be $(a - 2\beta)/3$ and the profit level of each firm $P$ would be $(a - 2\beta)^2/9$.

Thus a joint venture forms, provided $Z(a) = a^2 - 4a[8\beta - 9] - 32\beta^2 \geq 0$, where $Z(a)$ denotes the incentive for joint venture formation. It is easy to see that $Z'(a) > 0$.

Proof of Proposition 2 Clearly, the domestic firm prefers joint venture formation. Hence a joint venture forms if and only if the MNC prefers joint venture formation to remaining a monopolist, i.e. $X(a) = 2a[2\beta - (\delta/(1 - \delta))]^{1/2} - a^2(1 - \delta) - 4\beta^2 \geq 0$. Clearly, $X'(a) = -2a[\delta/(1 - \delta)]^{1/2} - (1 - \delta)1^{1/2} - 2\beta$. Note that for all $a \geq a' = 1/(1 - \delta)[2\beta - (\delta/(1 - \delta))]^{1/2}$, $X'(a) < 0$.

Proof of Proposition 3

(i) Notice that the output level under a joint venture is $a(a - 4)/8$, and that under Cournot competition is $2(a - 2\beta)/3$. Thus the consumers’ surplus under Cournot competition is greater provided $a > 8\beta - 6$.

(ii) The profit of the domestic firm under joint venture is $a(a - 4)/8$, so that the consumers’ surplus is $(a - 4)^2/8$. Thus the welfare under a joint venture is $a(a - 4)/8 + (a - 4)^2/8 = (a - 2)(a - 4)/4$ and that under Cournot competition is $3(a - 2\beta)^2/9$. 

References


Thus welfare under Cournot competition exceeds that under a joint venture provided 
\((a - 2\beta)^2 / (a - 4)(a - 2) > 3/4\). Using l'Hospital’s rule we find that in the limit as \(a\) 
tends to infinity, the L.H.S. of the previous expression tends to 1.

(iii) Note that \(2(a - 2\beta)^2 / 9 > a(a - 4)/4 > (a - 4)^2 / 4 > (a - 4)^2 / 8\), where \(2(a - 2\beta)^2 / 9\) 
and \((a - 4)^2 / 8\) represent consumers’ surplus under Cournot competition and joint 
venture respectively. Thus under Cournot competition both the producers’ and the 
consumers’ surplus exceed that under a joint venture.

\[ \text{Proof of Proposition 4} \]
The proof is very similar to that of Proposition 3 and hence 
 omitted.

For detailed proofs and some additional technical details we refer the readers to Roy 
Chowdhury and Roy Chowdhury (2001b).