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LEARNING, LIBERALISATION AND JOINT VENTURES

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Abstract: We provide a two period, learning-based model of joint venture formation and breakdown. We show that depending on parameter values different dynamic patterns emerge. The outcome may involve early and stable joint venture formation, joint venture formation followed by breakdown, or Cournot competition in both the periods. Furthermore, the prospect of liberalisation in related products can create an additional incentive for joint venture formation.

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Key words: Joint ventures, learning, liberalisation, synergy, multinationals

I. INTRODUCTION

This paper is motivated by some empirical observations regarding joint ventures.

Joint ventures represent one of the most fascinating developments in international business. Especially in the last two decades the rate of joint venture formation has accelerated dramatically. (See, Hergert and Morris (1988) and Pekar and Allio (1994), among others, for studies one joint venture formation.) Recent studies suggest, however, that joint ventures are subject to frequent breakdowns.[1] Kogut (1989), for example, found that out of 92 joint ventures studied by him, about half had broken up by the sixth year. Even in India there have been several well documented cases of joint venture breakdowns. These include those between Proctor and Gamble (P & G) and Godrej, General Electric (GE) and Apar, Tata Sons and Unisys Corporation, to name only a few.[2]

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[1] See Beamish (1985) and Gomes-Casseres (1987) for surveys of prior research on joint venture stability.

[2] See Bhandari (1996–97), Business India (1992, 1996) and Ghosh (1996) for a description of these and other cases.

There have been several studies that examine the question of joint venture formation at a theoretical level.[3] The question of joint venture breakdown, however, has received relatively little theoretical attention. In this paper we make a modest beginning in this respect.

We develop a theory of joint venture life cycle that relies on two basic building blocks, synergy and organisational learning. Synergy arises out of the complementary competencies of the two partner firms. In joint ventures involving a foreign multinational (MNC) and a domestic firm (especially from a less developed country) it has often been observed that the MNC provides the superior technology, while the domestic firm provides a knowledge of local conditions, access to distribution channels etc.[4] 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 utilise HP's competence in business processes, production and quality maintenance.[5] Organisational learning, whereby the partner firms may acquire the other firm's competencies, provides the second building block of our theory.[6] In other to keep things simple we assume that learning is both sided and symmetric. Thus both the firms are assumed to learn at the same rate.

We consider a dynamic two period model consisting of two firms, an MNC and a domestic firm. In every period they decide whether to form a joint venture, or to compete over output levels. The MNC is assumed to be technologically superior, while the domestic firm has superior access to local knowledge. If, in period 1, a joint venture forms, then the MNC can internalise some of the local knowledge of its domestic partner. Similarly the domestic firm can internalise some of the technological knowledge of its foreign partner. As a consequence both the firms become more efficient in the second period. If, however, the firms decide to compete in the first period, then there is no learning. We solve for the subgame perfect equilibrium of this game.

We demonstrate that depending on parameter values several outcomes are possible. For intermediate levels of demand a joint venture would form in the first period, but it would break up in the next period. The outcome is quite intuitive. In the first period the joint venture forms to take advantage of synergistic cost savings. Once the joint venture forms, however, organisational learning occurs. Thus in the second period both the firms become more efficient, reducing the value of synergistic cost savings to the two partner firms. Thus forming a joint venture becomes less attractive and breakdown occurs. For high levels of demand the outcome involves the formation of a stable joint

[3] These include, among others, Al-Saadon and Das (1996), D'Aspremont and Jaquemin (1988), Bardhan (1992), Chan and Hoy (1991), Chao and Yu (1996), Choi (1993), Combs (1993), Katz (1986), Marjit (1991), Purakayastha (1993), Roy Chowdhury (1995, 1997), Svejnar and Smith (1986) etc.

[4] For example, Miller *et al.* (1996) suggests that access to local knowledge is the main reason why MNCs form joint ventures with local partners from less developed countries. Similarly, access to foreign technology is the main reason why the domestic firms form joint ventures. Dymsza (1988) provide several case studies that supports this viewpoint.

[5] See Business India (1992).

[6] See Hamel (1991), Hamel, Doz and Prahalad (1989), and Beamish and Inkpen (1995), among others, for studies of strategic alliances that take organisational learning into account.

venture. Whereas for low levels of demand a joint venture will not form at all provided the discount factor is not too high.

We then apply our theory to examine some aspects of the liberalisation process being carried out in various less developed countries, including India. Consider a scenario where the domestic country is pursuing a policy of sequential liberalisation. Thus while some segments of an industry are liberalised early, other segments are liberalised later. In India, for example, the lubricant sector has been liberalised early, while the other segments of the petroleum industry are yet to be liberalised, though it is on the agenda. We examine the impact of such a policy of sequential liberalisation on joint venture formation.

We demonstrate that such a policy can create an additional incentive for joint venture formation. It is possible that in such cases an MNC would prefer to form a joint venture even though, from a purely short run point of view, such a joint venture may not be worthwhile.

The lubricant industry in India seem to provide an example where MNC firms appear to persist in doing joint venture even though the immediate prospect does not appear too appealing. This sector has seen a lot of joint venture activity, for example those between Indian Oil and Mobil Oil, BPCL and Royal Dutch Shell, HPCL and Exxon, IBP and Caltex Petroleum etc. While some of these joint ventures has been reasonably successful (e.g. those like Gulf Oil India and Tide Water Oil), the majority does not appear to be doing too well. In fact some joint ventures like Motul Mafatlal, Motorol and Sunstar Lubricants have been completely marginalised in the market. Despite this joint venture breakups has not occurred to any significant extent.

One possible explanation for such behaviour can be provided in the light of our analysis. Most of the partner MNCs in these joint ventures are also active in related segments like refining, marketing of diesel, petroleum and LPG, etc. These segments have not yet been liberalised though further liberalisations are expected. Thus we may conjecture that the MNCs are treating these joint ventures essentially as learning vehicles, the expectation being that the knowledge acquired through such joint ventures is going to prove useful if and when further liberalisations take place.

Finally, we relate our work to the existing theoretical literature on joint venture breakdown. Kabiraj (1997) shows that a joint venture may breakup because a third firm, which is not part of the joint venture, becomes more efficient via imitation. Thus in contrast to our work it is learning by a third firm, rather than by joint venture partners, that drives the result in Kabiraj (1997). Another paper that provides a learning-based theory of joint venture breakdown is by Kabiraj, Marjit and Mukherjee (1996). The model developed by them is, however, very different from ours. They use a three firm model where due to the anti-merger effect demonstrated by Salant, Switzer and Reynolds (1983) there is a strong bias against joint venture formation. Thus in their framework the analytical problem is not really to explain why joint ventures may break up, but rather to explain why joint ventures may form in the first place—the reason being learning possibilities. One implication of this is that in a two period model firms always break up in the second period. In contrast our model generates the possibility of stable joint venture formation, as well as joint venture breakdowns. This allows us to provide some empirically testable implications of our theory regarding the impact of demand parameters on joint venture stability.

II. THE MODEL

There are two firms, one multinational (denoted firm 1) and one domestic (denoted firm 2) who can either form a joint venture, or compete (over quantities) in the domestic market. Domestic demand (q) is linear in the level of price (p):

$$q = a - p\,. \tag{1}$$

We formulate a simple two period model, where every period is further divided into two stages.

Stage 1: The firms decide, sequentially, whether to opt for a joint venture, or compete over quantities (a la Cournot). Firm 1 moves first and can choose either of the two options, joint venture or Cournot competition. Firm 2 moves second and again chooses one of the two options, joint venture or Cournot competition. A joint venture forms only if both the firms opt to form a joint venture, otherwise Cournot competition ensues.

Stage 2: If both firm 1 and firm 2 opts for a joint venture, then they jointly decide on the output level for the venture. In case the two firms opt for Cournot competition, they simultaneously decide on their output levels, q_1 and q_2.

Let δ denote the common discount factor of the two firms, where $0 < \delta < 1$. The cost functions of the two firms are taken to be linear in their level of output. Let c_{ij} represent the constant marginal cost of firm i in period j. The marginal cost is the additive sum of two components T_{ij} and L_{ij}, where T_{ij} represents the technology specific costs, while L_{ij} represents the local knowledge component. Thus we can write:

$$c_{ij} = T_{ij} + L_{ij}\,, \tag{2}$$

The MNC is assumed to be technologically more advanced, while the domestic firm has greater access to local knowledge, i.e.

$$T_{11} < T_{21} \quad \text{and} \quad L_{11} > L_{21}\,. \tag{3}$$

As a simplifying device we assume that, to begin with, the cost conditions are entirely symmetric, so that

$$T_{11} = L_{21} = c \quad \text{and} \quad T_{21} = L_{11} = d\,, \tag{4}$$

where $c < d$. Hence $c_{11} = c_{21} = (c + d)$. We also assume that $a > 2d$.

Furthermore, we assume that joint venture formation involves some coordination or transaction cost B. We interpret B as a fixed, rather than as a set up (or sunk) cost that has to be incurred in each period. Thus if the joint venture breaks up in period 2, then the firms can save on this cost. This creates one possible reason why joint ventures may have an incentive to break up. Clearly, if B is a set up cost then it would be incurred in period 1 alone and there would be no such cost in period 2. In that case joint ventures would tend to be much more stable.

Clearly, a more general formulation would be to take $B = B_1 + B_2$, where B_1 is a sunk cost and B_2 is a fixed cost. Thus the total transaction cost is period 1 would be $B_1 + B_2$, whereas that in period 2 would be B_2. Even in this formulation our analysis would go through provided B_2 is large enough. However, for simplicity we restrict attention to the case where $B_1 = 0$, and $B = B_2$. (We are indebted to the referee for this point.)

Such costs may arise out of the different cultures and objectives of the two parent firms. (There have been some studies in the management literature that demonstrate that cultural distances among partner firms negatively affect the incentive for joint venture formation.) Alternatively they may be due to moral hazard problems intrinsic to any joint venture. Another source of such costs may be the administrative costs of running a joint venture head-quarter. (See Dymsza (1988).) An indirect evidence that such costs are substantial is provided by Hergert and Morris (1988) who find that 81% of all joint ventures studied by them involve only two firms. Joint ventures involving three or more firms are quite rare.

Learning is assumed to be both sided. In fact we assume that the rate of learning is symmetric. Suppose that a joint venture forms in period 1. Then the MNC can internalise some of the local knowledge of its domestic partner and the domestic firm can internalise some of the technological know how of the MNC. Thus the marginal cost of the MNC reduces to:

$$c_{12} = \mu L_{21} + T_{11}\,, \tag{5}$$

while that of the domestic firm reduces to:

$$c_{22} = \mu T_{11} + L_{21}\,, \tag{6}$$

where μ represents the common learning parameter. Obviously

$$d/c \geq \mu \geq 1\,. \tag{7}$$

Clearly, if $\mu = 1$, then learning is complete. Whereas if $\mu = d/c$, then there is no learning.

In case a joint venture forms profits are assumed to be equally shared. 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 endogenously determined following some bargaining procedure (say the symmetric Nash bargaining solution). However, since we have a completely symmetric game most bargaining solutions would yield a symmetric profit-sharing rule. (The full fledged Nash bargaining solution can be found in the appendix.)

We solve for the subgame perfect equilibrium of this game. In our simplified framework this reduces to a straightforward application of the backward induction logic.

We begin by solving the stage 2 game in period 2.

Period 2. Stage 2.

Joint Venture: We first consider the case where the firms form a joint venture. It is clear that the marginal cost of the joint venture is lowest if it combines the technological knowledge of the MNC and the local knowledge of the domestic firm. Thus the marginal cost of the joint venture is $(T_{11} + L_{21})$, and the profit function of the joint venture (in period 2 alone) is given by:

$$(a - q)q - (T_{11} + L_{21})q - B\,. \tag{8}$$

Clearly joint venture profits are maximised if the output level of the joint venture is $(a - T_{11} - L_{21})/2$. Let $\tilde{\Pi}$ denote the equilibrium profit level of the joint venture. Obviously

$$\tilde{\Pi} = (a - T_{11} - L_{21})^2/4 - B = (a - 2c)^2/4 - B\,. \tag{9}$$

Since the profit is equally distributed between the two firms, the profit level for both the firms would be $(a - 2c)^2/8 - B/2$.

Cournot Competition. We then examine the case where the two firms opt for Cournot competition. There are two sub-cases to consider.

Case (i). Suppose that the firms had pursued Cournot competition in period 1 also. Thus there is no learning and the cost parameters in period 2 are the same as in period 1. Hence the profit functions of the two firms for this period are given by:

$$P_{12} = (a - q_1 - q_2)q_1 - (T_{11} + L_{11})q_1 = (a - q_1 - q_2)q_1 - (c + d)q_1\,, \tag{10}$$

$$P_{22} = (a - q_1 - q_2)q_2 - (T_{21} + L_{21})q_2 = (a - q_1 - q_2)q_2 - (c + d)q_2\,. \tag{11}$$

A straightforward reaction function analysis shows that the equilibrium output level for both the firms would be $(a - c - d)/3$. Letting $\tilde{P}_{12}$ and $\tilde{P}_{22}$ denote the equilibrium profit levels of the two firms under Cournot competition we obtain:

$$\tilde{P}_{12} = \tilde{P}_{22} = (a - c - d)^2/9\,. \tag{12}$$

Case (ii). Suppose that in period 1 the two firms had opted for a joint venture. Then learning occurs and the marginal cost of the MNC gets reduced in period 2. Thus the profit functions of the two firms become:

$$\Pi_{12} = (a - q_1 - q_2)q_1 - (T_{11} + \mu L_{21})q_1 = (a - q_1 - q_2)q_1 - (c + \mu c)q_1\,, \tag{13}$$

$$\Pi_{22} = (a - q_1 - q_2)q_2 - (\mu T_{11} + L_{21})q_2 = (a - q_1 - q_2)q_2 - (c + \mu c)q_2\,. \tag{14}$$

We can again use a reaction function approach to solve for the equilibrium output level of the two firms. Letting $\tilde{\Pi}_{12}$ and $\tilde{\Pi}_{22}$ denote the profit levels of the two firms under Cournot equilibrium we observe that:

$$\tilde{\Pi}_{12} = \tilde{\Pi}_{22} = [a - 2(T_{11} + \mu L_{21}) + (\mu T_{11} + L_{21})]^2/9 = [a - c(1 + \mu)]^2/9\,. \tag{15}$$

We then solve for the stage 1 game in period 2.

Period 2. Stage 1.

There are two cases to consider depending on whether a joint venture had formed in period 1 or not.

Case (i). Suppose that in period 1 there was Cournot competition between the two firms. From equations (9) and (12) it follows that both the forms opt for the joint venture outcome provided the profit from Cournot duopoly, i.e. $(a - c - d)^2/9$, is less than their profits from the joint venture outcome, i.e. $(a - 2c)^2/8 - B/2$. Thus both the firms would opt for the joint venture provided:

$$(a - 2c)^2/8 - B/2 \geq (a - c - d)^2/9 . \tag{16}$$

Case (ii). Suppose that in period 1 a joint venture had, in fact, formed. In this case we find that the outcome depends on the level of domestic demand. Since from equation (15) it follows that $\tilde{\Pi}_{12}$ is equal to $\tilde{\Pi}_{22}$, in order to ensure that a joint venture forms it is sufficient to check that $\tilde{\Pi}/2 \geq \tilde{\Pi}_{12}$, i.e.

$$(a - 2c)^2/8 - B/2 \geq (a - c(1 + \mu))^2/9 . \tag{17}$$

We then examine the game in period 1.

Period 1. Stage 2.

Joint Venture. Let us begin by examining the outcome under the joint venture. Clearly, the marginal cost of the joint venture is again going to be $(T_{11} + L_{21})$. Thus the profit level of the two parent firms, in period 1 alone, will again be $(a - 2c)^2/8 - B/2$.[7]

Cournot Competition. We then consider the outcome under Cournot competition. Clearly the analysis of this case would be identical to that for case (i) under Cournot competition in stage 2 of period 2. Thus the profit levels of the two firms would again be given by $(a - c - d)^2/9$.

We are now in a position to examine the first stage game in period 1.

Period 1. Stage 1.

Let us first consider the case where both equations (16) and (17) hold. In this case, irrespective of what happens in period 1, a joint venture is always going to form in period 2. Hence the outcome in period 1 does not affect the outcome in period 2, and thus the first period problem can be solved in isolation.

Consider the game in period 1. Notice that for both the firms their profit from a joint venture, i.e. $(a - 2c)^2/8 - B/2$, is greater than their profit from Cournot competition, i.e. $(a - c - d)^2/9$. Therefore it is clearly optimal to form a joint venture in period 1 as well. Thus the present discounted value of profits for both the firms will be $(1 + \delta)[(a - 2c)^2/8 - B/2]$. Summarising the above discussion we obtain Proposition 1.

PROPOSITION 1. *If $(a - 2c)^2/8 - B/2 \geq (a - c - d)^2/9$, and $(a - 2c)^2/8 - B/2 \geq (a - c(1 + \mu))^2/9$, then the firms opt for a joint venture in both the periods.*

We then examine the case where equation (16) holds but equation (17) is violated, to be precise:

$$(a - 2c)^2/8 - B/2 < (a - c(1 + \mu))^2/9 . \tag{18}$$

[7] Suppose that in stage 1 of period 1 the firms decide to form a joint venture. Given this decision, the actual output levels in the next stage does not affect the outcome in period 2. Similarly suppose that in stage 1 of period 1 the firms decide to opt for Cournot competition. Again given this decision, the actual output levels under Cournot competition does not affect the outcome in anyway. Thus while solving the stage 2 game in period 1, we can ignore any possible dynamic implications, and perform the analysis as if we are dealing with a one shot game.

In this case if a joint venture forms in period 1 then, in period 2, it is going to break up.

Let us consider the decision facing anyone of the firms, say the MNC, in period 1. Suppose a joint venture forms in period 1. Then learning occurs and the joint venture breaks up in the next period. Hence the present discounted value of its profit is:

$$(a-2c)^2/8 - B/2 + \delta[a - c(1+\mu)]^2/9\,. \tag{19}$$

If, however, in period 1 the firms compete over quantities then, from equation (16), a joint venture is going to form in the next period. Thus the present discounted value of its profit is:

$$(a-c-d)^2/9 + \delta[(a-2c)^2/8 - B/2]\,. \tag{20}$$

Clearly, the MNC would prefer to opt for a joint venture provided:

$$\begin{aligned}&[(a-2c)^2/8 - B/2 - (a-c-d)^2/9]\\ &\qquad > \delta[(a-2c)^2/8 - B/2 - (a-c(1+\mu))^2/9]\,.\end{aligned} \tag{21}$$

Since $\delta < 1$, a sufficient condition for this equation to hold is that

$$(a-c(1+\mu))^2/9 \geq (a-c-d)^2/9\,, \tag{22}$$

which is always satisfied. Thus, in period 1, the MNC always prefers to opt for a joint venture. An identical argument establishes that firm 2 also prefers to opt for a joint venture in period 1.

We can summarise the above discussion in Proposition 2 below.

PROPOSITION 2. *Suppose that* $(a-2c)^2/8 - B/2 \geq (a-c-d)^2/9$ *and* $(a-2c)^2/8 - B/2 < (a-c(1+\mu))^2/9$. *Then a joint venture forms in the first period. However, the joint venture breaks up in the next period.*

Finally we consider the case where equation (17) holds, but equation (16) is violated, to be precise:

$$(a-2c)^2/8 - B/2 < (a-c-d)^2/9\,. \tag{23}$$

Clearly, irrespective of what happens in period 1, the second period outcome is always going to involve Cournot competition. Thus the aggregate profit from joint venture formation in period 1 (followed by Cournot competition) is $(a-2c)^2/4 - B + 2\delta[a-c(1+\mu)]^2/9$, whereas the aggregate profit from Cournot competition in period 1 is $2(1+\delta)(a-c-d)^2/9$. Hence if

$$(a-2c)^2/4 - B + 2\delta[a-c(1+\mu)]^2/9 \geq 2(1+\delta)(a-c-d)^2/9\,, \tag{24}$$

then there will be joint venture formation and the first period payoff for both firms will be $(a-2c)^2/8 - B/2$. Otherwise, there will be Cournot competition in both the periods. Summarising we obtain our next proposition.

PROPOSITION 3. *Suppose that* $(a-2c)^2/8 - B/2 < (a-c(1+\mu))^2/9$ *and* $(a-2c)^2/8 - B/2 < (a-c-d)^2/9$.

(i) *If* $(a-2c)^2/4 - B + 2\delta[a-c(1+\mu)]^2/9 \geq 2(1+\delta)(a-c-d)^2/9$, *then there is joint venture formation followed by breakdown.*

(ii) *Otherwise, the firms opt for Cournot competition in both the periods.*

Proposition 3(i) is interesting because it shows that in some cases a joint venture forms only because of learning possibilities. If the learning possibility was not there the joint venture will not form at all. Thus it is learning which leads to joint venture formation as well as breakdown.

Thus Propositions 1, 2 and 3 together provide a complete characterisation of the subgame perfect equilibrium outcomes in this model.

We then examine the impact of changes in the demand parameter, 'a' on the market outcome. Following some obvious algebraic manipulations we can re-write equation (16) as:

$$a^2 - 20ac + 16ad + 24c^2 - 8d^2 - 16cd \geq 36B\,. \tag{25}$$

Similarly we can re-write equation (17) as:

$$a^2 - 20ac + 16a\mu c + 36c^2 - 8c^2(1+\mu)^2 \geq 36B\,. \tag{26}$$

Let us define $Z(a)$ and $Y(a)$ as follows:

$$Z(a) = a^2 - 20ac + 16ad + 24c^2 - 8d^2 - 16cd\,,$$

and

$$Y(a) = a^2 - 20ac + 16a\mu c + 36c^2 - 8c^2(1+\mu)^2\,.$$

Clearly, $Z(a)$ and $Y(a)$ denote the left hand side of equations (25) and (26) respectively. We now examine the properties of $Z(a)$ and $Y(a)$ carefully. Straightforward calculations establish the following:

(i) $Z'(a) = 2(a - 10c + 8d)$,
(ii) $Y'(a) = 2(a - 10c + 8\mu c)$,
(iii) $Z'(c+d) = 18(d-c) > 0$,
(iv) $Y'(c+d) = 2(d + 8\mu c - 9c) > 0$,
(v) $Z''(a) = Y''(a) = 2$,
(vi) $Z(a) > Y(a), \forall a$. (This follows from equations (16) and (17), and the fact that $d > \mu c$.)

Since the output level under Cournot competition has to be positive, we restrict attention to the case where $a > c + d$. Thus we find that $Z(a)$ and $Y(a)$ are both convex and positively sloped over the relevant parameter region. Furthermore, for all demand parameters, $Z(a)$ is greater than $Y(a)$. These properties are conveniently represented in Fig. 1 below.

We then define $\bar{a}$ and $\tilde{a}$ as follows: $Z(\bar{a}) = 36B$, and $Y(\tilde{a}) = 36B$.

Proposition 4 now follows straightaway from Fig. 1 and the previous three propositions.

PROPOSITION 4. (i) *If* $36B \leq Y(c+d)$, *then* $\forall a > (c+d)$, *there is stable joint venture formation.*

(ii) *If* $Y(c+d) < 36B \leq Z(c+d)$, *then* $\forall (c+d) < a < \tilde{a}$, *there is joint venture formation, followed by breakdown. Whereas* $\forall a \geq a$, *there is a stable joint venture formation.*

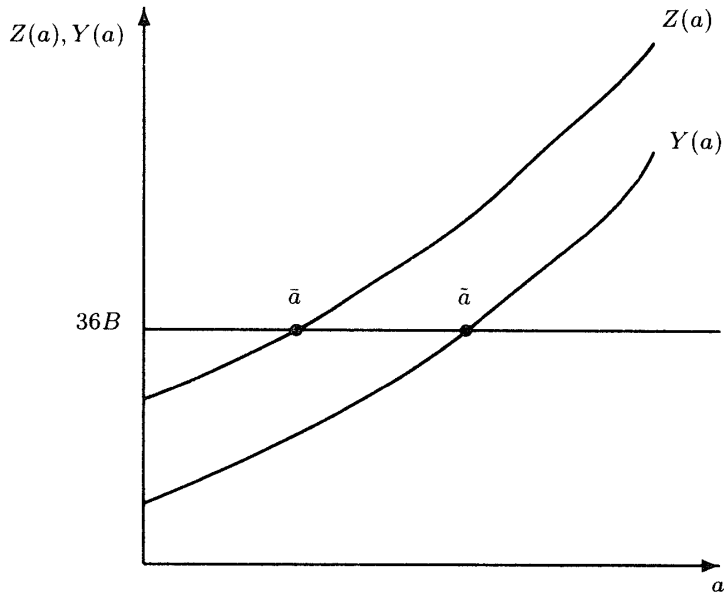

Fig. 1.

(iii) *If* $36B > Z(c+d)$, *then* $\forall (c+d) < a < \bar{a}$, *there is Cournot competition in both the periods, provided* $(a-2c)^2/4 - B + 2\delta[a - c(1+\mu)]^2/9 < 2(1+\delta)(a-c-d)^2/9$. *Otherwise, there is joint venture formation followed by breakdown. If* $\bar{a} \leq a < \tilde{a}$, *then there is joint venture formation followed by breakdown, whereas* $\forall a \geq \tilde{a}$, *there is stable joint venture formation.*

We then examine the impact of the learning parameter. Notice that greater is the rate of learning, i.e. lower is μ, greater is the value of the right hand side expression in equation (17) and it is more likely that equation (17) will fail to hold. Thus greater the rate of learning, greater are the chances of joint venture breakdown.

Finally we briefly examine the impact of the discount factor on the outcome. Clearly, the discount factor is relevant only when equations (17) and (18) hold. Notice that equation (24) can be re-written as follows:

$$(a-2c)^2/4 - B \geq 2(a-c-d)^2/9 - 2\delta[(a-c(1+\mu))^2/9 - (a-c-d)^2/9]\,. \quad (24')$$

Notice that for $\delta = 0$, this equation will be never satisfied. This follows from equation (23). Furthermore, the right hand side is decreasing in δ. Thus the greater is the discount factor, greater are the chances of joint venture formation.

III. LIBERALISATION AND JOINT VENTURE FORMATION

In this section we consider a scenario where the domestic country is liberalising its economy sequentially. Let X denote the old product we have been considering so far, and let Y denote a related product, which has not been liberalised till period 1. Following government policy, however, the market for Y is going to be opened up in the second period. Once this happens the MNC, which has market presence in product Y also, is going to enter.

We model the demand and cost conditions in the market for Y as simply as possible. The demand function for Y is linear and of the form $A - p$. For the MNC the cost of producing good Y is assumed to be identical to that of producing good X. Thus the marginal cost of good Y is taken to be $(c + d)$ if there is no learning in the first period, and $c(1 + \mu)$ in case learning takes place. The assumption that the cost of production in the two markets are identical is, of course, unrealistic, but is not crucial to the analysis. The critical assumption here is that the knowledge acquired from joint venture activity in product X would be passed on to Y, so that the cost of producing Y declines as well.

We also assume that after the market for Y opens up, the MNC is going to become a monopolist in this market. This can be justified by assuming that the domestic firms producing Y are so inefficient that they are going to be driven out once the MNC enters. Such an assumption, however, is not necessary. We can instead assume that the market structure in product Y is oligopolistic. However, since the alternative formulation does not yield any additional economic insight, we prefer to use our simpler, though less general formulation. Under these assumptions it is clear that the profit of the MNC in market Y would be $(A - c - d)^2/4$ if there is no learning in period 1, and $(A - c(1 + \mu))^2/4$ otherwise.

We focus on the case where both equations (18) and (23) hold. Moreover, $(a - 2c)^2/4 - B + 2\delta[a - c(1 + \mu)]^2/9 < 2(1 + \delta)(a - c - d)^2/9$. As Proposition 3(ii) demonstrates, if there is no prospect of liberalisation in sector Y, then there will be Cournot competition in both the periods. We demonstrate though, that in the presence of sequential liberalisation, joint venture formation may occur.

We again solve for the subgame perfect equilibrium of this game. Notice that the game is no longer symmetric. Thus, given an endogenously determined profit-sharing rule, we can no longer assume that the profit from a joint venture would be equally shared. We assume that in case of joint venture formation the profit share is determined according to the symmetric Nash bargaining solution. (Thus if the aggregate surplus is Z, and the disagreement payoff vector is (d_1, d_2), then firm 1's payoff would be $(Z + d_1 - d_2)/2$ and firm 2's payoff would be $(Z + d_2 - d_1)/2$, the implicit assumption being that $Z > d_1 + d_2$.)

We now examine the game in period 2. To begin with consider the case where a joint venture had formed in period 1. From equation (23) it follows that the aggregate profit under Cournot competition (taking both the markets into account), i.e. $2(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/4$, exceeds that under joint venture, i.e. $(a - 2c)^2/4 - B + (A - c(1 + \mu))^2/4$. Thus there will be Cournot competition in period 2. The profit of the domestic firm will be $(a - c(1 + \mu))^2/9$ and that of the MNC will be $(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/4$.

Next consider the case where there was Cournot competition in period 1. From equation (18) it now follows that there will be Cournot competition in period 2. Thus in this case the profit of the domestic firm will be $(a - c - d)^2/9$ and that of the MNC will be $(a - c - d)^2/9 + (A - c - d)^2/4$.

We then consider the game in period 1. Suppose that a joint venture forms. Then the sum of firm 1 and firm 2's profit is $(a-2c)^2/4-B$ in period 1, and $2(a-c(1+\mu))^2/9+(A-c(1+\mu))^2/4$ in period 2. Thus the present discounted value of the aggregate profit of the two firms is:

$$(a-2c)^2/4 - B + \delta[2(a-c(1+\mu))^2/9 + (A-c(1+\mu))^2/4]. \tag{27}$$

We then consider the case where, in period 1, the firms pursue Cournot competition. As already argued, in period 2 the firms would again opt for Cournot competition. Thus the present discounted value of the MNC's profit is:

$$(a-c-d)^2/9 + \delta[(a-c-d)^2/9 + (A-c-d)^2/4], \tag{28}$$

and the present discounted value of the domestic firm's profit is:

$$(a-c-d)^2/9 + \delta(a-c-d)^2/9. \tag{29}$$

Summing up equations (28) and (29), the present discounted value of profit for the two firms together is:

$$2(a-c-d)^2/9 + \delta[2(a-c-d)^2/9 + (A-c-d)^2/4]. \tag{30}$$

Obviously a joint venture is going to form provided the present discounted value of the aggregate profit from forming a joint venture is greater than that from pursuing Cournot competition, i.e. provided

$$\begin{aligned}(a-2c)^2/4 - B &+ \delta[2(a-c(1+\mu))^2/9 + (A-c(1+\mu))^2/4]\\ &> 2(a-c-d)^2/9 + \delta[2(a-c-d)^2/9 + (A-c-d)^2/4].\end{aligned} \tag{31}$$

Re-arranging equation (31) we obtain:

$$\begin{aligned}\delta[(A-c(1+\mu))^2/4 &- (A-c-d)^2/9]\\ &> 2[(a-c-d)^2/9 - (a-2c)^2/8 + B/2]\\ &\quad + 2\delta[(a-c(1+\mu))^2/9 - (a-2c)^2/8 + B/2].\end{aligned} \tag{32}$$

Observe that the left hand side of equation (32) is increasing (without bounds) in the parameter A. Thus if A is large enough then a joint venture forms in period 1, though it breaks up in the next period.

We then examine the impact of changes in μ on the incentives for joint venture formation. Observe that the left hand side of equation (31) is decreasing in μ. Thus greater the rate of learning, greater are the chances that a joint venture will form. In fact, in the extreme case where learning is totally absent we see that $\mu = d/c$, so that the left hand side of equation (32) becomes zero. Hence equation (32) will fail to hold and there is no joint venture formation.

It is also obvious that greater the discount factor greater are the incentives for joint venture formation. Equation (32) also highlights the role of coordination among the various divisions of the MNC. Suppose that the products X and Y are produced and marketed by two different divisions of the MNC. So far we had assumed that the knowledge acquired by division X is automatically passed on to division Y. Generally, however, information transmission is far from perfect. Thus if coordination among the two departments is very poor then the left hand side of equation (32) will be close to 0, and joint venture formation is unlikely. For well coordinated firms though, joint venture formation is possible.

Equation (32), however, only ensures that a joint venture forms in period 1. Next we explicitly solve for the payoffs of the two firms. Let Z_i denote the present discounted value of firm i's payoff (taking both period 1 and period 2 into account) under the Nash bargaining solution. Recall that according to the Nash bargaining solution

$$Z_1 = (Z + d_1 - d_2)/2 \quad \text{and} \quad Z_2 = (Z + d_2 - d_1)/2 .$$

It is clear that in the present context Z represents the sum of the present discounted value of aggregate profit of the two firms when there is joint venture formation in period 1 followed by breakdown in period 2. Similarly d_i represents the present discounted value of the i-th firm's profit if there is Cournot competition in both the periods. Thus:

$$Z = (a - 2c)^2/4 - B + \delta[2(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/4] ,$$

$$d_1 = (a - c - d)^2/9 + \delta[(a - c - d)^2/9 + (A - c - d)^2/4] ,$$

and,

$$d_2 = (a - c - d)^2/9 + \delta(a - c - d)^2/9 . \tag{33}$$

Solving explicitly we obtain:

$$\begin{aligned} Z_1 = {} & (a - 2c)^2/8 - B/2 \\ & + \delta[(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/8 + (A - c - d)^2/8] , \end{aligned} \tag{34}$$

and

$$\begin{aligned} Z_2 = {} & (a - 2c)^2/8 - B/2 \\ & + \delta[(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/8 - (A - c - d)^2/8] . \end{aligned} \tag{35}$$

We next find out the distribution of joint venture profit in period 1 alone. Let the payoff of firm 1 in period 1 be X_1 and that of firm 2 be X_2. Notice that in period 2 firm 1 is going to obtain $(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/4$, whereas firm 2 is going to obtain $(a - c(1 + \mu))^2/9$. Clearly, X_1 and the present discounted value of firm 1's profit in period 2 must sum up to Z_1. Similarly for firm 2. Therefore it follows that

$$Z_1 = X_1 + \delta[(a - c(1 + \mu))^2/9 + (A - c(1 + \mu))^2/4] , \tag{36}$$

and,

$$Z_2 = X_2 + \delta(a - c(1 + \mu))^2/9 . \tag{37}$$

Substituting the values of Z_1 and Z_2 into equations (36) and (37) we obtain:

$$X_1 = (a - 2c)^2/8 - B/2 - \delta[(A - c(1 + \mu))^2/8 - (A - c - d)^2/8] , \tag{38}$$

$$X_2 = (a - 2c)^2/8 - B/2 + \delta[(A - c(1 + \mu))^2/8 - (A - c - d)^2/8] . \tag{39}$$

Notice that in period 1 the MNC obtains a lesser share of the profit compared to the domestic firm. The intuition is clear. For the MNC forming a joint venture has the additional incentive that the knowledge acquired in market X can later be used in market Y also. The domestic firm, however, has no such incentive. Thus the MNC must pay a premium to the domestic firm so as to entice it to form a joint venture at all.

This is interesting because in the initial phases of liberalisation the equity ratios fixed by the LDC governments were often unfavourable to the MNCs. Our analysis suggests one possible reason why the MNCs were willing to accept such unfavorable equity ratios.

Summarising the above discussion we obtain Proposition 4.

PROPOSITION 4. (i) *There exists some* A^* *such that whenever* $A \geq A^*$, *a joint venture forms in period* 1, *though it breaks up in the next period. If* $A < A^*$, *then the firms will pursue Cournot competition in both the periods.*

(ii) *Assume that* $A \geq A^*$. *In the first period firm* 1 *has a profit of* $(a - 2c)^2/8 - B/2 - \delta[(A - c(1 + \mu))^2/8 - (A - c - d)^2/8]$, *and firm* 2 *has a profit of* $(a - 2c)^2/8 - B/2 + \delta[(A - c(1 + \mu))^2/8 - (A - c - d)^2/8]$.

Next notice that in this section we restrict attention to parameter values such that equations (18) and (23) hold, and equation (24) do not hold. If, however, equation (24) also holds, then a joint venture forms in any case. Extending the analysis to the other cases is also straightforward.

First consider the case where equations (16) and (18) both hold. Proposition 2 suggests that, if there is no prospect of further liberalisation, the outcome would involve joint venture formation, followed by breakdown. Would the outcome be any different if this prospect is indeed present?

Consider period 2 first. Notice that period 2 being the last period, any further learning is not possible. Since learning provides the only linkage between the two markets, the outcome in the market for X does not depend on what happens in the market for Y, in fact on whether the market for Y is present or not. Thus the outcome would be the same as that in the previous section. Hence joint venture formation in period 1 will be followed by breakdown (equation (18)), and Cournot competition in period 1 shall be followed by joint venture formation (equation (16)).

We then consider the outcome in period 1. In the absence of any further liberalisation a joint venture is going to form. If the market for Y is going to be liberalised then, for the MNC, the incentive for joint venture formation is strengthened, whereas the incentive for the domestic firm will not be affected. Thus in this case also we shall have joint venture formation in the first period (followed by breakdown).

We can now mimic the earlier argument to explicitly solve for the first period payoffs. In this case we find that the first period payoffs are identical to that for the case where equations (18) and (23) hold, and is given by equations (38) and (39).

Next consider the case where equations (16) and (17) both hold. In this case, even without sequential liberalisation, there shall be joint venture formation in both the periods (Proposition 1). We can argue, as before, that the prospect of liberalising the market for Y does not affect the outcome in period 2. Thus in the second period a joint venture always forms (equations (16) and (17)). Next consider the outcome in period 1. In the presence of a policy of sequential liberalisation the incentive to form a joint venture in period 1 is strengthened. Thus there will be joint venture formation in period 1. Hence in this case also the outcome shall involve joint venture formation in both the periods.

We can again mimic the earlier argument to explicitly solve for the first period payoffs. Again we find that the first period payoffs are identical to that for the case where equations (18) and (23) hold, and is given by equations (38) and (39). Thus in the first period the MNC will have a lesser share of the joint venture profit. In the second period, however, its profit share would increase to half.

This is interesting since recently there have been several instances of Indian joint ventures where the MNCs demanded a greater equity share and sometimes even threatened to breakup unless such increases were granted. For example, Bausch and Lomb was negotiating with Montori to increase its stake from the present 40%. In the joint venture between Triveni Engineering and GEC Alsthom, Alsthom refused to supply the latest technology unless its stake was increased (Bhandari (1996–97), and Ghosh (1996)).

Finally notice that we have assumed that it is completely certain that the market for Y is going to be opened up. Given the uncertainty surrounding the liberalisation process it may be more realistic to assume that any such liberalisation is probabilistic. It is easy to see that in that case joint venture formation is going to be more likely if the probability of liberalisation is higher.

IV. CONCLUSION

In this paper we provide a theory of joint venture life cycle that relies on synergy, organisational learning and sequential liberalisation. We demonstrate that depending on parameter values the outcome may involve any one of the following: stable joint venture formation, joint venture formation followed by breakdown, or Cournot competition in both the periods. Moreover, we demonstrate that the prospect of liberalisation in related industry segments can be an incentive for pursuing a joint venture.

Furthermore, notice that our analysis suggests the following empirically testable proposition:

Consider a market where synergy and learning is important. Joint ventures are more prone to breakdown if demand is at an intermediate level. For low levels of demand joint ventures will not form at all, whereas for large demands there will be stable joint venture formation.[8]

[8] This proposition is of course specific to our learning-based approach. Clearly, other models might generate different results. The referee in fact suggests that in some situations an increase in demand may lead to a *decrease* in joint venture stability. The idea is as follows. An increase in demand creates an incentive for greater capacity expansion, and/or cost raising capital then this may create a point of conflict, leading to centract renegotiation, or even breakdown. The point raised by the referee is well taken and it is worth looking into this conjecture in greater detail. In fact we feel that the same intuition may go through if the partner firms have identical costs of raising capital but different discount rates. Unfortunately, however, the basic model is quite different from the learning based one adopted by us, and hence it is beyond the scope of the present paper to provide a full fledged analysis of the problem. In the light of the above, however, in the main text we explicitly state that the testable proposition developed in the paper holds in joint ventures where learning plays an important role. In markets where learning is not important, this proposition need not hold.

Finally, notice that in this paper we strive for transparency of the results rather than complete generality. Moreover, there are several interesting issues that we have abstracted from. For example we totally ignore the issue of control, i.e. whether effective control lies with the MNC or the domestic firm. We would like to use our basic framework to examine this and other related issues in future work.

V. APPENDIX

In this appendix we explicitly solve for the Nash bargaining solution for the various stage games in section II. We begin by solving the stage 1 game in period 2.

Period 2. Stage 1: Recall that under symmetric Nash bargaining solution if the aggregate surplus is Z, and the disagreement payoff vector is (d_1, d_2), then firm 1's payoff would be $(Z + d_1 - d_2)/2$ and firm 2's payoff would be $(Z + d_2 - d_1)/2$, the implicit assumption being that $Z > d_1 + d_2$.

First consider the case where there was no learning in period 1. Note that in this case

$$Z = (a - 2c)^2/4 - B\,,$$

and

$$d_1 = d_2 = (a - c - d)^2/9\,.$$

Clearly, since $d_1 = d_2$, $(Z - d_i + d_j)/2 = Z/2 = (a - 2c)^2/8 - B/2$.

In case where learning did take place in period 1, Z is still the same but

$$d_1 = d_2 = [a - c(1 + \mu)]^2/9\,.$$

However, since $d_1 = d_2$, the payoff of both agents in this case is again $Z/2 = (a - 2c)^2/8 - B/2$.

We then consider the game in stage 1 of period 1.

Case 1. We first consider the case where both equations (16) and (17) hold, i.e. the case considered in Proposition 1.

First observe that since both equations (16) and (17) hold, in period 2 a joint venture forms and the payoff to both firms would be $(a - 2c)^2/8 - B/2$, irrespective of what happens in period 1. Also the aggregate payoff to joint venture formation in period 1 is $(a - 2c)^2/4 - B$. Thus in this case

$$Z = (1 + \delta)[(a - 2c)^2/4 - B]\,,$$

and

$$d_1 = d_2 = (a - c - d)^2/9 + \delta[(a - 2c)^2/8 - B/2]\,.$$

Notice that d_i represents the total profit of firm i if the firms pursue Cournot competition in period 1, knowing that in period 2 a joint venture is going to form anyway (since equation (16) holds). Since $Z > d_1 + d_2$, and $d_1 = d_2$, the Nash bargaining solution would be symmetric and the payoffs would be

$$Z/2 = (1 + \delta)[(a - 2c)^2/8 - B/2]\,.$$

We then solve for the joint venture shares in period 1 alone. Let X_1 and X_2 denote the payoff of firm 1 and 2 respectively in period 1. Clearly, it must be the case that

$$Z/2 = X_i + \delta[(a-2c)^2/8 - B/2].$$

This follows since in period 2 both firms obtain $(a-2c)^2/8 - B/2$. This implies that

$$X_i = (a-2c)^2/8 - B/2.$$

Thus the solution is exactly the same as we obtain using an exogenous but symmetric sharing rule.

Case 2. We then consider the case where equations (16) and (18) hold, i.e. the case considered in Proposition 2. What is Z in this case? If a joint venture forms in period 1, then, since equation (18) holds, it breaks up in period 2. Thus the aggregate discounted profit

$$Z = (a-2c)^2/4 - B + 2\delta[a - c(1+\mu)]^2/9.$$

Whereas if there is Cournot competition in period 1 then, in period 2, a joint venture forms. Hence

$$d_1 = d_2 = (a-c-d)^2/9 + \delta[(a-2c)^2/8 - B/2].$$

Again, since $d_1 = d_2$, the Nash bargaining solution yields

$$Z/2 = (a-2c)^2/8 - B/2 + \delta[a - c(1+\mu)]^2/9.$$

As in case 1, let X_1 and X_2 denote the payoff of firm 1 and 2 respectively in period 1. Clearly, it must be the case that

$$Z/2 = X_i + \delta[(a - c(1+\mu))^2/9].$$

This follows since in period 2 both firms obtain $[a - c(1+\mu)]^2/9$. This implies that

$$X_i = (a-2c)^2/8 - B/2.$$

Again this is the same solution that we obtain with the exogenous but symmetric sharing rule.

Case 3. Finally consider the case where equations (17) and (23) hold, i.e. the case considered in Proposition 3. Clearly, in period 2, there will always be Cournot competition. Thus

$$Z = (a-2c)^2/4 - B + 2\delta[a - c(1+\mu)]^2/9.$$

Whereas,

$$d_1 = d_2 = (1+\delta)(a-c-d)^2/9.$$

This follows since there is Cournot competition in both the periods. If $Z \geq d_1 + d_2$, i.e. if equation (24) holds, then we can mimic the earlier proof to claim that the Nash bargaining solution is symmetric and leads to

$$X_1 = X_2 = (a-2c)^2/8 - B/2.$$

Whereas if $Z < d_1 + d_2$, then the Nash bargaining solution leads to the disagreement vector (d_1, d_2). Again this is identical to what we obtained before.

Thus in all three cases the solution using a Nash bargaining solution is identical to that obtained with an exogenous surplus sharing rule. This justifies our use of an exogenous surplus sharing rule.

REFERENCES

Al-Saadon, Y. and S. P. Das, 1996, Host Country Policy, Transfer Pricing and Ownership Distribution in International Joint Venture: A Theoretical Analysis, *International Journal of Industrial Organization* 14, 345–364.

D'Aspremont and A. Jaquemin, 1988, Cooperative and Non-cooperative R & D in Duopoly with Spill-overs, *American Economic Review* 78, 1133–1137.

Bardhan, P. K., 1982, Imports, Domestic Protection, and Transnational Vertical Integration: A Theoretical Note, *Journal of Political Economy* 90, 1020–1034.

Beamish, P. W., 1985, The Characteristics of Joint Ventures in Developed and Developing Countries, *Columbia Journal of World Business*, Fall, 13–19.

Beamish, P. W. and A. C. Inkpen, 1995, Keeping International Joint Ventures Stable and Profitable, *Long Range Planning* 28, 26–36.

Bhandari, B., 1996–97, Losing Control, *Business World*, 25th Dec. 1996–7th January, 1997, 34–39.

Business India, 1996, July 15–28, Why P & G and Godrej Broke Up, 54–59.

Business India, 1992, November 23–December 6, A New Byte, 66–68.

Chan, R. and M. Hoy, 1991, East-West Joint Ventures and Buyback Contracts, *Journal of International Economics* 30, 330–343.

Chao, C. and E. Yu, 1996, Are Wholly Foreign-owned Enterprises Better Than Joint ventures?, *Journal of International Economics* 40, 225–237.

Choi, J. P., 1993, Cooperative R & D With Product Market Competition, *International Journal of Industrial Organization* 11, 553–571.

Combs, K. L., 1993, The Role of Information Sharing in Cooperative Research and Development, *International Journal of Industrial Organization* 11, 553–571.

Dymsza, W. A., 1988, Successes and Failures of Joint Ventures in Developing Countries: Lessons From Experience in F. J. Contractor and P. Lorange, eds., *Cooperative Strategies in International Business*, Lexington Books.

Ghosh, I., 1996, Jinxed Ventures, *Business World*, 24th July–6th August, 54–60.

Gomes-Casseres, B., 1987, Joint Venture Instability: Is it a Problem? *Columbia Journal of World Business*, Summer, 97–102.

Hamel, G., 1991, Competition for Competence and Inter partner Learning Within International Alliances, *Strategic Management Journal* 12, 83–103.

Hamel, G., Y. Doz and C. Prahalad, 1989, Collaborate With Your Competitors and Win, *Harvard Business Review* 1, 133–139.

Hergert, M. and D. Morris, Trends in International Collaborative Business, in F. J. Contractor and P. Lorange, eds., *Cooperative Strategies in International Business*, (Lexington Books).

Katz, M. L., 1986, An Analysis of Cooperative Research and Development, *Rand Journal of Economics* 16, 527–543.

Killing, J. P., 1982, How to Make a Global Joint Venture Work, *Harvard Business Review*, May June, 120–127.

Kabiraj, T., S. Marjit and A. Mukherjee, 1996, Joint Venture in the Presence of Learning, mimeo, Indian Statistical Institute, Calcutta.

Kabiraj, T., 1997, A Simple Theory of Joint Venture breakdown, mimeo, Indian Statistical Institute, Calcutta.

Kogut, B., 1988, A Study of the Life Cycle of Joint Ventures, in F. J. Contractor and P. Lorange, eds., *Cooperative Strategies in International Business*, (Lexington Books).

Marjit, S., 1991, Incentives for Cooperative and Non-cooperative R & D in Duopoly, *Economic Letters* 37, 187–191.

Miller, R. R., J. D. Glenn, F. Z. Jaspersen and Y. Karmakolias, 1996, International Joint Ventures in Developing Countries: Happy Marriages?, Discussion Paper No. 29, International Finance Corporation, World Bank, Washington, D.C.

Pekar, P. and R. Allio, 1994, Making Alliances Work-Guideline for Success, *Long Range Planning* 27, 54–65.

Purkayastha, D., 1993, Firm Specific Advantages, Multinational Joint Ventures and Host Country Tariff Policy, *Southern Economic Journal* 60, 89–95.

Roy Chowdhury, P., 1995, Technological Asymmetry and Joint Product Development, *International Journal of Industrial Organization* 13, 23–39.

Roy Chowdhury, P., 1997, Foreign Collaborative Ventures and Quality of Technology, *Journal of Quantitative Economics* 13, 11–28.

Reich, R. and E. Mankin, 1986, Joint Ventures With Japan Gave Away our Future, *Harvard Business Review* 2, 78–86.

Salant, S. W., S. Switzer and J. Reynolds, 1983, Losses From Horizontal Mergers: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium, *Quarterly Journal of Economics* 98, 185–213.

Svejnar, J. and S. Smith, 1984, The Economics of Joint Ventures in Developing Countries, *Quarterly Journal of Economics* 119, 149-167.