Chapter 3

Imitation, Buy-out and Entry in International Joint Ventures.
Chapter 3

Introduction

In the previous chapter we have discussed the possibility of joint venture formation and its subsequent instability under an asymmetric information framework where, the MNC has private information about its technological capability. We have shown joint venture instability in terms of complete buy-out of the business. This chapter deals with the issue of joint venture instability under another kind of asymmetric information. Here, the asymmetric information stems from the fact that the host firm knows more about local demand conditions as compared to the MNC. However, we assume that the technological capability of the MNC is common knowledge to both the host firm and the MNC. This chapter shows joint venture instability in terms of a partial buy-out of the joint venture unit as well as the possibility of setting up a subsidiary by the MNC to compete with its joint venture counterpart.

We consider a two period model consisting of two firms: an MNC and a host firm. The MNC has a superior technology as compared to the existing technology of the host firm. The government pursues the same stage-wise liberalisation policy as in the previous chapter. Thus, in the first period, the MNC is allowed to hold equity upto a certain limit; and in the second period, the MNC is allowed to set up a wholly owned subsidiary. In this chapter, we take the first period joint venture as given. Here, we are interested in the problem faced by an MNC in the second period in deciding whether to set up a subsidiary to compete with its already existing joint venture counterpart or, by using that threat of entry, to acquire some more shares of the joint venture unit by paying some mutually agreeable price. The present chapter analyses this trade-off in the MNC’s decision problem in an incomplete information framework.

We assume that the host firm has better information than the MNC about the market demand in the second period. The second period demand in the domestic market is random. For simplicity, we assume that it can take two values: high or low. The host firm knows the actual demand in the second period, whereas the MNC has a prior belief about the demand conditions. Due to this asymmetric information, when the MNC tries to buy out some shares from the host firm in the second period, the host firm tries to extract some information rent. The MNC would design a buy-out contract in order to minimise the information rent appropriated by the host firm. As a result, to maximise its overall surplus the MNC might take recourse to direct entry with a subsidiary (even though this is a costly option).
To motivate the analysis, let us begin with the assumption that the host firm cannot set up a business of its own after selling off its shares in the joint venture. First consider the situation when the actual demand is known to both parties. Then, it is easy to see that the MNC, by using the threat of entry with a subsidiary, may buy-out the host partner completely after paying its reservation payoff. This reservation payoff is the share of profit in case of the duopoly competition that would ensue, between the joint venture firm and the subsidiary unit, consequent upon the rejection of the buy-out offer. After this buy-out the MNC owns the joint venture unit completely to serve the market under monopoly. So the MNC has no reason to enter with a subsidiary anymore.

However, when the demand is not known to the MNC, then it faces an adverse selection problem in buying out shares from its host partner. To illustrate this point, let us consider that the MNC wants to buy-out some shares. Now even if the market demand is low the host firm may pretend that the market demand is high in order to get a higher price for its shares. So, when the MNC buys out some shares it might be paying high prices even though the market demand is actually low. This problem of adverse selection poses a problem for the buy-out of shares. On the other hand, the entry of the MNC with a subsidiary involves a set up cost as well as loss due to duopoly competition. Our purpose is to analyse the nature of this trade-off in the MNC’s decision problem in a principal-agent framework.

In this framework, we show that: (a) there is partial buy-out of a joint venture unit by the MNC; and (b) in some cases the MNC even sets up a subsidiary to compete with its already existing joint venture counterpart. The MNC can offer two types of contracts: (a) a pooling contract, where the same buy-out offer is made to the host firm irrespective of the host firm’s private information about demand condition; and (b) a separating contract, where different buy-out offers are made to the host firm depending on the host firm’s private information. An interesting feature of our model is that under certain parameter configurations the MNC’s payoff under a pooling contract is strictly greater than that under a separating contract. As a result, the principal (MNC) chooses to offer a pooling contract as opposed to a separating contract, and thereby it decides to acquire no information about the agent’s true private information. When imitation of foreign technology is considered to be a choice variable and costly to undertake, it is shown that the host firm may under- or over-invest on imitation of the technology, which is supplied to the joint venture business in the first period.

In the context of technology transfers there are two kinds of explicit treatment of imitation available in the literature: (i) costless imitation, and (ii) costly imitation. In case of costless
imitation, the imitation occurs once the technology is transferred, and so it is no longer a choice variable (Katz and Shapiro (1985), Kabiraj and Marjit (1993) etc.). An explicit treatment of costly imitation is available in Rockett (1990), where she has extended the licensing literature to allow the licensor to choose the “quality” of the licensed technology as well as “the structure of payments” for the license. The product market is characterised by Cournot competition and both the licensor and the licensee compete in the same market. In her paper, the nature of the contract is such that imitation becomes unprofitable in equilibrium. Gallini and Wright (1990) have considered the problem of technology transfer under asymmetric information when sharing of pre-contractual information, about the economic value of innovation, facilitates imitation at a fixed cost. However, in their analysis also imitation does not take place in equilibrium.

This chapter can also be motivated in terms of the entry decision of an entrant when it has the opportunity to acquire an incumbent firm in the same product market. It is not clear why an entrant, having an opportunity to acquire some shares in an existing firm, would enter to compete when direct entry involves some loss of total surplus on account of both setup cost as well as competitive loss due to subsequent competition. Within the framework of a single model, we show the occurrence of entry with some probability, depending on the parameter values, even though the possibility of acquisition exists through the process of buy-out of shares of the incumbent firm. Some empirical findings provide a picture of both direct entry as well as entry through acquisition. For instance, in a sample of 138 foreign entry events into the United States examined by Caves and Mehra (1986), 58% were acquisitions. Porter (1987) reported that acquisition accounted for 70% of the 3788 entry events by 33 companies over the period 1950-1986.

We now relate our chapter to the existing theory on acquisition or merger. In the theoretical literature the question of acquisition or merger under Cournot competition was posed by, among others, Salant et al (1983), Kamien and Jang (1990), but they tend to look at the competitive effects of horizontal mergers. Gilbert and Newberry (1995) consider the strategic factors affecting “build or buy” decision of potential entrants. However, in these models with complete information about costs and profits, the answer turns out to be that the acquisition is better strategy than direct entry, when the post entry market is characterised by a few firms. This result holds strictly for two firms. The reason is obvious acquisitions or mergers help to monopolise the market by avoiding duopoly competition and also save on entry cost, if any. However, we question the validity of this result in an incomplete information model and show
that in case of two firms (one entrant and one incumbent) direct entry may occur in equilibrium even though there is a possibility of acquisition of shares of the incumbent firm.

In an asymmetric information framework, McCardle and Viswanathan (1994) have considered the issue of direct entry versus acquisition with one potential entrant and two incumbents (total 3 firms) having different efficiency levels, as captured by their marginal cost parameters. They develop a model with asymmetric information about the entrant's type (depending on fixed entry costs) when the post entry game is characterised by Cournot oligopoly. They focussed on the mode of entry and the relative efficiency of the acquisition targets (the entrant can take over only one incumbent firm). In their model, direct entry may occur.

Das and Sengupta (1999) have analysed the possibility of international merger between a foreign firm and a domestic firm in the presence of asymmetric information. They considered two different situations, (a) where the local firm has private information about market size and (b) where the foreign firm has private information about its technology. They also conclude that the merger may not occur even under Cournot duopoly. However, they have not allowed for merger offers involving share distributions in the merged business. In their model the merger offer is restricted to a lumpsum payment made by the principal (who makes the offer) to the agent. Whereas in our model the principal may offer a menu of shareholding in the merged business along with lumpsum payments (which can be made to either party). Thus, we consider explicitly the share distribution in the merged firm.

In section II, we set out the basic framework of our analysis and present the complete information version of the game. In section III, we discuss the incomplete information problem. We introduce the possibility of imitation as a choice variable in section IV. In the last section we conclude our discussion.
Section II

The basic framework

We consider a two period model with no discounting and maintain the assumption of stage-wise liberalisation pursued by the government. In this model we take the first period joint venture as given because of certain advantages over licensing\(^1\). In any case, we will not explicitly model that here. In the first period joint venture, the government stipulates a minimum shareholding of the host partner \((\bar{\alpha})\) greater than 50\%. We assume that joint venture is agreed upon at the prescribed limit of the foreign equity holding, which is \((1-\bar{\alpha})\), leaving \(\bar{\alpha}\) share to the host firm in the first period. We are interested in analysing the second period game, which would be played when the government announces full liberalisation.

We assume that production units are managed by managers. The managers of each unit first observe the demand and then choose the level of output that maximises the profit of that particular unit, regardless of who holds how much shares in the unit.

We now describe the technological setting of our model. In the first period, the MNC possesses a technology, which may be used to produce a particular product in the domestic market. This technology is "drastic" as compared to the existing technology of the host firm, i.e., if any firm introduces that technology into the domestic market, that firm would be able to monopolise the market by out-competing the host firm. This technology involves a particular constant marginal cost, which is common knowledge to both the host firm and the MNC.

We assume that the technology transfer facilitates imitation at a cost \(I\) in the first period. This is a choice variable of the host firm. If the host partner decides to imitate the technology in the first period then in the second period it will have the necessary technical knowledge to carry out production with this technology in the joint venture without depending on the MNC. Initially we assume that the technology transfer facilitates imitation without any cost. As a result, the MNC's technology is imitated in the first period, if it is transferred. However, the case of costly imitation is discussed in section IV, where the host firm chooses either to imitate or not to imitate in the first period.

---

\(^1\) In fact some of the existing explanations of joint venture formation (cited in the first chapter) can be incorporated to endogenise the joint venture formation in the present framework. In order to focus on the issue of joint venture instability we are assuming the first period joint venture as given.
homogeneous goods market after full liberalisation in a developing country. This can be done simply by putting $\alpha = 1$. However, rather than taking a specific value of $\alpha$, we keep our analysis more general by allowing a joint venture in the first period.

The Complete Information Scenario

Suppose the profit realisable in the second period is $i$ under monopoly production. The second period game can be represented by the following diagram.

![Figure 3.1](image)

This second period game can be solved through backward induction. First we find out the reservation payoff of the host firm, which is the payoff it gets by rejecting the offer of the MNC. After rejection the MNC can choose either to enter with a subsidiary or not. If it sets up a subsidiary then there will be Cournot duopoly competition between the joint venture unit and the subsidiary unit in homogenous goods, since the production units are managed by independent managers. When there is Cournot duopoly competition between the joint venture and subsidiary units then the profit for each unit is $\lambda i^4$, where $\lambda < 1/2$. So the entry threat of the MNC after rejection of the buy-out offer by the host firm, will be credible if the following condition holds:

$$\lambda i + (1-\alpha)\lambda i - F>(1-\alpha)i. \quad (1)$$

---

$^4$ We assume that the management of the subsidiary unit maximises the profit of its own unit without taking into consideration the MNC’s shareholding in the joint venture unit. If the management maximises the total payoff i.e., share of joint venture profit plus the subsidiary profit in deciding the output of the subsidiary unit then also similar analysis will follow. For the sake of simplicity we stick to our assumption.
If the entry threat is credible then the host firm gets $\alpha \lambda i$ by rejecting the MNC's offer. If the entry threat is not credible then the host firm can get $\bar{\alpha} i$ after rejection of any offer made by the MNC. These are the host firm's reservation payoffs in the second period. So, any acceptable offer must involve at least the reservation payoff to the host firm in the subsequent equilibrium after acceptance; otherwise, the host firm would reject the offer.

To find out the subgame perfect equilibrium of the game we note that the entry of the MNC to compete with its joint venture counterpart involves not only the cost of setting up a subsidiary but also a competitive loss due to duopoly competition. Thus, this entry of the MNC reduces the total surplus in the relationship. So, the MNC would try to avoid the entry to maximise its profit. Now we write the following lemma.

**Lemma 1.** *In any equilibrium, entry never takes place after acceptance of the buy-out offer by the host firm.*

**Proof:** Suppose that the host firm holds $\alpha$ share of the joint venture business after the buy-out. There are two cases to consider: (1) when the entry is credible at $\alpha$ and (2) when the entry is not credible at $\bar{\alpha}$. In first case, if the MNC enters after acceptance, there will be duopoly competition between the joint venture unit and the subsidiary unit. Since the MNC enters in the following subgame after the buy-out, so the buy-out offer would be acceptable to the host firm provided, $\alpha \lambda i + p(i) \geq \bar{\alpha} \lambda i$. So, the MNC can at the most receive $\lambda i + (1-\bar{\alpha})\lambda i - F$. However, this contract would always be dominated by a complete buy-out offer by giving a price $p = \bar{\alpha} \lambda i$ for $s = \alpha$ and then not entering after acceptance of the offer by the host firm.

In second case the host firm's reservation payoff is $\bar{\alpha} i$. If the MNC enters after any buy-out offer, it would get at the most $\bar{\alpha} i - F$, which is dominated by simply continuing the joint venture without giving any acceptable offer and then not entering. Hence, we argue that any acceptable offer on the equilibrium path of the game must involve that the entry of the MNC does not take place after acceptance of the buy-out offer.

So any acceptable offer on the equilibrium path must involve that entry never occurs in the following subgame. Consider the subgame after acceptance of a buy-out offer. After the buy-out, the host firm holds $\alpha$ share of the joint venture unit and the MNC holds the rest. Now the MNC's entry in the subsequent node depends on whether
\( \lambda i + (1-\alpha)\lambda i - F(1-\alpha)i. \)

\[
1 + \frac{F}{i} - 2\lambda \left( \frac{i}{1-\lambda} \right) = h \text{ (say)}. \tag{2}
\]

Thus, whenever \( \alpha \leq h \) the MNC does not enter after acceptance of the buy-out offer. If the entry threat of the MNC is credible at \( \bar{\alpha} \), i.e., condition (1) holds, then \( h < \bar{\alpha} \). However, if the condition (1) does not hold, then \( h \) can be considered to be equal to \( \bar{\alpha} \) since the entry is not credible at the existing shareholding of the joint venture.

If condition (1) holds then by making an acceptable offer of buy-out \( s(i) \) and \( p(i) \) such that after acceptance, the host firm holds \( \alpha \) share and \( \alpha + p(i) = \bar{\alpha}i \) where \( \alpha \leq h \), the MNC gets \( i - \alpha \lambda i \). This offer will be accepted by the host firm, since by rejection it does not get more as entry will take place after the rejection. This is always better for the MNC than making an unacceptable offer that gets rejected and as a result entry takes place in the following node of the game. So in this case, the MNC makes either complete or partial buy-out offer, which is accepted by the host firm and the MNC does not enter.

When the entry threat is not credible at \( \bar{\alpha} \) i.e., (1) does not hold, the MNC can make an offer to buy-out any amount of share \( s \) by paying \( p = si \) and entry does not take place. Thus, the host firm gets \( \bar{\alpha}i \) and the MNC would get \( (1-\bar{\alpha})i \). This is because any offer of giving less to the host firm will be rejected and any offer of giving more is not optimal for the MNC. So the MNC can either buy out (completely or partially), or continue with the existing joint venture by giving an unacceptable offer and then not entering. And without loss of generality we assume that they continue the joint venture at the existing shareholdings. Thus,

**Proposition 1.** In the complete information game when the entry threat is credible, the subgame perfect equilibrium involves the MNC making a buy-out offer (complete or partial) such that the host firm gets \( \bar{\alpha}i \) and the host firm accepts that offer and entry never occurs. If the entry threat is not credible then in the equilibrium, the MNC will continue with the existing joint venture without entering.

---

5 Under complete information, Mukherjee and Sengupta (1998) have analysed the possibility of entry of the MNC with a subsidiary to compete with its existing joint venture counterpart when the later stage full liberalisation is associated with entry of many other firms.
Section III

Incomplete information problem

We assume that the demand condition in the domestic market is random in the second period. For simplicity, we assume that the demand can take two values: high or low. Two parties have different perceptions about the demand. The MNC has some prior belief about these states of demand. However, during the first period, the host firm gets a signal about what would be the actual demand in second period. This can be justified on the ground that since the host partner has the controlling stake in the first period joint venture, it might have better access to certain information as compared to the MNC. Also in a dynamic economy the host partner being local agent might have greater ability to interpret the consumers’ reaction to the product in the first period, which would ultimately determine the second period demand. Due to this signal, the second period game starts with an asymmetric information structure. We denote the monopoly profit in high state of demand by \(X\) and in low state of demand by \(Y\). Now depending on the signal the host firm can be identified as \textit{high type} (if it has got the signal of profitability \(X\)) and \textit{low type} (if it has got the signal of profitability \(Y\)). In essence the incomplete information game attributes two values of \(i\), i.e., \(i = X\) or \(Y\) and about which the two parties have different information in the beginning of the second period. The MNC’s prior belief about the high state of demand is represented by a probability \(q\) in the beginning of the second period. Since the host firm has private information about the true state of demand in the second period, the MNC is confronted with an adverse selection problem in buying out shares form the host firm. The second period game can be represented by the following diagram.

![Figure 3.2](image-url)
P denotes the posterior belief of the MNC that the host firm is the high type after rejection of the buy-out offer.

The entry of the MNC is credible in the second period when it has joint venture in operation for any state i, if

\[ \lambda i + (1 - \alpha) \lambda i - F > (1 - \alpha) i^6 \quad \text{for} \quad i = X \text{ and } Y. \]

So \[ \lambda > \frac{(1 - \alpha) i + F}{(2 - \alpha) i} = \frac{1 - \alpha + \frac{F}{i}}{2 - \alpha} \quad \text{for} \quad i = X \text{ and } Y \] (3)

This means that the market should not become too competitive after the entry given the setting up cost F. Depending on the credibility of entry threat in the second period we can have three cases: (a) entry threat is credible for both states, (b) entry threat is credible for the high state but not so for the low state, and (c) entry threat is not credible for both states.

We get a similar lemma as in complete information game.

**Lemma 2.** In any equilibrium, entry does not take place after acceptance of the buy-out offer.

**Proof:** Consider the situation when the MNC makes a pooling buy-out offer which is accepted by both types. Since after rejection the host firm at least gets \( \bar{\alpha} \lambda i \) in case of entry depending on its type, so any acceptable contract must involve each type getting at least those amounts in the following equilibrium. Hence, by giving a pooling contract which is accepted by both types and then entering the MNC can at the most get \( q[X - \alpha \lambda X] + (1 - q)[Y - \alpha \lambda Y] - F \), which the MNC can always get by making an unacceptable offer and then entering after rejection.

Note that after acceptance of any separating contract the identity about the types of the host firm will be revealed to the MNC. By rejecting the MNC's offer, the host firm can at least expect to get \( \bar{\alpha} \lambda i \) because at worst the entry will take place after the rejection. Suppose the entry takes place in any equilibrium after acceptance. In that equilibrium the host firm at least

---

\(^6\) Consider the demand function \( P = A - bQ \) and cost function \( C = cQ \) (where \( A, b \) and \( c \) are positive real numbers \( A > c \)); and \( P \) and \( Q \) are price and quantity respectively). Since any firm produces output after observing the demand, so if the MNC believes that the intercept \( A \) is uncertain and can take two values \( A_1 \) and \( A_2 \) with probability \( q \) and \( 1 - q \) respectively then \( X = (A_1 - c)^2 / 4b \) and \( Y = (A_2 - c)^2 / 4b \). Under Cournot competition \( \lambda = 4/9 \) for both states of demand. This analysis can be carried out more generally with different \( \lambda \) for different states of demand also. To avoid algebraic complications we take a common \( \lambda \) for both states.
Case a: Entry is credible for both types

Consider the case (a), where the MNC's entry threat is credible for both types i.e.,

\[
\lambda > \frac{1 - \alpha + \frac{F}{Y}}{2 - \alpha} > \frac{1 - \alpha + \frac{F}{X}}{2 - \alpha} \quad \text{from condition (1)}.
\]

We have to find out the perfect Bayesian equilibrium in the second period game. Since entry threat of the MNC is credible for both types of demand condition, so the MNC will enter after rejection of the host firm. As a result, the host firm's reservation payoff is \(\alpha \lambda i\) depending on its type. Consider the following acceptance rule of the host firm depending on its type.

High type: Accept any buy-out offer, which gives a payoff \(\geq \alpha \lambda X\)
And reject otherwise;

Low type: Accept any buy-out offer, which gives a payoff \(\geq \alpha \lambda Y\)
And reject otherwise.

There are four possible strategy for the host firm with respect to its type (accept, accept); (reject, accept); (accept, reject) and (reject, reject). We claim that (reject, reject) can never be a part of an equilibrium strategy. Since entry is credible for both types after rejection, the entry would occur in the following subgame. In other words, we claim the following lemma to hold.

**Lemma 3:** When \(q \in (0, 1)\), the probability of entry is strictly less than one in any equilibrium.

**Proof:** Suppose, the MNC makes an offer such that both types reject and therefore it would enter with probability 1. By this offer, the MNC gets

\[
q\{(1 - \alpha)\lambda X + \lambda X - F\} + (1 - q)\{(1 - \alpha)\lambda Y + \lambda Y - F\}.
\]

Now consider the deviation the MNC can make by giving an offer of complete buy-out to the low type such that it gets \(\alpha \lambda Y\) and enter if rejected. This offer will be accepted by the low type and the high type will reject this offer as it does not get \(\alpha \lambda X\), which is greater than \(\alpha \lambda Y\). After rejection by the high type, the MNC enters with a subsidiary. Thus, by this deviation the MNC can get \(q\{(1 - \alpha)\lambda X + \lambda X - F\} + (1 - q)\{Y - \alpha \lambda Y\}\). For \(q \in (0, 1)\), this deviation yields greater payoff than the payoff where the MNC enters with probability 1. Hence, this deviation will upset the equilibrium, which would be achieved where the host firm play the strategy (reject, reject).
take place after rejection. And the MNC does not do any better by making unacceptable offer to any type as in that case (strategy S2 or S3) the entry will take place, after rejection by one type of the host firm, in the following subgame. As a result, the payoff of the MNC would be less in that equilibrium as compared to the payoff from above strategy.

The above proposition may be intuitively seen with the help of the following diagram.

```
0 | a | 1/2 | a\lambda | 1
```

Figure 3.3

Here the MNC buys out \(\alpha - \bar{\alpha} \lambda\) amount of share at zero price. After this buy-out the entry threat of the MNC vanishes as the host firm holds \(\bar{\alpha} \lambda\) (\(h_x < h_y\)) share of the joint venture business. Both types of the host firm accept the buy-out offer and entry of the MNC never occurs in equilibrium. Note that there exists a range of separating contract, which does equally well for the MNC. Consider the contract \(s(Y) > \bar{\alpha} - \alpha \lambda\) and \(p(Y)\) such that the low type host firm gets \((\bar{\alpha} - s(Y)) Y + p(Y) = \bar{\alpha} \lambda Y\) and \(s(X) = \bar{\alpha} - \alpha \lambda\) with \(p(X) = 0\). This is a class of such separating contract. In this contract the MNC may buy-out the low type completely also.

To find out the equilibrium in possibility (2), we first prove the following proposition.

**Proposition 3.** If \(h_x < \bar{\alpha} \lambda < h_y\), then for any \(q \in (0, 1)\), the MNC’s optimal payoff from pooling contract is always greater than the optimal payoff from separating contract, which are acceptable to both types of the host firm. The MNC’s payoffs from these two types of contracts are as follows:

under separating contract: \(q\{X - \bar{\alpha} \lambda X\} + (1-q)\{Y - \bar{\alpha} \lambda Y - (\bar{\alpha} \lambda - h_x)(X-Y)\}\),

and under pooling contract:

\(q\{X - \bar{\alpha} \lambda X\} + (1-q)\{Y - \bar{\alpha} \lambda Y\},\) \hspace{1cm} \text{for } q \leq q^*;

\(q\{X - \bar{\alpha} \lambda X\} + (1-q)\{Y - \bar{\alpha} \lambda Y - (\bar{\alpha} \lambda - \alpha^*)(X-Y)\}\), \hspace{1cm} \text{for } q > q^*;

where \(\alpha^*\), and \(q^*\) are certain critical values (derived in the proof below).
the pooling offer if the host firm holds the share \( \alpha \), entry does not occur provided that \( \alpha \) satisfies condition (5). Since \( h_x < \bar{\alpha} \lambda < h_y \), given the contract there is a positive gain from entry for the high type i.e., first term in the second bracket is positive and that for the low type is negative (given by the second term). Thus, when \( q \) tends to zero, the LHS of (5) is negative and when \( q \) tends to one the LHS of (5) is positive. Hence by continuity there exists a \( q^* \) such that for \( q \leq q^* \), the condition (5) is satisfied under the given contract. Hence the above contract will be accepted for \( q \leq q^* \) as entry would not occur after acceptance. Thus, the MNC gets from this contract \( q(X-\bar{\alpha} \lambda X) + (1-q)(Y - \bar{\alpha} \lambda Y) \). However, for \( q > q^* \), the above contract will not be accepted as the entry will occur after that (because the condition (5) is positive). So in order to make the entry threat vanished after the acceptance, the MNC has to buy some more shares from the host firm.

We claim that for \( q^* < q < 1 \), there exists \( \alpha^* \) such that for \( \alpha^* \in (h_x, \bar{\alpha} \lambda) \), the no-entry condition (5) becomes zero and for any \( \alpha \leq \alpha^* \), entry would not occur after the buy-out of share. This is because at \( \alpha = h_x \), condition (5) is negative and at \( \alpha = \bar{\alpha} \lambda \), the condition (5) is positive. Hence by continuity it follows that \( \alpha^* \) exists and belongs to the said range.

Note that the sign of \( \frac{\delta \alpha^*}{\delta q} \) is negative. Also, it is obvious from the definition of \( h_x \) and \( h_y \) that for \( \alpha < h_x \), the condition (5) is negative.

Now consider the following pooling buy-out offer \( s(i) \) and \( p(i) \) to each \( i \) such that \( s(i) = \bar{\alpha} (1 - \lambda) + \beta \) and \( p(i) = \beta X \) and the host firm’s shareholding after the buy-out \( \alpha = \bar{\alpha} - s(i) \leq \alpha^* \).

Since \( \alpha^* < \bar{\alpha} \lambda \), so \( \beta > 0 \). By accepting this offer, the high type gets the payoff \( \bar{\alpha} \lambda X \) and the low type gets \( \bar{\alpha} \lambda Y + \beta (X - Y) \). So the low type accepts the offer also, as \( \beta > 0 \). This offer will be accepted by both types of the host firm, since by rejection any type \( i \) would get \( \bar{\alpha} \lambda i \) because of entry in the subsequent node. Here the low type gets a rent because the offer entails a buy-out of \( \beta \) shares at the price of \( X \) and the rest of the shares at zero price in the given contract. Therefore, the MNC’s payoff from the above pooling contract is

\[
q(X - \bar{\alpha} \lambda X) + (1-q)(Y - \bar{\alpha} \lambda Y - \beta (X - Y)) .
\]

To maximise the payoff, the MNC chooses \( \beta \) at a minimum possible level, say \( \beta^* \). Since \( \bar{\alpha} - s(i) \geq \bar{\alpha} \lambda - \alpha^* \), i.e., \( \beta \geq \bar{\alpha} \lambda - \alpha^* \). So the optimal \( \beta^* = \bar{\alpha} \lambda - \alpha^* \).

Hence the MNC obtains the payoff from the pooling contract
\[ q\{X - \alpha \lambda X\} + (1-q)\{Y - \alpha \lambda Y - (\alpha \lambda - \alpha^*) (X-Y)\}. \]

For \( q \in (0, 1) \), \( \alpha^* > h_X \). Hence, by comparing the payoffs from the two types of contract we have Proposition 3.

The intuition of the above proposition is the following. First note that the best possible offer for the MNC would be to buy-out \( \alpha - \alpha \lambda \) amount of shares at zero price from both types of the host firm provided that entry does not occur after acceptance. The host firm would accept that as it would get its reservation payoff \( \alpha \lambda \mu \) in equilibrium depending on its type. So the MNC gets \( q \{X - \alpha \lambda X\} + (1-q)\{Y - \alpha \lambda Y\} \), which is the best possible payoff for the MNC.

Given the parameter restrictions, for \( q \leq \alpha^* \) the above contract is possible to offer, as the entry threat vanishes after that buy-out. However, for \( q > \alpha^* \), the entry threat would remain after the buy-out. The only way to make 'no-entry' credible is to buy-out some extra amount of shares such that entry becomes unprofitable after the acceptance of the buy-out offer. Since the buy-out offer is accepted by both types, so this extra amount of shares has to be bought in the high type's share price, otherwise the high type would not accept the offer. Under separating contract this additional share that needs to be bought out is greater as compared to the pooling contract. This is the crucial factor behind this proposition.

**Remark 1.** This is a very interesting feature of our model. Although there exists a separating contract, which is acceptable to both types, it turns out that the pooling contract strictly dominates the separating contract in terms of the maximum payoff accrued to the MNC. This is because to pre-empt the entry threat, the MNC has to buy a greater amount of shares at the high type's price from the low type under the separating contract as compared to the pooling contract. So whenever the strategy \( S_1 \) is undertaken in equilibrium, the MNC prefers to acquire no information even though the agent's private information can be acquired correctly by designing a separating contract. A similar result about information extraction may be seen in Cremer (1995).%

---

7 In a different context Cremer (1995) argued that the principal might not like to have full information about the type of the agent, as full information might prevent him from committing to a threat like "firing" the agent in case of "high" ability agent. In his model the information acquisition was done by a choice of exogenous mechanism as monitoring technology; whereas, in our model, the principal (the MNC) has the option of giving either a separating or a pooling contract. Thus, the acquisition of information can be done endogenously by designing a contract rather than any exogenous mechanism as in Cremer (1995).
Under strategy S2 the MNC makes an offer to the low type such that it accepts and enters in case of the high type consequent upon its rejection. This offer can be made by completely buying out the low type after paying the reservation payoff $\alpha \lambda Y$. This offer will not be accepted by the high type as it would not get its reservation payoff. The buy-out offer to the low type may be partial as $s(Y)$ and $p(y)$ such that $\alpha - s(Y) < \alpha \lambda$ and $p(Y) = [s(Y) - \alpha + \alpha \lambda]Y$ also. Thus, under the strategy S2, the MNC would get

$$q [\lambda (1 - \alpha) X + \lambda X - F] + (1-q)[Y - \alpha \lambda Y].$$

(8)

The strategy S3 is not feasible under the given parameter configurations as it is obvious from the step 1 of Proposition 3 that any offer which is acceptable to the high type would be accepted by the low type as well. Hence, the MNC would choose between these strategies S1 and S2 depending on their payoffs. Note that the maximum possible payoff is simply the surplus after giving the worst possible payoff $\alpha \lambda$ to each type and that offer being accepted. Any offer, which involves payoffs less than $\alpha \lambda$, will not be accepted as the host firm can at least get this, even after entry of the MNC. Define any shortfall from the maximum possible payoff to the MNC as loss. Under strategy S1, for $q \leq q^*$ the MNC gets the best possible payoff, but for $q > q^*$, the low type gets a rent which is the loss to the MNC. For $q > q^*$, the expected loss to the MNC from strategy S1 is given by the following expression $(1-q) \lambda (\alpha - \alpha^*) (X-Y)$. We have already noted from the definition of $\alpha^*$ that $\frac{\delta \alpha^*}{\delta q}$ is negative. Thus, the expected loss from undertaking S1 strategy can be plotted with respect to $q$ as follows.
On the other hand, under strategy S2 there are two losses: one is the setting up cost and the other is the competitive loss due to duopoly competition, which would ensue because of entry of the MNC in case of the high type only. So the expected loss from undertaking strategy S2 is $q[(1-2\lambda)X + F]$ (from (8)), which can be represented as below with respect to $q$.

![Figure 3.6](image1)

There are two possibilities that would arise depending on the nature of expected loss functions and the associated optimal strategy with respect to $q$ are given below.

![Figure 3.7](image2)

Thus, the perfect Bayesian equilibrium outcome in possibility (2) can be described as below.

**Proposition 4.** When $h_x < \alpha \lambda < h_y$ (possibility (2)), the MNC chooses either of the strategies S1 or S2 depending on the payoffs. Both types of the host firm accept the offer in case of strategy S1. In case of strategy S2 only the low type host firm accepts the offer and the MNC enters consequent upon the rejection by the high type. The MNC does not enter whenever the offer is accepted.
Note that if S1 strategy is undertaken, then the buy-out offer is strictly partial in nature. However when the low type is bought out in case of strategy S2 the buy-out may be complete or partial.

Before we move on to the analysis of the next possibility, we make the following remark on Proposition 4.

**Remark 2.** It is generally true in the principal-agent literature that the separating contract is weakly dominant over the pooling contract. Here we get the opposite result. In general, in the principal-agent models with adverse selection, the principal can design a separating contract by paying the information rent to the agent and the agent accepts that contract. However, the principal does not take any action, which might punish the agent in some way after information revelation. Here after the acceptance of the buy-out offers the principal (the MNC) has the option of entry, which is detrimental to the agent. Since the principal cannot commit on that punishment strategy, so the information extraction becomes more costly resulting in the fact that the MNC’s payoff from pooling contract dominates that from the separating one.

Consider the third possibility i.e., \( h_x < h_y \leq \overline{\alpha} \lambda \). For the similar reason, we can argue that the MNC gets more payoff from pooling contract than from separating one under S1 strategy. Under separating contract the MNC has to buy at least \( \overline{\alpha} - h_x \) amount of shares from the high type by paying \((\overline{\alpha} \lambda - h_x)X\) price to make it acceptable to the high type. By accepting this offer the low type would get \( \overline{\alpha} \lambda Y + (\overline{\alpha} \lambda - h_x)(X-Y) \). On the other hand, from pooling contract the MNC can optimally buy-out \( \overline{\alpha} - \alpha^* \) amount of share where \( \alpha^* \) is such that the condition (5) is equal to zero. This \( \alpha^* \) would lie in \((h_x, h_y)\) for any \( q \in (0, 1) \) in this possibility (3). Under the given set of parameter values, for any \( q \) the MNC has to buy \( \overline{\alpha} \lambda - \alpha^* \) amount of shares under pooling contract at the high type's price. So the low type will always get a rent. Thus, the loss from strategy S1 is \((1-q)(\overline{\alpha} \lambda - \alpha^*)(X-Y)\). Now \( \alpha^* \) behaves the same way with respect to \( q \) as in earlier case (i.e., \( \frac{\delta \alpha^*}{\delta q} \) is negative). In fact, the difference with the possibility (2) is that \( q^* \) goes to zero, since the loss is incurred for any positive \( q \). The strategy S2 would have the same associated payoff. The strategy S3 is not feasible again for the same reason. Thus, we have characterisation of the equilibrium in this possibility (3) as below.
Alternatively, the equilibrium can be described as follows.

**Proposition 5.** When \( h_x < h_y \leq \overline{\alpha} \lambda \) (possibility (3)), the following constitutes a perfect Bayesian equilibrium. There exists a prior belief \( \overline{q} \) such that the MNC chooses strategy \( S_2 \) for \( q \leq \overline{q} \); and it chooses strategy \( S_1 \) for \( q > \overline{q} \). Both types of the host firm accept the offer in case of strategy \( S_1 \). In case of strategy \( S_2 \), only the low type host firm accepts the offer and the MNC enters consequent upon the rejection by the high type. The MNC does not enter whenever the offer is accepted.

Now the question is whether the equilibrium is unique or not. First note that the uniqueness of equilibrium is described with respect to the strategy combination undertaken by the two parties. Now it is easy to see that the equilibrium described in Proposition 2 is not unique. Note that another perfect Bayesian equilibrium involves the MNC’s strategy of completely buying out the low type host firm by paying \( \overline{\alpha} \lambda Y \) and buying out the high type’s \( \alpha - \overline{\alpha} \lambda \) shares at zero price with the belief that in case of rejection \( P \in [0, 1] \) and both types of the host firm accepting their respective offers. However, in this equilibrium also the MNC receives the same payoff as in the equilibrium described in Proposition 2. Instead of uniqueness of equilibrium, we are interested in whether the equilibrium payoffs are unique given any parameter configuration. Now we prove the following proposition in this regard.
Proposition 6. For any given parameter configuration, the equilibrium payoffs received by the parties are unique.

Proof. We will prove the above proposition only for the parameter configuration under possibility (3), the proofs for other possibilities being similar. Suppose, the proposition is not true, so there exists at least another set of payoffs for the parties, which can be sustained in some equilibrium. Consider the situation when \( q \leq \bar{q} \), the strategy \( S_2 \) is optimal in the given equilibrium. Now in the alternative equilibrium, either the entry of the MNC occurs or not. Suppose the MNC enters for the low type after giving an acceptable offer to the high type. However, the low type would also accept the offer made for the high type. In that case, the MNC's best strategy is to undertake the strategy \( S_1 \). And we know that for this range of probability the strategy \( S_2 \) is better than \( S_1 \). Therefore, the MNC enters only after making an offer to the low type and in that case \( S_2 \) is the best strategy. If the MNC does not enter in equilibrium it must be the case that both types of the host firm accept the offer and in that case \( S_1 \) is the best strategy to undertake. Moreover, for this range of prior probability, the MNC's payoff from \( S_2 \) is greater than \( S_1 \). So by making the deviation to strategy \( S_2 \), the MNC does better. Thus, for \( q \leq \bar{q} \), \( S_2 \) is the best strategy to undertake for the MNC and therefore the payoffs to the parties are as given under strategy \( S_2 \). These payoffs are uniquely defined given the parameter values. Now consider the other range \( q > \bar{q} \). Similarly we argue that if entry occurs then \( S_2 \) is the best strategy but \( S_1 \) dominates \( S_2 \). And if entry does not occur, \( S_1 \) is the best strategy for the MNC. Thus, \( q > \bar{q} \), \( S_1 \) is the best strategy to undertake for the MNC and therefore the payoffs to the parties are unique.

Remark 3. From the above analysis it is obvious how our model can be interpreted as a model of entry. When the strategy \( S_2 \) is undertaken by the entrant then in equilibrium either the entrant buys out the incumbent firm in case the incumbent firm is of the low type or it enters to compete in the case of the high type. When the strategy \( S_1 \) is undertaken the entrant can acquire the incumbent firm partially, which is tantamount to the fact that the entrant forms a joint venture with the incumbent firm.
Case (b): Entry is credible for the high type but not for the low type

This case arises when the following condition holds:

\[
\frac{1 - \alpha + \frac{F}{Y}}{2 - \alpha} \geq \lambda > \frac{1 - \alpha + \frac{F}{X}}{2 - \alpha}
\]

**Lemma 4:** Given the above condition, there exists a probability \( P^* \) in the left hand node of the MNC's second information set (i.e., after rejection by both types) such that

- for \( P > P^* \), entry is better than no entry;
- for \( P < P^* \), no entry is better than entry;
- and for \( P = P^* \) the MNC is indifferent between entry and no entry.

It is easy to see that for \( P=1 \) the entry is better and for \( P=0 \), the no entry is better for the MNC and hence the lemma follows from the continuity of the payoffs.

Let us try whether we can get a perfect Bayesian equilibrium involving the same set of strategies of the players as in case (a).

Note that the proofs of lemma 2 and 3 are crucially dependent on the fact that after rejection, the entry is credible for the MNC and as a result entry would occur. So the host firm accepts the offer irrespective of its type given the threat that the entry would take place in case of rejection. Now in this case although the entry is not credible for all values of posterior beliefs in the MNC’s second node, however if the MNC holds the belief \( P = 1 \) after rejection then the proofs of the above lemmas would go through. \( P=1 \) implies that the MNC believes that the offer is rejected by the high type only. This belief of the MNC makes entry credible after rejection of the buy-out offer.

Now in this situation \( h_y = \bar{\alpha} \). We have two subcases to consider (1) \( h_x \geq \bar{\alpha} \lambda \) and (2) \( h_x < \bar{\alpha} \lambda \). We state the following proposition on the equilibrium in case (b), i.e., when entry is credible for the high type but not for the low type.

**Proposition 7.** (a) If \( h_x \geq \bar{\alpha} \lambda \) (subcase 1), the following constitutes a perfect Bayesian equilibrium in the second period. The MNC offers \( s(t) = \bar{\alpha} (1-\lambda) \) and \( p(t) = 0 \) for both \( t \). The MNC enters if rejection occurs (with belief \( P=1 \)) and never enters on acceptance of the offer by the host firm. Both types of the host firm accept the offer.
(b) If \( h_x < \bar{\alpha} \lambda \) (subcase 2), then a perfect Bayesian equilibrium outcome is given by the following strategy profile. The MNC chooses either of the strategies \( S_1 \) or \( S_2 \) depending on their payoffs. Both types of the host firm accept the offer in case of strategy \( S_1 \) given the belief \( P=1 \). In case of strategy \( S_2 \) only the low type host firm accepts the offer and the MNC enters consequent upon the rejection by the high type (with \( P=1 \)). The MNC never enters on acceptance of the offer by the host firm.

**Proof:** (a). Take the same set of strategies for both the players as in case (a). Given the offer, each type gets \( \bar{\alpha} \lambda \) by accepting it. By rejection each type of the host firm would get those amounts since the MNC would enter after rejection given the belief \( P=1 \), which makes the entry as the dominant option there. Hence, both would accept the offer. Now we have to check whether this strategy is optimal for the MNC. Suppose the MNC undertakes the strategy \( S_2 \). Then the equilibrium in the following subgame is that the low type will accept the offer and entry occurs in case of the high type after rejection. So by this strategy the MNC would get less because of setup cost and the competitive loss.

Now the strategy \( S_3 \) is feasible if the following offer is made \( s(X) \) and \( p(X) \) such that \( h_x \geq \bar{\alpha} - s(X) > \bar{\alpha} \lambda \), \( p(X) = [\bar{\alpha} \lambda - \bar{\alpha} + s(X)]X \ (<0) \). By accepting this offer the high type gets \( \bar{\alpha} \lambda X \). Note that this offer will not be acceptable to the low type as by accepting, it would get less than \( \bar{\alpha} \lambda Y \). Given this offer, there will not exist any pure strategy equilibrium in the following subgame for \( q > P^* \). Because as the low type is surely rejecting the offer the MNC does not enter in the following subgame, so the high type would reject also by anticipating this, but in that case entry would take place which implies that the rejection of the high type was not optimal. With this strategy \( S_3 \), the mixed strategy equilibrium is given by the high type randomising between acceptance with probability \( t \), and rejection with probability \( (1-t) \) such that

\[
\frac{q(1-t)}{q(1-t) + (1-q)} = P^*,
\]

implying that the MNC is indifferent between entry and no entry. The low type rejects the offer and the MNC enters with probability one in the second information set. In this equilibrium, the MNC gets less than the payoff from strategy \( S_1 \), as entry is occurring with positive probability. For \( q \leq P^* \), after rejection by both types the MNC can not enter so the payoff to the MNC will be less for that range also. The strategy \( S_4 \) is also not optimal in this subcase, since the MNC can choose the strategy \( S_2 \), which gives more payoff to the MNC. Comparing the payoffs from all the relevant strategies we find the above proposition 7(a) to describe a perfect Bayesian equilibrium.
(b) First note that the Proposition 3 holds in this case also. Hence, by undertaking S1 strategy the MNC gets,

\[ q(X-\alpha \lambda X) + (1-q)(Y - \alpha \lambda Y), \quad \text{for } q \leq q^*; \]

and

\[ q(X-\alpha \lambda X) + (1-q)(Y - \alpha \lambda Y - (\alpha \lambda - \alpha^*) (X-Y)), \quad \text{for } q > q^*; \]

In this case the strategy S3 is not feasible as any offer to the high type would be accepted by the low type for the similar reason discussed in case (a) under possibility (2). Under strategy S2 the MNC makes an offer only to the low type such that it gets \( \alpha \lambda Y \) and enters if the rejection occurs with the belief \( P=1 \). So the MNC gets (from (8))

\[ q [(1-\alpha^*) \lambda X + \lambda X - F] + (1-q)[Y - \alpha \lambda Y]. \]

It is easy to see that the strategy S4 is dominated by the strategy S2. Thus, depending on the losses from the strategies S1 and S2, the equilibrium can be characterised as in Figure 3.7.

**Remark 4.** This finding is interesting because even though in this case the entry is not credible for the low type the same equilibrium configuration goes through. The low type gets \( \alpha \lambda Y \) in some equilibrium outcome and some extra rent in some other, which is exactly similar to the earlier case. This is a difference with the complete information case where the low type would have got \( \alpha Y \) in equilibrium in second period, as the entry threat is not credible for the low type. The reason is that although the entry threat is not credible for the low type, due to incomplete information the low type host firm becomes defenseless as the MNC maintains an out-of-equilibrium belief that the rejection is made by the high type which makes the entry threat credible there. Thus, the low type is forced to accept the offer, which involves the payoffs similar to what is associated with the entry threat being credible (case (a)).

Now the question is whether there exists some other set of payoffs to the parties that can be sustained as equilibrium outcome also. We state the following propositions in this regard.

**Proposition 8:** For \( q > P^* \), the equilibrium payoffs are unique in any subcase. However, for \( q \leq P^* \), the equilibrium payoffs are non-unique for both subcases and any payoff \( L \in [\alpha \lambda Y, \alpha Y] \) to the low type can be sustained in some pure strategy equilibrium.
Proof: We prove it for the subcase (1) and the proof for the other subcase can be carried out similarly. Consider the situation \( q > P^* \). Suppose, the equilibrium payoffs are not unique then there exists at least another set of payoffs to the parties, which can be sustained as perfect Bayesian equilibrium. Note that in the given equilibrium (described in Proposition 7a) the host firm gets exactly \( \alpha \lambda_i \) depending on its type. In the alternative equilibrium either of the two situations occur: both types get more; or, either one type gets more as compared to the given equilibrium. Suppose both types get more. Now consider the deviation of making an offer to both types, \( s(i) = \alpha (1-\lambda) \) and \( p(i) = 0 \) and enter if rejection occurs with the belief \( P=1 \). Then, neither type will reject, as by rejection the host firm does not get more in the following equilibrium with entry. If both types reject the offer, then entry occurs in the following subgame as for this range of beliefs the ‘entry’ is dominant over ‘no-entry’ in that information set of the MNC. Hence both will accept the offer. So the alternative equilibrium where both types get more, is upset by the deviation we have considered.

Suppose the high type gets more in the alternative equilibrium then we reduce the offer to the above level. In that case the low type would continue to accept and the high type will also accept as the rejection entails entry in the following subgame and hence the deviation upsets the alternative equilibrium. If the low type gets more in the alternative equilibrium then also the similar deviation will upset the alternative equilibrium. Hence, the equilibrium payoffs are unique.

To prove that the equilibrium payoffs are not unique for \( q \leq P^* \), we consider the following strategy chosen by the low type host firm. It accepts any offer which gives him the payoff greater than or equal to \( L \) and rejects otherwise, where \( L \in [\alpha Y, \alpha \lambda Y] \). Then any offer on the equilibrium path involves at least a payoff \( L \) to the low type, which will be accepted by it. Otherwise, if the MNC offers less than \( L \), then the low type would reject. If the low type rejects then entry will not take place in the following node. So by anticipating that the high type will also reject. In that case given the fact that both types have rejected and \( q \leq P^* \), the MNC’s entry threat is not credible. Thus, the MNC has to continue the existing joint venture. If the MNC makes an offer of buying out the low type such that the low type gets \( L \) from acceptance in the subsequent equilibrium. The low type would accept the offer given its action rule. Now, the MNC’s payoff will be determined depending on the following situations: (A) \( \alpha \lambda X \leq L \); and (B) \( \alpha \lambda X > L \). In the first situation, any acceptable buy-out offer to the low type will be mimicked by the high type also. We claim that the buy-out offer to the low type, such that the low type gets \( L \), has to be complete in nature. Since the high type
would mimic the low type, so any partial buy-out offer would lead to more than $L$ payoff to the high type. Hence to minimise the rent appropriated by the high type the MNC would make a complete buy-out offer to each type by paying $L$ and enter if the offer is rejected. This offer will be accepted by the low type given its strategy and the high type will mimic and get the same payoff, since by rejection it would get less due to entry of the MNC in the subsequent node. As a result the high type gets a rent above its reservation payoff $\bar{\alpha} \lambda X$. Hence, the MNC gets $q \{X-L\} + (1-q) \{Y-L\}$. This complete buy-out offer is better for the MNC given the strategy of the low type than making an unacceptable offer to the low type, since in that case the MNC has to continue with the existing joint venture.

In second situation when $\bar{\alpha} \lambda X>L$, the MNC makes a separating contract such that the low type gets $L$ by buying it out completely and make the offer $p(X) = 0$ and $s(X) = \bar{\alpha} (1-\lambda)$ and enter if rejection occurs. This contract will be accepted by the high type as it does not get more by rejection since entry will occur after rejection with the belief $P=1$. The low type would accept the offer according to its action rule. From this offer the MNC gets $q \{X-\bar{\alpha} \lambda X\} + (1-q) \{Y-L\}$.

Now can the low type get a payoff, which is greater than $\bar{\alpha} Y$? The answer is no. Consider the payoff $\bar{\alpha} Y + \epsilon$, where $\epsilon>0$. Now in both the above situations if the MNC reduces the buy-out (complete) price to $\bar{\alpha} Y$ to the low type in undertaking any strategy and enter if rejection occurs. This offer will be accepted by the low type, since by rejection it can at most expect that the MNC does not enter and in that case it would get the same amount as it is already offered. So if rejection occurs, then the MNC would believe that it is done by the high type only. Thus, the MNC's entry with a subsidiary would be the dominant option there. So in any equilibrium the low type can at the most get $\bar{\alpha} Y$. In all such equilibria the high type gets max $[\bar{\alpha} \lambda X, L]$.

In both situations, the MNC gets more by offering $L$ to the low type rather than making an unacceptable offer to the low type and then from the continuation of the joint venture at the existing shareholding after rejection. Hence the proposition is established.
Case (c): Entry is not credible for both types

Since the entry is not credible for both types, so after rejection the MNC would have to continue with the joint venture without entering. As a result, the host firm gets $\bar{\alpha}_i$ depending on its type. Hence any buy-out offer must allow the respective types to get the above payoffs. Without loss of generality we assume that the MNC continues the existing joint venture and entry never occurs.

**Proposition 9.** When entry of the MNC is not credible for both types of the host firm, the first period joint venture is continued and entry never occurs in equilibrium.

Section IV

On imitation

So far we were concerned with the analysis of the second period outcome by assuming that the host firm imitates the foreign technology in the first period without incurring any cost. Let us introduce the notion that the imitation is costly to undertake in the first period. Suppose the technology transfer facilitates imitation at a cost $I$ in the first period. This is a choice variable of the host firm. In the beginning of second period, the MNC knows whether the host firm has imitated the technology or not. In the first period, the host firm makes the choice of imitation after receiving the signal about the state of the economy of the second period. Whether the host firm will imitate or not depends on what each type of the host firm expects to get from the outcome in the second period subgame. We assume that $i-F>0$ for all $i$. This means that the MNC’s entry is feasible when it operates in the economy as a monopolist irrespective of the demand condition in the second period. If any type does not imitate, since it is observable, the MNC would buy out that type of the host firm at zero price and the host firm would accept that offer. Because by rejection also it would get zero as the MNC would enter after that to monopolise the market. Hence the host firm would imitate the technology so long as it gets a positive payoff from imitation. We assume that the contract can not be written prohibiting imitation in the first period.
Under complete information the host firm gets $\alpha \lambda i$, if the entry is credible at $\alpha$. So the host firm imitates the technology if $\alpha \lambda i - I > 0$. If entry is not credible then the imitation is done if $\alpha i - I > 0$.

Consider case (a) i.e., when the entry threat is credible for both types. Recall the propositions 2, 4 and 5. In every equilibrium, the high type always gets the payoff $\alpha \lambda X$. So it chooses to imitate as long as $\alpha \lambda X - I > 0$. In some equilibrium the low type gets a rent above its complete information game payoff $\alpha \lambda Y$ and as a result whenever the low type gets the rent its decision to imitate would depend on $\alpha \lambda Y + (\alpha \lambda - \alpha^*) (X - Y) - I > 0$ and when it does not get any rent the decision to imitate depends on $\alpha \lambda Y - I > 0$. Hence, in some equilibrium the investment on imitation would be more as compared to the complete information game. Thus, we have the proposition:

**Proposition 10.** When entry is credible for both types (case (a)), there will be over-investment on imitation in some equilibrium under incomplete information game as compared to the complete information game.

Now consider the equilibria in case (b) i.e., the entry threat is credible only for the high type. Note that in this case under complete information game the low type gets $\alpha Y$ and the high type gets $\alpha \lambda X$. In comparison to that, in incomplete information game the low type would be getting anything in the closed interval $[\alpha Y, \alpha \lambda Y]$ and the high type gets $\alpha \lambda X$ and in some equilibrium even more by mimicking to be low type discussed under proposition 8. When the imitation is not done by any type it would get zero as the MNC would give a complete buyout offer by paying zero to the host firm and the host firm would accept that offer. Thus, we write the following proposition.

**Proposition 11.** When entry is credible for the high type but not for the low type (case (b)), the low type may under-invest on imitation and the high type may over-invest on imitation under incomplete information game as compared to the complete information game.

In case (c), i.e., when the entry is not credible for both types of the host firm, both types get the similar payoffs as in complete information game. Therefore, the investment on imitation remains the same as in case of the complete information game.
Section V

Conclusion

We have considered an important aspect of the international joint venture relationship in this chapter, where the local partner has better information about domestic demand as compared to the foreign partner. Within the framework of a single model, we have shown that a whole range of outcomes is possible, depending on the parameter values of the model. We find that there is partial share adjustment and complete buyout of the joint venture by the MNC and sometimes the MNC even enters with a subsidiary to compete with its already existing joint venture counterpart. Although the entry of the MNC and the ensuing competition involves some loss of total surplus, because of the incomplete information, buy-out does not turn out to be the dominant strategy always, as in the complete information game.

This chapter demonstrates the importance of incomplete information in a dynamic context to establish certain observable behaviour of joint venture organisation. When we consider imitation as a choice variable, we find that the host firm under- or over-invests on imitation of the foreign technology.

Another important feature of our model is that although the principal (the MNC) has the option of offering both the separating and pooling contracts, yet under certain parameter configurations the principal (MNC) prefers to offer a pooling contract as opposed to a separating contract. The implication is that the principal decides to acquire no information about the agent’s true private information. This is an interesting feature of our model, since, in general, in the principal-agent literature, the principal is not worse off having more information about the agent. However, the opposite is true in our model.

This chapter can also be considered as an analysis of entry mode when, an MNC faces a domestic competitor in the homogeneous goods market after full liberalisation in developing countries. We have established the possibility of joint venture formation under these circumstances. We have shown the occurrence of direct entry with some probability, depending on the parameter values, even when there is a possibility of acquisition through a process of buy-out of shares of the incumbent. Contrary to conventional wisdom, this direct entry occurs even though the post entry market is characterised by Cournot duopoly competition.