Chapter 4

Buy-out, Control and Entry in International Joint Ventures.
Section I

Introduction

This chapter is closely related to the previous chapter. Here we introduce the issue of control explicitly into the structure of the asymmetric information problem analysed in Chapter 3. In Chapter 3, we have assumed that the 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. As a result, the issue of control was not relevant there.

In this chapter, we assume that the production decisions are undertaken by the party that has a controlling stake in the joint venture business. Thus, the issue of control plays a crucial role in determining the nature of competition between the subsidiary and joint venture units. For example, if the MNC holds control of the joint venture after buy-out in the second period, then to maximise its total payoff, it would choose zero level of output for the joint venture in case the subsidiary too is in operation. In this chapter, we also introduce the possibility of the host firm setting up a business of its own after selling off its shares in the joint venture.

As in the previous chapter, we establish similar scenarios of joint venture instability in terms of partial share adjustment of a joint venture unit by the MNC; and in some cases the MNC even sets up a subsidiary to compete with its already existing joint venture counterpart. Additionally, we show that in the process of buy-out, the MNC may take over “control” of the joint venture unit or leave the control with the host partner. When we allow the host firm to set up a new business even after selling off its share in the joint venture unit, we find complete buy-out and even breakdown of the joint venture, where breakdown is interpreted as the partners part ways to compete with their own businesses.

The rest of the chapter is organised as follows. In section II, we describe the basic framework of our analysis and present the complete information version of the game. Section III presents the incomplete information scenario when the host firm’s setup cost is prohibitive. We extend the discussion in section IV by allowing for low setup costs of the host firm. Section V concludes the discussion. Some of the proofs are relegated to the appendix to this chapter.
Section II

The basic framework

We assume that the control of the joint venture unit rests with the party that holds more than 50% of the shares in the joint venture unit. This controlling party takes the production decisions of the unit. When the shareholding is 50% each, then either party may take the production decisions in the joint venture unit. In the first period joint venture, the government stipulates a minimum shareholding of the host partner \((\bar{\alpha})\) greater than 50%, so that the control of the business rests with the host firm.

We maintain the assumption that a joint venture is agreed upon with the prescribed limit of foreign equity holding. Thus the MNC holds \(1-\bar{\alpha}\) share, leaving \(\bar{\alpha}\) share to the host firm in the first period. Here we analyse the second period game. This chapter, like the previous one, can also be considered as an analysis of the mode of entry, when an MNC faces a domestic competitor in the homogeneous goods market, after full liberalisation in developing countries.

We keep the same technological setting as described in Chapter 3. However, we restrict ourselves to the case of costless imitation of the foreign technology by the host firm, which occurs through a process of "learning by doing" during the first period production.

The structure of the game is similar to the game considered in the previous chapter.

First period: The MNC offers the technology by forming a joint venture with the host firm at an upfront fee \(R\) such that the participation constraint of the host firm is satisfied. Since the upfront payment is fixed, it does not matter to the subsequent analysis of the game. The first period profit is realised at the end of the period.

Second period: The MNC makes an offer of buying out some shares \(s\) at a price \(p\). The host firm can either accept or reject the offer. After this acceptance or rejection, the MNC decides whether to enter with a subsidiary or not. The second period payoffs are realised at the end of the period.

We assume that: (1) the MNC enters if it gets strictly greater payoff than the no-entry option and (2) the host firm accepts the buy-out offer not only when its payoff is strictly greater but also when it is indifferent between acceptance and rejection in terms of payoff.
We restrict ourselves to only the pure strategies on the equilibrium path of the game. We assume that the host firm’s setting up cost is prohibitive so that it does not set up a new unit after selling off its shares even if it knows the technology. We rule out the possibility of selling out of shares by the MNC, so \( s \) is non-negative (these last two assumptions are relaxed only in section IV). Any firm first observes demand before it chooses the level of output. In the second period, if the MNC wants to set up a subsidiary it has to incur a set up cost \( F \ (>0) \). Both parties are risk neutral. We assume that no contract can be written that prohibits entry in the second period. Also we rule out any contract which is contingent on the outputs of the joint venture unit.

**The Complete Information Scenario**

Suppose the profit realisable in the second period under monopoly production is \( i \), which is known to both parties. We consider the same second period game as in chapter 3.

![Figure 4.1](image)

This game can be solved through backward induction. First we find out the reservation payoff of the host firm in the second period, which is the payoff it gets by rejecting the offer of the MNC. After rejection, the MNC may either enter to set up a subsidiary or not. If it sets up a subsidiary then there will be Cournot duopoly competition in homogenous goods as the host firm has control over the existing joint venture unit. When there is Cournot duopoly
competition between the joint venture and subsidiary units then the profit for each unit is $\lambda i$, where $\lambda < 1/2$. We assume

$$(A1). \quad \lambda i + (I - \alpha)\lambda i - F > (I - \alpha)i.$$ 

This assumption implies that the entry threat of the MNC, after rejection of the buy-out offer by the host firm, is credible. Thus, the host firm would get $\alpha \lambda i$ by rejecting the MNC's offer. This is the host firm's reservation payoff. 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 that 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. So this entry reduces the total surplus in the relationship. As a result, the MNC would try to avoid the entry to maximise its profit.

Note that the strategy of buying out completely by paying a price $\alpha \lambda i$ to the host firm gives the payoff $(i - \alpha \lambda i)$ to the MNC. This is the maximum payoff the MNC can obtain and it does not enter after the buy-out as it owns the joint venture unit fully. This strategy will upset any equilibrium involving entry even after the acceptance of the buy-out offer, as entry is costly. Hence we obtain the following lemma.

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

So any acceptable offer on the equilibrium path must be such that entry never occurs in the subsequent subgame.

Consider the following subgame after the acceptance of a buy-out offer. First, we specify the rules of the game at this stage. Suppose, after the buyout the host firm holds $\alpha$ share of the joint venture unit and the MNC holds the rest. Now the nature of the competition, that would ensue in case of entry of the MNC, is very different depending on the values of $\alpha$. If $\alpha \geq 1/2$, then after entry there will be two firms controlled by different management (joint venture by the host firm and subsidiary by the MNC). Hence, there will be Cournot duopoly competition

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1 We maintain the assumption 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.
between the two firms. On the other hand, if $\alpha < 1/2$ the MNC will be in a controlling position in both joint venture and subsidiary units. Thus, the MNC will maximise its own total profit by operating the subsidiary unit at the monopoly output level and putting the joint venture output at zero. Therefore, the critical value $\alpha = 1/2$ plays an important role in determining the nature of competition after the buy-out of shares by the MNC. This is because the control of joint venture switches hands with respect to the critical shareholding $1/2$.

Thus, if $\alpha \geq 1/2$, the MNC’s entry in the subsequent node depends on whether

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

$$1 + \frac{F}{i} - 2\lambda \frac{i}{1 - \lambda} = h \text{ (say).}$$  \hspace{1cm} (1a)

If $h$ exists in the range $[1/2, 1]$ then for $\alpha \in [1/2, h]$, the MNC does not enter after acceptance of the buy-out offer. The necessary and sufficient condition for the range to exist is that the entry threat is not credible at $\alpha = 1/2$. Note that $h < a$ because of assumption (A1).

Similarly, for $\alpha < 1/2$ the entry threat of the MNC would be credible after acceptance of the buyout offer by the host firm if

$$i - F > (1-\alpha)i$$

i.e., $\alpha > F/i = m$ (say). \hspace{1cm} (1b)

It is easy to check that $m < 1/2$ under assumption (A1). So the MNC does not enter after the acceptance of the buy-out offer if the host firm’s shareholding $\alpha$ belongs to the range $[0, m]$.

If $h$ exists, there are two ranges of $\alpha$ for which entry does not take place after the buy-out. An interesting point to note here is that there is no direct relationship between the credibility of entry threat and the amount of share bought out by the MNC. This is simply because of the switch of control of the joint venture unit with respect to the critical shareholding $1/2$. This phenomenon restricts the nature of buy-out contract that can be offered by the MNC if it wants to avoid entry after the buy-out. This may be seen in Figure 4.2 below.

![Figure 4.2](image-url)
For any $\alpha$ belonging to either $[0, m]$ or $[1/2, h]$ (if the second range exists), by giving an acceptable offer of buy-out $s(i)$ and $p(i)$ such that: $\alpha = \alpha - s(i)$ and $\alpha + p(i) = \alpha \lambda i$, the MNC can get $i - \alpha \lambda i$. 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 so that it gets rejected and entry takes place in the subsequent node. Thus, we write the following proposition.

**Proposition 1.** In the subgame perfect equilibrium the MNC makes a buy-out offer (complete or partial) such that the host firm gets $\alpha \lambda i$ and the host firm accepts that offer and the entry of the MNC never occurs in equilibrium.

### Section III

**Incomplete information problem:**

As in Chapter 3 we make the assumption that the demand conditions in the domestic market is random in the second period. For simplicity, we assume that this demand can take two values: high or low. The two parties have different perceptions about 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 the second period. Due to this signal, the second period game starts with an asymmetric information structure. We denote the monopoly profit in the high state of demand by $X$ and in the low state of demand by $Y$. Now depending on the signal, the host firm can be identified as high type (if it has got the signal of profitability $X$) and 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 from the host firm. The second period game, which is the same as in chapter 3, can be represented by the following diagram.
We assume that the entry of the MNC is credible in the second period when it already has a joint venture in operation, irrespective of its prior belief about the demand condition. We take the same $\lambda^2$ to be the ratio of duopoly profit to monopoly profit for both states. Since $X > Y$, so for the above assumption we need to assume only the following.

\[(A2) \quad \lambda^2 Y + (1 - \alpha) \lambda Y > (1 - \alpha) Y.\]

Under assumption (A2), the MNC would enter after rejection of the buy-out offer irrespective of the states of demand. As a result the reservation payoff of the host firm is $\alpha^2 Y$, depending on its type. Note that in this chapter, we are not considering the other two situations, where the entry threat is not credible either for the low type or for both types after rejection of the buy-out offer. Those situations have been analysed in the previous chapter and can also be analysed by introducing the issue of control. However, we restrict ourselves to one situation, which is permissible under assumption (A2).

Since entry reduces the total surplus in the relationship, the MNC would try to avoid entry as far as possible. Consider a strategy that the MNC makes an offer to buy out the host partner completely at a price $\alpha^2 Y$ and enter in case of rejection. This offer will be accepted by the low type only and the high type will reject this offer as it does not get $\alpha^2 \lambda Y [> \alpha \lambda Y]$. Then the entry cost is incurred with probability less than one. This strategy is strictly better for the

\footnote{This is true for the linear demand and cost functions, which is already demonstrated in the previous chapter (see footnote number 6).}
MNC as compared to any other strategy that involves the entry of the MNC with probability one. Hence we have the following lemma.

**Lemma 2**: In equilibrium, for $0 < q < 1$, the probability of entry is never one.

We get a similar lemma as in the complete information game.

**Lemma 3**: In equilibrium entry does not take place after acceptance of the buy-out offer.

**Proof**: First suppose that only one type of the host firm accepts a buy-out offer. Given assumption (A2), the MNC would enter after rejection of the buy-out offer. If entry occurs even after the acceptance of the buy-out offer, then entry is actually occurring in that equilibrium with probability 1; which violates our lemma 2.

Now suppose that in any equilibrium both types accept the buy-out offer. Note that the MNC can offer two types of contracts: (a) a pooling contract where the same offer is made to both types of the host firm and (b) a separating contract where a menu of buy-out offer is made, and out of which different types accept different offers. First consider the situation when the MNC makes a pooling buy-out offer. Under a pooling contract if entry occurs after acceptance of the offer by both types then lemma 2 is violated.

Secondly, consider the case of a separating contract. Suppose, entry occurs after acceptance of buy-out offer for type $i$. Now if the shareholding of the host firm of type $i$ is $\alpha(i) \geq 1/2$, then the MNC gets from that buy-out and subsequent entry at most $\lambda i + (1-\alpha) \lambda i - F$; which the MNC gets by simply entering without making any buy-out offer to type $i$. Similarly, for $\alpha(i) < 1/2$ the host firm gets nothing from the joint venture unit if entry occurs after that buy-out, since the MNC would choose the joint venture output to be zero to maximise its profit. So the buy-out offer in this case must involve at least a price $p(i) = \bar{\alpha} \lambda i$, otherwise the $i$ type would do better by rejecting the offer. Since it is a case of separating contract and the MNC is paying a price $p(i) = \bar{\alpha} \lambda i$, so the MNC can do better by paying the same price to buy-out the type $i$ completely as entry would not be profitable any more when the MNC owns the joint venture unit fully. Hence we argue that any acceptable offer on the equilibrium path of the game must be such that entry does not take place in equilibrium after acceptance.

The implication of lemma 3 is that after acceptance of the buy-out offer the entry threat must vanish in equilibrium. To find out the range of shareholdings at the MNC’s entry node such
that entry does not take place after the acceptance of the separating contract, we define, with
the help of (1a) and (1b), the following critical values of $\alpha$:

$\alpha = \frac{F_i}{i}$ for $i = X$ and $Y$

$\alpha = \frac{1}{1 - \lambda}$

Note that $m_x < m_y$ and $h_x < h_y$. It is easy to check that $m_x < m_y < \alpha \lambda$ under assumption (A2).

Hence by lemma 3, we argue that any separating contract which is acceptable to both types
leaves the host firm with the share $\alpha(i)$ such that

either $\alpha(i) \in [0, m_i]$ when $\alpha(i) < 1/2$, \hspace{1cm} (2)

or $\alpha(i) \in [1/2, h_i]$ if the range exists. \hspace{1cm} (3)

Similarly, under pooling contract the buyout offer $s(i)$ and $p(i)$ must be such that after
acceptance, entry does not take place. If the host firm holds $\alpha$ share after buy-out ($\alpha = \bar{\alpha} - s$)
then the entry threat must vanish. That is given by the conditions

$q \{X - F - (1-\alpha)X \} + (1-q) \{Y - F - (1-\alpha)Y \} = 0$, for $\alpha < 1/2$; \hspace{1cm} (4)

and $q \{(1-\alpha)\lambda X + \lambda X - F - (1-\alpha)X \} + (1-q) \{(1-\alpha)\lambda Y + \lambda Y - F - (1-\alpha)Y \} = 0$, for $\alpha \geq 1/2$. \hspace{1cm} (5)

To calculate the perfect Bayesian equilibrium in the second period game we consider the
following acceptance rule of the host firm depending on its type.

High type: Accept any offer, which gives a payoff $\geq \bar{\alpha} \lambda X$,

and reject otherwise;

Low type: Accept any offer, which gives a payoff $\geq \bar{\alpha} \lambda Y$,

and reject otherwise.

There are four possible strategies for the host firm with respect to its type (accept, accept);
(reject, accept); (accept, reject) and (reject, reject). It should be noted that (reject, reject) can
never be a part of an equilibrium strategy because of lemma 2.

Given the action rule of the host firm we note the following set of constraints:

$(\bar{\alpha} - s(i)) i + p(i) \geq \bar{\alpha} \lambda i \hspace{1cm}$ for $i = X, Y$ \hspace{1cm} (6a)

and $(\bar{\alpha} - s(-i)) i + p(i) \geq (\bar{\alpha} - s(-i)) (i) + p(-i)$ \hspace{1cm} (6b)

where $-i$ is the complement of state $i$.

The first condition implies that the participation constraint of each type must be satisfied and
the second condition implies that the offer must be incentive compatible for each type to
accept their respective offers. So any separating contract, which is accepted by both types of
the host firm, must satisfy the above set of constraints. In pooling contract a single buyout
offer is accepted by both types, so only condition (6a) is relevant.

The following is the class of strategy, which the MNC can undertake:
S1: Make an offer such that both types accept and enter if rejection occurs,
S2: Make an offer such that only the low type accepts but the high type rejects and enter if
rejection occurs,
S3: Make an offer such that only the high type accepts but the low type rejects and enter if
rejection occurs,
S4: Make an offer such that both types reject and enter if rejection occurs.

An offer is a menu of buyout contracts consisting of various amounts of shares and its
corresponding prices. First note that strategy S4 can never occur in equilibrium by lemma 2.
Now depending on who is holding the controlling share in the joint venture unit after the buy-
out, the strategy S1 can be split into four strategies: S1hh, S1hm, S1mh and S1mm with
respect to the high and low types respectively. Superscripts (hm) implies that after buy-out the
host firm (h) holds the controlling share for the high type and the MNC(m) holds the
controlling share for the low type. In the class of S1 strategy, S1mh and S1hm essentially
involve separating contracts, as the control of joint venture would be in different hands
depending on host firm’s type after the acceptance of the offer. In case of S2 and S3 classes of
strategy we have four possible strategies denoted by S2m, S2h and S3m, S3h depending on
whether the host firm (h) or the MNC (m) would hold control in the joint venture unit after
the acceptance of the buy-out offer by only one type.

Now to find out the perfect Bayesian equilibrium of the game we consider three mutually
exclusive cases depending on parameter values. The cases are (1) $F < \frac{3\lambda - 1}{2} Y$; (2) $\frac{3\lambda - 1}{2} X > F \geq \frac{3\lambda - 1}{2} Y$ and (3) $F \geq \frac{3\lambda - 1}{2} X^3$.

3 First note that all cases are possible given $\lambda = 4/9$ in our linear demand and cost example. Recall our
starting assumption about the value of $F$ given by assumption (A2). It is easy to see that assumption
(A2) and case (1) and (2) are consistent parameter restrictions. Since assumption (A2) imposes an
upper limit on $F$, so this may not be always consistent with case (3), which implies a lower limit on $F$.
However, we are considering the exhaustive set of parameter configurations given the assumption
(A2). Consider the following example which allows all the cases to be possible for different values of
$F$. $\alpha = 3/4$, $\lambda = 4/9$, $Y = 36$, and $X = 48$. Assumption (A2) imposes the restriction $F < 11$. Now
case 1 would arise if $F < 6$, case 2 would arise if $6 \leq F < 8$ and case 3 would arise if $8 \leq F < 11$. 


Case 1. $F<\frac{3\lambda-1}{2}$.

In this case, at $\alpha = 1/2$, the entry threat of the MNC is credible for both types. From lemma 3 we know that in any equilibrium after acceptance of the buy-out offer the entry threat should vanish. As a result in this case the MNC's equilibrium strategy set is restricted to the class of strategies which entail that after acceptance of the buy-out offer, the control of the joint venture shifts to the MNC. Therefore, the classes of relevant strategies are $S_{1m}$, $S_{2m}$ and $S_{3m}$. In order to find out the payoffs from these strategies we write the following proposition for strategy $S_{1m}$ first.

Proposition 2. Under strategy $S_{1m}$ it is always better for the MNC to offer a pooling contract rather than a separating one. The MNC's payoffs from these two types of contracts are as follows:

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

and under pooling contract: $q(X-\bar{\alpha} \lambda X) + (1-q)(Y - \bar{\alpha} \lambda Y - (\bar{\alpha} \lambda - \alpha^*)(X-Y)),$

where $\alpha^* \in (m_X, m_Y)$ and is given by condition (4) satisfied with equality.

(The proof is given in the appendix)

First note that if the 'no-entry' option could have been committed along with the buy-out offer then the best possible offer for the MNC would be to buy-out $\bar{\alpha} = \bar{\alpha} \lambda$ amount of shares at zero price from both types of the host firm. And the host firm would accept that as it would get its reservation payoff $\bar{\alpha} \lambda i$ in equilibrium depending on its type. So the MNC gets $q (X-\bar{\alpha} \lambda X) + (1-q)/Y - \bar{\alpha} \lambda Y)$, which is the best possible payoff for the MNC. Since the no-entry option cannot be committed along with the buy-out offer in the given game, the only way to make 'no-entry' credible is to buy-out some extra amount of shares so that entry becomes unprofitable after the acceptance of the buy-out offer. This is the crucial factor behind this proposition.

Note that when a separating contract is accepted by both types, the identity of the host firm is revealed to the MNC. Now any acceptable offer to the high type would involve a buy-out offer $s(X)$ and $p(X)$ such that after the buy-out entry does not occur (by lemma 3). As a result
at least $\bar{\alpha} - m_x$ amount of shares need to be bought out. Since $m_x < \bar{\alpha} \lambda$, to make the offer acceptable to the high type this extra amount of share, $\bar{\alpha} \lambda - m_x$, has to be bought at the high type's share price. So by mimicking to be the high type and accepting the same offer, the low type gets the rent $(\bar{\alpha} \lambda - m_x)(X-Y)$. Thus to separate out the low type, the low type must be given that rent in equilibrium. One way to do this is to buy out the low type completely after paying the above amount. Therefore, the payoff from the separating contract is as mentioned in the proposition above.

On the other hand in the pooling contract the MNC makes the entry threat non-credible after acceptance of buy-out offer in the pooling sense given by condition $(4)$. Since $(4)$ becomes zero if the host firm holds share $\alpha^*$ such that $\alpha^* \in (m_x, m_y)$ for $0 < q < 1$, the MNC can make its entry non-credible by buying a lesser amount of share, $\bar{\alpha} \lambda - \alpha^*$, at high type's price in order to make it acceptable to the high type. As a result the rent appropriated by the low type becomes less in pooling contract as compared to the separating one. This may be clearly seen with the help of the following diagram.

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| 0 | m_x | \alpha^* | m_y | \bar{\alpha} \lambda | 1/2 | \bar{\alpha} | 1 |
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Figure 4.4

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. The reason is the same as discussed in the previous chapter.

It is obvious from the above discussion on proposition 2 that the strategy $S_3^m$ is not a feasible strategy to undertake as the acceptable buy-out offer to the high type abiding by lemma 3 would be mimicked by the low type.

Under strategy $S_2^m$ the MNC would make an acceptable offer only to the low type. This is simply done by making a complete buyout offer to the low type at a price $\bar{\alpha} \lambda Y$ that is just
sufficient for its participation constraint to be satisfied. However, the high type will not accept this offer, as it does not receive $\bar{\alpha} \lambda X$, which it obtains by rejection. After rejection entry occurs, so the MNC’s optimal payoff from $S_2^m$ is

$$q [(1-\bar{\alpha})\lambda X + \lambda X -F] + (1-q)[ Y - \alpha \lambda Y]. \quad (7)$$

Note that this offer to the low type can also be made by giving a buy-out contract $s(Y), p(Y)$ such that after buy-out the host firm’s shareholding becomes $\alpha = \bar{\alpha} - s(Y) \leq my$ and the buy-out price is $p(Y) = (\bar{\alpha} \lambda - \alpha) Y$.

So, in this case 1, the relevant strategies are $S_1^{mm}$ (under pooling contract), and $S_2^m$. Now depending on the payoffs we get the following proposition.

**Proposition 3.** In case 1, the following strategy combination constitutes a perfect Bayesian equilibrium. There exists a prior probability $q^*$ such that the MNC undertakes the strategy $S_2^m$ for $q < q^*$ and it undertakes $S_1^{mm}$ for $q \geq q^*$. When the strategy $S_1^{mm}$ is played both types accept the offer and when the strategy $S_2^m$ is played only the low type 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.

**Proof:** Define any shortfall from the maximum possible payoff to the MNC as loss. The maximum possible payoff is simply the surplus after giving the worst possible payoff $\bar{\alpha} \lambda i$ to each type and that offer being accepted. Any offer less than $\bar{\alpha} \lambda i$ will not be accepted as the host firm can at least ensure this, even after entry of the MNC. Under strategy $S_1^{mm}$ the low type gets a rent which is the loss to the MNC. So the expected loss to the MNC from strategy $S_1^{mm}$ is given by the following expression $(1-q) (\bar{\alpha} \lambda - \alpha^*) (X-Y)$. Now it is easy to check from the definition of $\alpha^*$ (from (4)) that

$$\frac{\delta \alpha^*}{\delta q} = \frac{\alpha^* (X-Y)}{q(X-Y) + Y},$$

which is negative. Thus, the function can be plotted with respect to $q$ as follows.
equilibrium. This is because when the MNC believes that the likelihood of the low type is high (i.e., for the lower range of prior belief about the high type, \( q \)) it does better by giving an offer only to the low type and entering for the high type after rejection. Although entry involves loss of total surplus on two counts (a) competitive loss and (b) the set up cost for entry, the expected payoff to the MNC from entry is greater as the ex-ante probability of entry is low. In comparison to that, the MNC obtains lower payoff by giving acceptable offer to both types, which involves greater expected loss in terms of rent appropriated by the low type as the ex-ante probability of that is high for this lower range of \( q \). Secondly, given the parameter restrictions we find a situation where the MNC buys out shares from the host firm to take over control of the joint venture unit whenever the offer is accepted by the host firm.

Thirdly, when the buy-out offer is accepted by both types of the host firm (under \( S_{1mm} \) strategy), it is a partial buy-out of the joint venture unit by the MNC.

**Case 2.** \( \frac{3\lambda - 1}{2} X > F \geq \frac{3\lambda - 1}{2} Y \)

To find out the equilibrium in case 2, we first note from the analysis of case 1 that the strategies \( S_{1mm} \) and \( S_{2m} \) will have the same associated payoffs and \( S_{3m} \) is dominated by \( S_{1mm} \). Since entry is credible at \( \alpha = \frac{1}{2} \) for the high type, but not for the low type, in this case \( h_Y \) exists but \( h_X \) does not. As a result no offer can be made such that after acceptance of the buy-out offer, only the high type of the host firm holds control of the joint venture and entry does not take place. So the strategies \( S_{1hm} \) and \( S_{3h} \) would never occur in equilibrium.

The remaining set of strategies is \( S_{2h} \), \( S_{1hh} \) and \( S_{1mh} \).

Under the strategy \( S_{2h} \) the buy-out offer must involve \( s(Y) \) and \( p(Y) \) such that after buy-out the low type holds \( \alpha \) share and its payoff \( \alpha Y + p(Y) \geq \alpha \lambda Y \) and also \( \alpha \in [\frac{1}{2}, h_y] \). Since entry will not take place after acceptance, by mimicking the low type, the high type can get \( \alpha X + p(Y) \geq \alpha \lambda X + (\alpha \lambda - \alpha) (Y - X) \geq \alpha \lambda X \) [since \( \alpha \lambda < \frac{1}{2} \), the second term is positive], so the high type will mimic the low type and accept the offer made for the low type. Hence, it is not possible to undertake the strategy \( S_{2h} \), as both types would accept the offer.
equilibrium will involve the strategies $S_{1}^{mm}$ and $S_{2}^{m}$ as described in Proposition 3 (in case 1). On the other hand, when $X(2\lambda -1/2-\bar{\alpha}\lambda) < 1/2Y- \bar{\alpha}\lambda Y +F$, the strategy $S_{1}^{hh}$ is dominant over $S_{2}^{m}$ whenever $S_{1}^{hh}$ is feasible. As a result the equilibrium strategies can be determined depending on whether $q^0(1/2)$ is greater or less than $q^*$ (from Proposition 3). These situations may be seen in the following diagrams.

Thus, we have our next proposition on the equilibrium in case 2.
Proposition 4. (a) Suppose, $X(2\lambda -1/2 -\overline{\alpha}\lambda) \geq 1/2 Y- \overline{\alpha}\lambda Y + F$, then the perfect Bayesian equilibrium is the same as in case 1 described in Proposition 3.

(b) When $X(2\lambda -1/2 -\overline{\alpha}\lambda) < 1/2 Y- \overline{\alpha}\lambda Y + F$, the perfect Bayesian equilibrium is described by the following strategy combination. The MNC chooses any one of the following strategies $S_1^{hh}$, $S_1^{mm}$ and $S_2^m$ depending on their payoffs. Both types of the host firm accept the offer in case of $S_1$ classes of strategy. In case of strategy $S_2^m$, 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.

The Proposition 4(b) establishes two scenarios. In one scenario (Figure 4.7), entry does not occur at all and the MNC offers two classes of pooling contracts in equilibrium. For lower values of $q$ the pooling contract ($S_1^{hh}$) involves a partial buy-out such that each party holds 50% shares of the joint venture business after the buy-out. And for higher values of $q$ the other pooling contract ($S_1^{mm}$) involves a partial buy-out by the MNC such that the control of the joint venture is taken over by it. In the other scenario (Figure 4.8), entry occurs for the high type for some intermediate range of prior beliefs and for both higher and lower prior beliefs the offer is made such that both types accept the buy-out offer and entry does not occur there.

Case 3. $F \geq \frac{3\lambda - 1}{2} X$

In case 3, $h_x$ exists so the strategy $S_1^{hh}$ is feasible for all values of $q$. This is because an acceptable buy-out offer to both types of the host firm without taking over control can be designed for all prior beliefs such that entry does not occur after acceptance of the buy-out offer (see lemma 4 in appendix). For the same intuition (as it is discussed in case 2) the optimal buy-out offer is pooling and the payoff is as given by (8). Along with the earlier strategies, two other strategies $S_1^{hm}$, $S_3^h$ are also feasible here. The payoffs associated with those earlier strategies are already discussed. Under strategy $S_1^{hm}$ the MNC may make an offer to the high type host firm leaving the control of joint venture and an offer to the low type host firm to take over control of the joint venture after the buy-out.
Consider a separating buy-out contract \( s(X), p(X) \) and \( s(Y), p(Y) \) such that after buy-out the high type holds \( \alpha(X) \) satisfying (3), where \( \alpha(X) = -\bar{\alpha} - s(X) \) and \( p(X) = \bar{\alpha} \lambda X - \alpha(X)X \), and the low type holds \( \alpha(Y) \) satisfying (2), where \( \alpha(Y) = -\bar{\alpha} - s(Y) \) and \( p(y) = \bar{\alpha} \lambda Y - \alpha(Y)Y \).

Note that the above buy-out contract satisfies the constraints (6a) and (6b). A specific example of the above separating buy-out offer is to buy-out the low type completely by paying \( p(Y) = -\bar{\alpha} \lambda Y \) and offer \( \alpha(X) = \frac{1}{2} \) by paying \( p(X) = (\bar{\alpha} \lambda -\frac{1}{2})X \) (negative). As a result this separating buy-out offer will be accepted by the respective types only and the MNC would get the best possible payoff as no type obtains a rent by accepting this offer and entry does not occur after acceptance.

Hence the MNC’s payoff from the strategy \( S_{1hm} \) is
\[
q \{ X - \bar{\alpha} \lambda X \} + (1 - q) \{ Y - \bar{\alpha} \lambda Y \}.
\]
This is the best possible payoff the MNC can expect to get.

In this case it is also possible to undertake the strategy \( S_{3h} \) but that would involve entry for the low type and as a result the MNC incurs some loss by undertaking the strategy \( S_{3h} \).

Hence the following proposition characterises the equilibrium in this case 3.

**Proposition 5.** In case 3, the following strategy profile constitutes the perfect Bayesian equilibrium. The MNC chooses strategy \( S_{1hm} \) and both types of the host firm accept the separating buy-out offer. The MNC does not enter after acceptance.

**Remark:** From the above analysis it is obvious how our model can be interpreted as a model of entry. When the strategy \( S_{2m} \) is undertaken by the entrant then in equilibrium either the entrant buys out the incumbent firm to take over control in case the incumbent firm is of the low type or it enters to compete in the case of the high type. However, the entrant can acquire the incumbent firm partially, which is tantamount to the entrant forming a joint venture with the incumbent when the strategy \( S_{1mm} \) is undertaken. Similarly, whenever the strategy \( S_{1hh} \) is optimal it establishes the possibility of a 50:50 joint venture. When the entrant undertakes the strategy \( S_{1hm} \) then it is a case of a joint venture or acquisition such that in case of the low type incumbent the control is taken over by the entrant but the control is left or shared (for 50:50 joint venture) with the incumbent in case it is of high type.

Before getting into the next section, we describe the equilibrium in the case where \( F=0 \). In this situation the only possibility when the entry threat of the MNC vanishes after acceptance
of buy-out offer is when the offer involves complete buy-out of the host firm. Then the two relevant strategies are $S1^{mm}$ and $S2^{m}$ and the equilibrium involves either one of these strategies depending on their payoffs.

Section IV

So far our analysis was based on the assumption that the host firm’s setup cost is prohibitive; as a result it never pays the host firm to enter after selling off its shares in the joint venture unit. In this section we allow for the possibility of the host firm setting up its own unit of production at a cost $H$ after acceptance or rejection of the MNC’s offer. For simplicity, we keep the MNC’s set up cost $F = 0$ and assume that the two parties play a one-shot simultaneous move entry game after acceptance or rejection of the buy-out offer. We make a crucial assumption that if both partners enter in this one-shot simultaneous entry game then the joint venture has to be dissolved and the parties can earn profit only from their own independent business. This one-shot game can be represented as below. To find out the perfect Bayesian equilibrium we need to know what the host firm gets after rejection of any offer in the following subgame. The payoffs given below are what the two parties get after the rejection depending on the host firm’s type $i$.

\[
\begin{array}{c|cc}
\text{MNC} & \text{Enter} & \text{Not enter} \\
\hline
\text{Enter} & \lambda_i & 0 \\
\lambda_i -H & i-H \\
\hline
\text{Not enter} & (1-\alpha)\lambda_i +\lambda_i & (1-\alpha)i \\
\alpha \lambda_i & \alpha i \\
\end{array}
\]

Figure 4.9

4 Tackling the problem more generally by allowing for all possible combinations of $F$ and $H$ would involve mixed strategy equilibrium in the one-shot entry game for some combinations. Since our purpose is to illustrate the difference that might arise if we allow both firms to enter after the buy-out of shares, we are restricting ourselves to the simplest possible cases by assuming $F=0$.

5 This assumption simplifies the analysis drastically in our present set up. Without this assumption there might be Cournot oligopoly with three firms for low values of set up cost. Also it might lead to multiple entry of a partner which is complicated and not a very meaningful exercise in the given context.
Suppose after the acceptance of the buy-out offer the host firm holds \( \alpha \) share of the joint venture business. Then we write the following lemma.

**Lemma 5.** For any \( \alpha > 0 \), the action 'entry' of the MNC always dominates the action 'no-entry' in the one-shot entry game.

**Proof:** Consider the possibility that \( \alpha \geq 1/2 \). Suppose, the host firm enters, then by entering the MNC gets \( \lambda \bar{i} \) whereas it gets zero by not entering. When the host firm does not enter the MNC obtains \((1-\alpha)\lambda \bar{i} + \lambda \bar{i}\) by entering and \((1-\alpha)i\) by not entering. The MNC's payoff from entry is always greater than no-entry for this range of \( \alpha \) as \( \lambda = 4/9 \) (associated with linear demand and cost functions). For \( \alpha < 1/2 \), when the host firm does not enter, the MNC can get \( i \) by entering as opposed to \((1-\alpha)i\) by not entering; and when the host firm does enter then the MNC gets \( \lambda \bar{i} \) by entering as opposed to \((1-\alpha)\lambda \bar{i}\) by not entering. In both cases the payoff is larger with entry of the MNC.

The implication of this lemma is that the MNC can never commit to no-entry action after acceptance of any offer by the host firm unless the MNC holds the full ownership in the joint venture. Intuitively one can see that there are two ways to improve the payoff in the second period by designing a contract such that (a) the entry cost of the host firm is saved and (b) competition is avoided, if possible. The only possibility when competition may be avoided is when the MNC holds all the shares of the joint venture and the host firm's entry threat is not credible. It is also clear that if any equilibrium involves entry of one party then it must be the case that the MNC enters as its entry cost is zero (when \( H > 0 \)); otherwise, there will be a scope for improvement of the payoffs for the MNC.

Note that the reservation payoff (after rejection of the buy-out offer) of the host firm is either \( \lambda i - H \) (in case the host firm enters and competes) or \( \bar{i} \lambda \) (in case it continues the joint venture to compete with the MNC's subsidiary) depending on whichever is greater, with respect to its type \( i \). So any acceptable buy-out offer must involve the host firm getting at least its reservation payoff after acceptance of the offer in the subsequent equilibrium. To find the perfect Bayesian equilibrium of this second period game we proceed to analyse by identifying the following cases.
Case 1. $H = 0$

In this case both the MNC and the host firm having zero setup costs would enter in the one-shot entry game unless they own the joint venture unit completely. As a result both parties get $\lambda_i$ depending on the type $i$ in equilibrium. Here, any of the parties may sell out its shares in joint venture at zero price and set up his own business. The host firm obtains $\lambda_i$ depending on its type and the MNC obtains $q\lambda X + (1-q)\lambda Y$.

Case 2. $0 < H \leq (1-\alpha)\lambda Y$.

To calculate the reservation payoff of the host firm we note that after rejection of the buy-out offer, both types of the host firm would prefer entry to no-entry as $\lambda Y - H \geq \lambda Y$ (under the given parameter restrictions). Hence the reservation payoff is $\lambda_i - H$ depending on the type $i$. For maximising its payoff, the MNC can try to preclude the entry of the host firm in order to save the set up cost $H$. The MNC can easily do that by offering to sell off $(1-\alpha)$ share at a price $H$. In equilibrium both types accept that offer and do not enter as the host firm owns the joint venture unit wholly and the MNC enters after acceptance and gets the expected payoff $q\lambda X + (1-q)\lambda Y + H$. The host firm’s payoff is $\lambda_i - H$ depending on its type.

Case 3. $(1-\alpha)\lambda Y < H \leq (1-\alpha)\lambda X$.

Given the parameter restriction we see that $\lambda X - H \geq \lambda Y$ and $\lambda Y > \lambda Y - H$, so the reservation payoff for the high type is $\lambda X - H$ and for the low type $\lambda Y$. Now the MNC can make a sell out offer of $(1-\alpha)$ share at a price $H$ to the high type and enter with a subsidiary. The high type would accept this offer and the low type would not accept this offer as it gets less by accepting this offer. However the MNC can completely buyout the low type host firm at a price $\alpha \lambda Y$ if $\lambda Y - H < 0$, as the low type would not enter after that buy-out. Otherwise, for $\lambda Y - H \geq 0$ the MNC enters and the low type continues the joint venture without entering. Hence the MNC’s payoff is:

$$ q(\lambda X + H) + (1-q)(\lambda Y - \alpha \lambda Y) \quad \text{for } \lambda Y - H < 0, $$

$$ q(\lambda X + H) + (1-q)(\lambda Y + (1-\alpha)\lambda Y) \quad \text{for } \lambda Y - H > 0. $$
Case 4. \( H > (1-\alpha)\lambda X \).

The reservation payoffs for both types of the host firm are \( \alpha \lambda_i \) depending on its type \( i \), as \( \alpha \lambda_i > \lambda_i - H \). If \( \lambda_i - H > 0 \) for both \( i \) then the MNC enters without giving any offer and the host firm continues the joint venture and does not enter. If \( \lambda X - H > 0 \) but \( \lambda Y - H < 0 \) then the MNC buys out the low type completely by paying \( \alpha \lambda Y \) and enters only for the high type and the low type accepts the offer and both types do not enter in equilibrium. By giving this buy-out offer to the low type only, the MNC gets

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

If \( \lambda X - H < 0 \), then after complete buy-out of the host firm’s share, both types of the host firm do not enter after that as it involves a duopoly competition with the MNC, which gives negative payoff to the host firm. Now the MNC has two options: either to buyout both types completely or to buyout only the low type and enter directly in case of the high type. Note that the third option of not buying out any type of the host firm would be dominated by the option of buying out the low type only. If it buys out both types completely then the low type would pretend to be the high type, as a result the MNC gets \( q [X-\alpha \lambda X] + (1-q)[Y-\alpha \lambda X] \) and from the other option the MNC gets \( q [\lambda X + (1-\alpha)\lambda X] + (1-q)[Y-\alpha \lambda Y] \). Depending on the payoffs the MNC chooses either of the strategies.

Section V

Conclusion

This chapter, like the earlier one (Chapter 3), establishes a whole range of outcomes with respect to joint venture instability. We find that there is partial buy-out or complete buy-out of the joint venture unit by the MNC. Under certain parameter configurations, it is found that the MNC enters with a subsidiary to compete with its joint venture counterpart. Additionally, in the process of buy-out the MNC may either take over control of the joint venture unit or it may leave control of the joint venture with the host firm.

In section IV, we show that the joint venture may break down as one partner walks out of the joint venture business (case 1) or the MNC may sell out its share in the joint venture and set up its own business to compete with its earlier joint venture partner (see case 2).
This chapter, like the previous one, 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 by an MNC with both minority and majority ownership in the venture. We have also established the result of information acquisition, which is similar to the result in the previous chapter.

Appendix

**Proof of proposition 2:** When a separating contract is accepted by both types, the identity of the host firm is revealed to the MNC. Now any acceptable offer to the high type would involve \( s(X) \) and \( p(X) \) such that \( \alpha = (\bar{\alpha} - s(X)) \) satisfying condition (2) and \( \alpha X + p(X) \geq \bar{\alpha} \lambda X \). So the optimal \( p(X) = (\bar{\alpha} \lambda - \alpha)X > 0 \). By mimicking the high type and accepting the same offer the low type gets

\[
\alpha Y + (\bar{\alpha} \lambda - \alpha) X \\
= \bar{\alpha} \lambda Y + (\bar{\alpha} \lambda - \alpha)(X-Y) > \bar{\alpha} \lambda Y. 
\]

So to separate out the low type, the MNC can give a contract such that the low type gets what it will be getting by mimicking. This can be done by buying out shares \( s(Y) > s(X) \) at a price \( p(Y) \) such that the low type gets the above payoff. One such possibility is to buy-out the low type completely by paying the above payoff. By this separating contract the MNC can get

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

To maximise the payoff the MNC chooses \( \alpha = m_X \) by (2) and hence the optimal payoff to the MNC under the separating contract in strategy \( S_1^{mm} \) is

\[
q\{X - \bar{\alpha} \lambda X\} + (1-q)\{Y - \bar{\alpha} \lambda Y - (\bar{\alpha} \lambda - \alpha_0)(X-Y)\}. 
\]

Now consider the pooling contract that is acceptable to both types. After acceptance of the pooling offer if the host firm holds the share \( \alpha \), entry does not occur provided that \( \alpha \) satisfies condition (4).

We claim that for \( 0 < q < 1 \) there exists \( \alpha^* \) such that for \( \alpha^* \in (m_X, m_Y) \), the no-entry condition (4) becomes zero and for any \( \alpha \leq \alpha^* \) entry would not occur after the buy-out of share. This is because at \( \alpha = m_X \), condition (4) is negative and at \( \alpha = m_Y \), the condition (4) is positive.
does not enter after acceptance. So in that case only pooling contract is possible to a limited extent as the expected payoff from entry under that contract (condition (5))

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

is nonpositive for \( q \leq q^0 (\alpha) \), say. This follows from the fact that the first term is positive and the second term is negative and the expression is continuous with respect to \( q \).

Consider the buyout offer \( s(Y) = (\alpha - \alpha), p(Y) = (\alpha \lambda - \alpha)Y \). By accepting the offer the low type gets \( \alpha \lambda Y \) and by accepting the same offer the high type gets

\[ \alpha X + (\alpha \lambda - \alpha)Y = \alpha \lambda X + (\alpha \lambda - \alpha)(Y-X) \]

So the high type gets a rent here, since \( \alpha \lambda - \alpha < 0 \). The MNC maximises the payoff by choosing \( \alpha = 1/2 \). Now by this strategy the MNC gets the payoff

\[ q \{X - \alpha \lambda X - (\alpha \lambda - 1/2)(Y-X)\} + (1-q) \{Y - \alpha \lambda Y\} \]

In case 3, \( h_X \) exists so it is also possible to give a separating contract in place of a pooling contract. Now consider offer \( s(Y) = (\alpha - \alpha), p(Y) = (\alpha \lambda - \alpha)Y \) such that \( \alpha \in [1/2, h_Y] \), to the low type. By accepting this offer the low type gets \( \alpha \lambda Y \). Now this offer will be accepted by the high type also as by accepting it the high type gets

\[ \alpha X + (\alpha \lambda - \alpha)Y = \alpha \lambda X + (\alpha \lambda - \alpha)(Y-X) \]

So the high type gets a rent here. The MNC maximises the payoff by choosing \( \alpha = 1/2 \). Now the only way the MNC can separate out the high type is to give a contract such that the high type receives at least the above payoff. This can be done by buying out \( s(X) \) at \( p(X) \) price such that \( \alpha = \alpha - s(X) \leq h_X \) and \( p(X) = (1/2 - \alpha)X + (\alpha \lambda - 1/2)Y \). This offer is not acceptable to the low type. Hence in this case the optimal pooling contract and separating contract are equivalent.