Financing and Mode of Entry in Foreign Markets

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Abstract

We study the mode of entry decision of a multinational firm with and without financing constraints on the local firm. We find that the local firm’s financing constraints lead to an increase in the multinational’s profits from joint venture for all possible beliefs about demand, while its profits from foreign direct investment decrease if the probability of high demand is low but increase otherwise. Examples show that joint venture arises for a larger set of beliefs when the local firm is financially constrained. The relative profitability of joint venture increases as technology transfer increases, fixed cost of entry increases and the multinational’s cost advantage decreases. Further, optimal contract in the joint venture without financing depends on parameter values and displays novel features, leading to a discontinuous expected profit function of the multinational. Financing considerations restore uniqueness of the contract and continuity of the profit function. In contrast, the multinational’s expected profits in FDI are continuous in its belief when there is no financing but are discontinuous with financing, due to features of the financial contract between the local firm and a lender.

Keywords: Multinational, Joint venture, Financing, Contracts
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1 Introduction

We study a multinational firm’s choice regarding entry into a foreign market between forming a joint venture (JV) with a local firm and competing with it through foreign direct investment (FDI). While this question has been studied extensively and various theories exist on the determinants of this choice (See for example, Horstmann and Markusen (1996), Mattoo, Olarreaga and Saggi (2004), Eicher and Kang (2005), Raff, Ryan and Stahler (2009), De Hek and Mukherjee (2011), and Dai and Lahiri (2011).), our focus is on the effect of financing constraints faced by the local firm on the multinational’s decision in a model where the multinational has an informational disadvantage but a technological advantage. Financing constraints introduce new considerations possibly involving third parties, such as lenders, in the multinational’s decision making. For example, one might think that if the local firm is self-financed, it would be a more formidable competitor should the multinational enter through foreign direct investment and thus, the multinational would be more likely to choose a joint venture with such a firm, and vice-versa. This could be because a financing contract with an outsider limits the ability of the firm to undertake certain projects or may give it incentives to set different prices and outputs than it would without these contracts. On the other hand, financing constraints may reduce the bargaining power of the local firm in a joint venture and thus, may lead to JV as a relatively more profitable mode of entry. We examine the interplay of these factors in a static model.

Effects of financing decisions on the outcomes of competition between firms in a domestic context have been studied extensively in the literature (see Bolton and Scharfstein (1990) in the context of predation; Brander and Lewis (1986) in the context of the effect of debt on outputs; Jain, Jeitschko and Mirman (JMa) (2002) in the context of entry-deterrence, and Phillips (1995) for empirical evidence of the effect of debt on industry performance, among others). However this industrial organization literature assumes that the entrant competes with the incumbent, which is the analogue of FDI in a foreign market. Thus, the main contribution of our paper is to extend this analysis to
the study of multinational enterprises where the mode of entry is a decision variable\(^1\).

A multinational firm may enter a foreign market on its own (that is, through FDI) or form a joint venture with local firms or license its product to local firms or simply export. We examine only two modes of entry, namely, JV and FDI, for simplicity.\(^2\) There is a substantial literature in international trade that examines the determinants and effects of this decision, in particular on technology transfer. One of the leading theories (Horstmann and Markusen, 1996) of the choice between JV and FDI is that local firms have better information about the market than the multinational\(^3\) and it is to overcome this disadvantage, in addition to saving the entry costs, that the multinational chooses JV over FDI. The leading argument in favor of FDI is that the multinational has a technological advantage over the local firm and thus, is better off competing with it. The goal of this paper is to analyze this decision in a model that incorporates all of these elements as well as financing considerations. We assume that the multinational firm does not face any financing constraints whereas local firms do. The question then is whether financing constraints of the local firm lead to more or less joint venture formation, and how this effect depends on the degree of technological transfer, the belief of the multinational about demand and fixed costs of operations and entry. Throughout the paper, we assume that the degree of technological transfer is exogenously given, for convenience.

We model the joint venture as a principal-agent relationship as in Horstmann and Markusen (1996) and Dai and Lahiri (2011), with the multinational as the principal. Our model differs from Horstmann and Markusen (1996) in that the multinational competes with the local firm when it chooses FDI. This has the effect of endogenizing reservation utilities in addition to other changes when

\(^1\)The analysis here may very well be applicable in the domestic context as well where entering firms consider acquiring incumbents or forming alliances with them.

\(^2\)Raff et al (2009) study FDI, JV and Mergers. Our notion of JV is similar to their notion of Mergers. They do not incorporate informational differences, nor differential costs between local and foreign firms.

\(^3\)Jain and Mirman (2001) also make this assumption and study multinational learning in a dynamic model.
financing constraints are introduced. Further, we do not assume an interior solution but rather consider all possible beliefs. We also differ from Dai and Lahiri (2011) in several significant ways. First, they assume that the local firm’s information advantage depends on its unobserved effort, whereas we assume it to be exogenously given and public information. Thus, their agency problem in JV is one of inducing the optimal effort though a compensation scheme, whereas our JV problem is to induce the different types of the local firm to produce optimal output. Second, they model financial constraints as exogenously given wealth constraints whereas we allow the local firm to borrow, creating an agency game, which has a significant effect on results.

We first analyze the benchmark model where financing is not an issue for the local firm. We find that while the expected profits of the multinational under FDI are a differentiable function of the probability of high demand, its expected profit function under JV has a point of discontinuity, and takes two different forms depending on parameter values. The discontinuity takes the form of a drop in the multinational’s profits once the probability of high demand reaches a certain level. This result contrasts with the standard asymmetric information models where reservation utilities are assumed to be zero for all types, and is partly due to the fact that the reservation utility of the local firm is its expected profits in FDI which are higher for the high-demand type. These profits increase sufficiently in the probability of high demand to cause the high-type’s participation constraint to fail. The two different forms of the profit function arise due to the fact that for some parameter values, the first-best contract is feasible when the probability of high demand is sufficiently low.

The nature of the JV contract and the resulting form of the expected profit function of the multinational leads to our result that in the benchmark model, if JV does not occur when probability of high demand is low, it cannot occur when this probability is high. That is, ceteris paribus, a high probability of high demand favors FDI. This result is interesting particularly because not only, as expected, are the FDI profits of the multinational higher in this case, but also, surprisingly, its JV profits are much lower since the JV contract yields
only the low-demand profits.

The mode of entry depends crucially on the degree of technological transfer and the amount of fixed costs of entry and operations. Greater the technological transfer in JV, and/or greater the fixed costs, more likely it is that the multinational chooses JV. The intuition is simple - a joint venture reduces competition in the market and the multinational being the principal enjoys the residual profits from the joint operation. Total profits from this operation are higher, the greater the technological spillover. Fixed costs of operations turn out not to affect the JV profits due to the endogenous reservation utility but they reduce the FDI profits, as does the entry cost. It is to be noted that, because of the discontinuity in profits, the mode of entry may not change as long as the model parameters are within a certain range.

We next incorporate financing constraints in the model. The local firm is assumed to have to borrow from a lender in order to finance the fixed costs of operations. The lender, like the multinational, does not know the state of demand and is the principal in the financial contracting relationship. The financing constraint leads to an interesting reversal in the expected profit functions of the multinational under the two modes of entry. First, the expected profits under JV are an increasing and differentiable function of the probability of high demand. Intuitively this is because the high-demand type’s expected profits under FDI are lower due to borrowing from a lender and therefore, its participation constraint is not violated. On the other hand, the FDI solution with financing leads to a discontinuity in the expected profit function of the multinational. This has to do with the way the loan contract inter-

\footnote{Loan contracts have been studied extensively in the economics and finance literature. How these are modeled depends on the question of interest. Gale and Hellwig (1985) assume that revenue of the borrower, exogenously given, is random and private information unless the lender incurs a cost to inspect it ex-post. Bolton and Scharfstein (1990) analyze a reporting game between lenders and borrowers without allowing for costly state verification. In these models, there are no adverse selection or moral hazard issues. In contrast, Stiglitz and Weiss (1981) study credit rationing by banks when the borrower’s type is its private information or the borrower can choose projects of different types. JIMA enrich this literature by letting firms choose outputs and/or prices, while at the same time borrowing, and incorporate adverse selection either on the demand or the cost side. We adopt this approach.}
acts with duopoly competition between the local firm and the multinational. When the probability of high demand is low, the loan contract is such that the multinational’s profit is the minimum possible.\(^5\) As this probability increases, a threshold is reached at which the lender finds it optimal not to lend to the low-demand firm, which leads to a jump in the multinational’s expected profits.\(^6\) Overall, while the JV profits increase at all beliefs, the FDI profits are lower at low probabilities of demand but higher at probabilities above a threshold.

As for the effects of financing on the optimal mode of entry, we find that in many scenarios, a joint venture is more likely to occur when there are financing constraints although the precise outcome depends on the degree of technological transfer, the extent of the cost advantage that the multinational enjoys, and the size of fixed costs of operation and entry. The most straightforward case is when technological transfer is perfect and fixed costs are zero. Here, we find first of all, that a high probability of high demand no longer favors FDI. Indeed, FDI arises only if the multinational’s cost advantage is high and only when the probability of high demand is moderate. That is, while FDI occurs for sufficiently high probabilities of demand in the absence of financing constraints, it may not occur at all when financing constraints are introduced. Even when it does occur, examples show that the set of probabilities over which the multinational chooses FDI is smaller. Intuitively, JV becomes more appealing with financing for two reasons. First, the local firm’s reservation utility in JV decreases due to the financial contract with a lender so that the multinational is able to appropriate more profits in a joint venture. In addition, the high-type participates in the joint venture even when its surplus is zero since the alternative is to obtain zero surplus from the lender. Second, up to a threshold belief, FDI becomes less attractive for the multinational

\(^5\)This result is similar to the one obtained in JJMa, in the context of entry and private information about costs, and different to the one in JJMb (2002). In these papers, demand is assumed to be random which implies a different output strategy for mimicking than when demand is deterministic. We comment on this further later.

\(^6\)This effect seems to capture the idea that financial constraints of the rival are beneficial to a firm. However, as we have explained, this effect applies only when demand is high with a sufficiently high probability.
at low probabilities of demand due to the way the financial contract affects competition under FDI.

Another effect of financing constraints is that fixed costs of operations no longer have any effect on the mode of entry decision, while the fixed cost of entry continues to affect FDI negatively. This has to do with reservation utilities as well. In the absence of financing, fixed costs of operations have no effect on JV profits because the negative direct effect is completely offset by the fall in reservation utility. But when financing constraints are introduced, the reservation utility is independent of these costs.

The theoretical results of this paper lead to some useful empirical implications about the emergence of joint ventures v/s FDI. Industries experiencing a boom (high probability of high demand) and characterized by a high degree of technology transfer in JV are likely to see more joint ventures, if the local firm needs to borrow. That is, if the local firm is well funded in such industries, the multinational is more likely to compete via FDI than it would if the local firm borrows. Industries that are stable are likely to see more FDI rather than JV, if the local firm borrows. Declining industries may or may not see a change in the mode of entry as a result of financial constraints. However, relative profitability of a joint venture in such industries increases. If technology transfer is low, and fixed costs of entry and operations are low, it is possible that FDI occurs with or without financing. This work also shows that ease of technology transfer in joint ventures not only benefits the host country but also the multinational since it enjoys a higher profit. Thus, if technology transfer is a strategic decision, findings of this paper imply that the multinational is better off choosing a high degree of it. While our model assumes one local firm, our findings imply that if the market is oligopolistic with firms symmetric all respects except their financial condition, the multinational is more likely to form a joint venture with a firm that is not internally funded.

The paper is organized as follows: in Section 2, we present the benchmark model without financing constraints; in Section 3, we introduce financing constraints and in Section 4, we conclude. All diagrams are presented at the end of the paper.
2 The Benchmark model: No financing

We first consider the benchmark scenario. A multinational firm (M) considers entering a foreign market either as a stand-alone firm (FDI) or in a joint venture (JV) with a local firm (L). We assume that there is only one multinational firm and one local firm in this market for simplicity. Demand function for the good is given by \( p = \tilde{a} - bQ \), where \( \tilde{a} \) is known only to the local firm. M believes that \( \tilde{a} \) is either \( \bar{a} \) (high demand) or \( a \) (low demand), with \( a < \bar{a} \) and probability of \( a \) is \( 1 - \rho \). We similarly use upper bars and lower bars on prices and quantities to denote these variables under high demand and low demand respectively. We assume that price is observable but quantity of the other firm is not. Since the local firm knows the demand intercept, we refer to the firm as the high-demand firm or the low-demand firm. Thus, informational advantage of the local firm is captured by its knowledge of the demand function, which is a common assumption made in the industrial organization literature, to capture information asymmetry.

Let the marginal cost of production of M be given by \( c_m \). The local firm’s cost disadvantage is captured by a higher marginal cost \( c_l > c_m \). We also assume that there is a fixed cost of \( F \) for both firms. In addition, if M enters through foreign direct investment, it must pay an additional upfront cost of \( G \), to be interpreted as an entry cost, or a set-up cost, that the local firm does not have to pay.

2.1 FDI

Consider the case when M enters via foreign direct investment. The resulting competition environment is the standard incomplete information Cournot
competition between the two firms. M maximizes,\(^7\)

\[
\Pi_{m}^{f_{di}} = \rho(a - q_m - q_l - c_m)q_m + (1 - \rho)(a - q_m - \hat{q}_l - c_m)q_m - F - G, \\
= (\hat{a} - q_m - \hat{q}_l - c_m)q_m - F - G,
\]

by choosing \(q_m\). Here, we use ^ to denote expected values.

The local firm maximizes \((\hat{a} - \hat{q}_l - q_m - c_l)\hat{q}_l - F\) by choosing \(\hat{q}_l\). Solutions are:

\[
q_m = \frac{\hat{a} - 2c_m + c_l}{3b}, \\
\hat{q}_l = \frac{3\hat{a} - \hat{a} - 4c_l + 2c_m}{6b}.
\]

Note that the high-demand firm produces more and thus, is better off due to asymmetric information in contrast to the low-demand firm. To ensure that outputs are positive, we must have \(3\hat{a} - \hat{a} - 4c_l + 2c_m > 0 \Rightarrow \hat{a} < 3a - 4c_l + 2c_m\.

We assume that parameters satisfy this condition.

Expected profits of M are:

\[
\Pi_{m}^{f_{di}} = \frac{(\hat{a} - 2c_m + c_l)^2}{9b} - F - G. \tag{1}
\]

L’s expected profits are:

\[
\tilde{\Pi}_{l}^{f_{di}} = \frac{1}{36b}(3\tilde{a} - \tilde{a} - 4c_l + 2c_m)^2 - F. \tag{2}
\]

For later use, we note that the multinational’s expected profits in FDI are increasing in its belief about high demand, and increasing in its cost advantage over the local firm. Also, the local firm’s expected profits in FDI are higher

\(^7\)We assume that the multinational’s foreign operations and home operations are independent, for convenience. This is true for example when variable costs are linear in total output, which is what we assume, in addition to the assumption that home demand and foreign demand are independent.
when true demand is high than when it is low. However, these profits vary negatively with respect to the multinational’s belief about high demand. That is, even though the local firm knows demand, it is better off if the multinational believes demand to be low rather than high.\textsuperscript{8}

\section*{2.2 Joint venture}

We model it as follows: the multinational hires the local firm as an agent to produce the product. We assume that M has all the bargaining power so that it maximizes its expected profits subject to the local firm’s participation (IR) and incentive compatibility (IC) constraints. Further, we assume that the cost of JV is a weighted average of the costs of M and L, the weight reflecting the ease of technology transfer and denote this cost by \( c_j \). Thus, \( c_j = \theta c_m + (1-\theta)c_l \), where \( \theta \) is between 0 and 1 and is exogenously given. The local firm does not produce on its own when it enters into a joint venture. Thus, formation of a joint venture implies monopoly in the market.

Let \( \bar{R} \) denote the transfer from the local firm to the multinational if the observed price \( p \) is high and let \( R \) be similarly defined. Then, the multinational’s problem is to choose \( \{(\bar{p}, \bar{R}), (p, R)\} \) to maximize\textsuperscript{9},

\[ \rho \bar{R} + (1-\rho)R, \]

\textsuperscript{8}This may lead to strategic information manipulation by the informed local firm, an issue that we abstract from, in order to keep the analysis tractable.

\textsuperscript{9}The contract specifies transfers contingent on the observable price. Since the model is deterministic, there is a unique output that corresponds to a given price in high or low demand market. However, the local firm can produce more in the high demand state to generate a low price and vice-versa, if transfers are not incentive-compatible. The contracting problem ensures that the menu offered is incentive-compatible so that the local firm produces the output implied by the price specified in the contract. The contract is forcing in that any other price observation leads to transfers that are higher than the realized profit.
subject to the standard IR and IC constraints\textsuperscript{10}

\begin{align*}
(a - b\bar{Q} - c_j)\bar{Q} - F - \bar{R} &\geq (\bar{a} - b\bar{Q} - c_j)\bar{Q} - F - \bar{R}, \\
(a - b\underline{Q} - c_j)\underline{Q} - F - R &\geq (a - b\underline{Q}' - c_j)\underline{Q}' - F - \underline{R},
\end{align*}

Thus, a joint venture involves the multinational delegating the task of production to the local firm and providing it incentives to produce optimally according to true demand. However, in doing so, it incurs a marginal cost that need not be as low as its own, depending on the ease of the technology transfer. In addition, it incurs the agency cost of inducing the local firm to produce optimally. On the other hand, it does not have to incur the entry cost entailed in FDI and it does not have to compete under asymmetric information with the local firm. This trade-off determines the optimal mode of entry.

Note that the reservation utilities of the local firm (given in Equation (2)) are its expected profits in FDI, and are different for the two types in contrast to the standard model, and thus, the optimal contract is not necessarily one in which the IC constraint of the ‘good’ type and the IR constraint of the ‘bad’ type bind. In particular, note that the reservation utility of the high type could be high enough that a binding IC constraint may not ensure that the high type is better off in the joint venture, as would be the case if reservation utilities were the same as is generally assumed in agency problems. We start with this standard case in which only the high type’s IC and the low type’s

\textsuperscript{10}Here \(Q\) and \(Q'\) are such that the observed price is the same as needed to mimic the other type. That is, \(\bar{a} - b\bar{Q} = a - bQ \Rightarrow Q = \bar{Q} + \frac{\bar{a} - \bar{Q}}{b}\) and similarly, \(Q' = \bar{Q}' - \frac{a - \bar{Q}'}{b}\). This is different from models in which the intercept is known but cost of the firm is private information. There price targeting is equivalent to quantity targeting, assuming a deterministic environment.
IR bind. Then,

$$\bar{R} = (\bar{a} - b\bar{Q} - c_j)\bar{Q} - \frac{\bar{a} - a}{b}(a - b\bar{Q} - c_j) - F - \Pi_{fdi}^l,$$

and,

$$R = (a - bQ - c_j)Q - F - \Pi_{fdi}^l.$$

Substituting in the objective function yields M’s expected profits from JV:

$$\Pi_{jm}^v = \rho \left((\bar{a} - b\bar{Q} - c_j)\bar{Q} - \frac{\bar{a} - a}{b}(a - b\bar{Q} - c_j) + (1-\rho) \left((a - bQ - c_j)Q - F - \Pi_{fdi}^l\right)\right).$$

Note that $F$ and $\Pi_{fdi}^l$ are constants and thus, have no effect on the equilibrium output levels. We can show that the profit maximizing outputs for this problem are:

$$\bar{Q} = \frac{\bar{a} - c_j}{2b},$$

$$Q = \frac{a - c_j}{2b} + \frac{\rho}{1-\rho}\frac{\bar{a} - a}{2b}.$$

Thus, output of the good type is first-best but output of the bad type is distorted above. To ensure that the markup is positive, we assume that,

$$a - b\bar{Q} - c_j > 0 \Rightarrow \frac{a - c_j}{2} > \frac{\rho}{1-\rho}\frac{\bar{a} - a}{2} \Rightarrow \rho < \frac{a - c_j}{\bar{a} - c_j}.$$  

We now verify the other two constraints. It is easy to see that IC of the low type is slack.$^{11}$ However, IR of the high type may not be met, for example, when $\rho$ is close to the upper bound. This can be seen as follows: for this constraint to be met, we need,

$$\frac{\bar{a} - a}{b}(a - bQ - c_j) + \Pi_{fdi}^l \geq \bar{\Pi}_{fdi}^l,$$

$$6 \left((a - c_j) - \frac{\rho}{1-\rho}(\bar{a} - a)\right) \geq 3\bar{a} + 3a - 2\bar{a} - 8c_l + 4c_m. \hspace{1cm} (3)$$

$$^{11} \bar{\Pi}_{fdi}^l \geq (a - bQ' - c_j)Q' - F - \bar{R} = (\bar{a} - b\bar{Q} - c_j)\bar{Q} - F - \bar{R} - \frac{\bar{a} - a}{b}(\bar{a} - b\bar{Q} - c_j) = \Pi_{fdi}^l + \frac{\bar{a} - a}{b}(a - bQ - c_j) - \frac{\bar{a} - a}{b}(\bar{a} - b\bar{Q} - c_j) = \Pi_{fdi}^l - \frac{\bar{a} - a}{b}(\bar{a} - b\bar{Q} - (a - bQ)).$$
Now, we can see that the right hand side is positive for all values of $\rho^{12}$. However, the left hand side decreases to zero as $\rho$ increases to the upper bound needed for the low-demand mark-up to be zero. We can also see that as $\rho$ falls, the inequality is easier to satisfy. This yields an upper bound on $\rho$, say $\hat{\rho}_{jv}$, below which the inequality may be met. We can also show that if (3) is met, $R$ is positive. However, there are parameter values for which (3) may not be met at all. It is more likely to hold if technology transfer is perfect, or if $\bar{\sigma}$ is low, other things being equal.$^{13}$ If parameters are such that (3) holds, there exists an optimal JV contract in which the high-demand local firm produces the first-best output and enjoys a surplus while the low demand firm produces more than the first-best output and makes profits equal to its reservation utility. The expected profits of the multinational are:

$$
\Pi_{jv}^m = \rho \frac{(\bar{a} - c_j)^2}{4b} + (1 - \rho) \frac{(a - c_j) - \rho (\bar{a} - a)}{4b}^2 - F - \Pi_{l}^{fdi}. \tag{4}
$$

**Lemma 1:** There exist parameter values for which the optimal JV contract is one in which IR of the low type and IC of the high type bind, while the other constraints are slack, provided $\rho \leq \hat{\rho}_{jv} < 1$. Expected profits of the multinational are given by (4).

As we can see in (4), the multinational’s profits in JV are lowered by having to produce at $c_j$ rather than $c_m$ as well as by the distortion in the low-demand firm’s output, which measures the agency costs of the joint venture.

If parameters are such that (3) does not hold for any $\rho$, we can show that there exists another threshold belief $\hat{\rho}_{jv}^2$ such that for all $\rho \leq \hat{\rho}_{jv}^2 < 1$, the optimal contract is first-best, that is, $\bar{IR}$ and $\bar{IR}$ bind and the incentive constraints are slack. Substituting the first-best outputs, we can see that $IC$

$^{12}$This is because given our assumptions on parameters, the full information duopoly profits of the local firm are positive even when demand is low.

$^{13}$For example, when $\bar{\sigma}=8.5$, $a = 5$, $c_j = c_l = 2$ and $c_m = 1$, there is no belief for which (3) holds.
is met if and only if,

\[
\bar{a} - \frac{a}{b}(a - bQ - c_j) + \Pi^l_{fdi} \leq \bar{\Pi}^l_{fdi},
\]

\[
6(a - c_j) \leq 3\bar{a} + 3\bar{a} - 2\bar{a} - 8c_l + 4c_m.
\]

(5)

Note that if (3) is satisfied, (5) cannot be. Further, (5) leads to a requirement that \( \rho \) be sufficiently low, given other parameters. For example, (5) leads to the following condition on \( \rho \), if there is no technology transfer (\( c_j = c_l \)):

\[
\rho \leq \frac{3\bar{a} - 5a - 2c_l + 4c_m}{2(\bar{a} - a)}.
\]

We find that the cost differential needs to be low relative to the low demand intercept for (5) to be met. In addition, \( \bar{a} \) needs to be sufficiently high and technology transfer needs to be low.

Constraint IC is met if and only if,

\[
\Pi^l_{fdi} - \frac{\bar{a} - a}{b}(\bar{a} - bQ - c_j) \leq \bar{\Pi}^l_{fdi},
\]

\[
3\bar{a} + 3\bar{a} - 2\bar{a} - 8c_l + 4c_m \leq 6(\bar{a} - c_j).
\]

This can be shown to hold since the largest value of the LHS is when there is no difference between the two demand levels. But then the LHS reduces to

\[4\bar{a} - 8c_l + 4c_m = 4\bar{a} - 4c_l - 4(c_l - c_m) < 6(\bar{a} - c_j) = 4(\bar{a} - c_j) + 2(\bar{a} - c_j)\]

Another way to see this is: \[3\bar{a} + 3\bar{a} - 2\bar{a} = (3 - 2\rho)\bar{a} + (3 - 2(1 - \rho))a\]. As \( a \) increases, this term increases to \( 4\bar{a} \), holding \( \rho \) and \( \bar{a} \) constant. In terms of \( \rho \), the LHS increases as \( \rho \) falls. In the limit, this part becomes \( 3\bar{a} + a < 4\bar{a} \).

If (5) holds, the multinational’s expected profits are,

\[
\Pi^m_j = (1 - \rho)[\frac{1}{4b} (\bar{a} - c_j)^2 - F - \Pi^l_{fdi}] + \rho[\frac{1}{4b} (\bar{a} - c_j)^2 - F - \bar{\Pi}^l_{fdi}].
\]

(6)

**Lemma 2:** There exist parameter values for which the optimal JV contract is first best, provided \( \rho \leq \bar{\rho}_{jv}^2 < 1 \). Expected profits of the multinational are
Finally, we consider the possibility when parameters are such that neither (4) nor (6) are valid. That is, given other parameters, \( \rho \) is above the relevant threshold. We find that in this case, the optimal contract is one which sets outputs based on binding \( IC \) and \( IR \) constraints. As a result, the low type’s output is first best but the high type’s output is distorted above where, the distortion is independent of \( \rho \).

\[ \bar{Q} = \frac{\bar{a} - c_j}{2b} + \frac{\bar{a} - a}{2b}. \]

Note that \( \bar{a} - b\bar{Q} > 0 \). We now check \( IC \).

\[ \frac{\bar{a} - a}{b}(a - b\bar{Q} - c_j) + \Pi^l_{fdi} \leq \frac{\bar{a} - a}{b}(\bar{a} - b\bar{Q} - c_j) + \Pi^l_{fdi}, \]
\[ a - b\bar{Q} - c_j \leq \bar{a} - b\bar{Q} - c_j. \]

Substituting output values yields equality so that \( IC \) binds as well. It follows that \( \bar{R} = \bar{R} \). Finally, \( IR \) requires,

\[ \bar{\Pi}^l_{fdi} \leq \frac{\bar{a} - a}{b}(\bar{a} - b\bar{Q} - c_j) + \Pi^l_{fdi}, \]
\[ 3\bar{a} + 3a - 2\bar{a} - 8c_l + 4c_m \leq 6(a - c_j). \] (7)

If (7) is met, the high-type participates in the joint venture and M’s expected profits are:

\[ \Pi^{jv}_m = \frac{1}{4b} (a - c_j)^2 - F - \Pi^l_{fdi}. \] (8)

Note that these profits are the same as if the multinational knew that demand is low and are the minimum level of profits that it can earn in a joint venture. We can verify that the high-type earns a higher surplus in this scenario than when \( \rho < \hat{\rho}_{jv} \).

We can now prove the following:

**Proposition 1:** The optimal JV contract depends on parameter values. Given all parameters other than \( \rho \), there are two possibilities: either (1) for \( \rho \leq \hat{\rho}_{jv} < 1 \), profits of the multinational under JV are given by (4) and for
1 ≥ ρ > ˆρ_j, by (8); or (2) for ρ ≤ ˆρ^2_j < 1, profits are given by (6) and for
1 ≥ ρ > ˆρ^2_j, by (8).

Proof: Suppose parameters are such that (5) does not hold for any ρ. Then
(7) holds for all ρ. But this implies that (3) holds for all ρ ≤ ˆρ, for some ˆρ
between 0 and 1. We can show that profits in (4) dominate profits in (8) for
these values and thus, (4) applies for low values of ρ and (8) applies for high
values. Now suppose parameters are such that (5) holds for low values of ρ.
Then (3) cannot hold for such values. And as is obvious, (7) holds for high
values of ρ. We can also show that the upper bounds for ρ are less than 1, for
both (3) and (5). Thus, if ρ is sufficiently high, (7) applies. Hence the result.

Proposition 1 characterizes all possibilities for the JV scenario. Intuitively,
the first possibility is more likely when π is not too high and technology trans-
fer is high; whereas the second possibility is more likely when π is high and
technology transfer is low, and in addition, the cost differential is low relative
to the demand intercept differential.14

We can prove the following corollary:

Corollary 1: The expected profit of M in JV is discontinuous in ρ. Further,
(i) expected profits given by (4) are increasing up to the threshold ˆρ_j,
(ii) expected profits given by (6) are increasing up to ˆρ^2_j, (iii) expected profits in
(8) are increasing at a smaller rate than in (4) and (6) and are lower than in
(4) and (6) at the relevant threshold, but greater than these profits evaluated
at ρ = 0.

Proof: Straightforward.

The discontinuity in the profit function does not occur when reservation
utilities are zero because then, for ρ above a certain threshold, it is possible
to extract all the surplus from the high type and not contract with the low
type, whereas in our setting, the high type is better off walking away from
the contract, so that the most that can be extracted is what the low type is

14We find that in Example 1a (see Figure 1a) where ̅a = 6, a = 4, c_l = 2, c_m = 1
and c_j = 1, Possibility 1 applies and Example 1b (see Figure 1b), where ̅a = 8.5, a = 5,
c_l = 2, c_m = 1 and c_j = 2, Possibility 2 applies. We assume b to be 1 in all our examples.
able to pay. This is a novel feature of the contract due to the endogeneity and magnitude of reservation utilities of the two types. In the first possibility, the high-demand type can do better in competition with the multinational when $\rho$ is ‘high’ than in the joint venture contract requiring it to produce the first-best output, where its profits are simply the surplus that decreases as $\rho$ increases. Thus, the only way to induce the high-demand type to participate in the joint venture, when $\rho$ is sufficiently high, is to offer a different contract that requires it to produce a higher than the first-best output. This scenario is equivalent to the multinational believing that demand is high with probability zero. For the second possibility (which too does not arise in the case when reservation utilities are zero for both types\footnote{This is because incentive constraints are violated when the principal attempts to implement the first best. Here, divergence in reservation utilities creates the possibility of the first-best being possible at least for some parameter values.}), for small values of $\rho$, and given the other parameter values consistent with this scenario, M’s profits in JV are first-best since neither type has an incentive problem. Both types are ensured their reservation utility. Once $\rho$ reaches a threshold, the high type’s incentive constraint is violated and thus, the only possibility for M is to collect profits yielded by the low-type.

We now compare profits of the multinational in the joint venture as derived above, with its profits in FDI given by (1). Note that the JV profits in all cases are independent of $F$. This is because as $F$ increases, the reservation utility of the low-demand type decreases by the same amount, leaving net profits unchanged. Now, given the discontinuity of the profit function in JV, the mode of entry preferred by M depends on whether the JV profits are given by (4), (6) or (8). This in turn depends on the probability of high demand, given demand and cost parameters, and the degree of technology transfer. For example, if we consider values of $\rho$, which exceed the relevant threshold, so that profits of M in JV are given by (8), we see that JV dominates if and only if,

$$
\frac{1}{4b} (a - c_j)^2 - \Pi_{fdi}^f \geq \frac{(\hat{a} - 2c_m + c_l)^2}{9b} - G,
$$
Thus, if the RHS is positive,\footnote{We find that in Example 1a, the RHS is positive for all $\rho$ consistent with (8), given $c_j = c_m$.} for JV to dominate FDI, a sufficiently high fixed cost is needed. The RHS is the difference between total expected profits under FDI and monopoly profits under JV when realized demand is low. We can see that the total FDI profits are increasing in $\rho$, whereas the monopoly profits are constant, thus, implying that the RHS is increasing in $\rho$. The maximum value of this RHS, when technology transfer is perfect, is positive given our assumptions. This implies that if fixed costs are zero, and technology transfer is perfect, FDI dominates if $\rho$ is sufficiently high. If technology transfer falls, that is, as $c_j$ increases, the RHS increases given $\rho$ and $F + G$, and thus, the threshold belief falls so that FDI dominates for a larger set of beliefs. Similarly, as $F + G$ increases, given $\rho$ and $c_j$, JV becomes more likely which is intuitive as a higher entry cost makes FDI less attractive and a higher $F$ reduces FDI profits while leaving the JV profits unchanged.

When probability of high demand is small, other parameters determine whether the first-best or the second-best outcome is applicable. In general, we can show that when technology transfer is perfect and fixed costs are zero, and parameters are such that the first-best outcome is not feasible, JV profits are higher than FDI profits for all $\rho \leq \hat{\rho}_{jv}$, and FDI profits are higher otherwise. Figure 1a illustrates this case. As fixed costs increase, JV becomes more profitable relative to FDI in all scenarios. However, due to the drop in JV profits at the threshold, FDI may continue to dominate JV at sufficiently high values of $\rho$.

As $c_j$ increases, i.e. technology transfer falls, profits from JV fall while those from FDI remain the same. If technological transfer is zero, whether or not JV dominates at all, given zero fixed costs, depends on the marginal cost-differential. If it is small, JV dominates for small values of $\rho$. If it is
the maximum allowed\textsuperscript{17}, JV does not dominate for any beliefs (See Figure 3.).

Finally, Figure 1b illustrates Possibility 2 in Proposition 1 where the first-best contract is feasible and optimal for small values of $\rho$. Results are similar. FDI may occur for all beliefs if fixed costs are low. Note the difference in parameter values assumed for possibilities 1 and 2. In Figure 1a, we assume perfect technology transfer whereas it is the opposite for Figure 1b. Also, the high demand parameter is higher relative to the low demand parameter, and this difference in turn is higher relative to the cost differential, in Figure 1b.

We summarize our general findings in the following proposition.

**Proposition 2**: Suppose $F + G$ and $c_j$ are given. Further, assume that Possibility 1 of Proposition 1 applies. Then, if $F + G$ is low, and $c_j = c_m$, M chooses FDI for all beliefs above a threshold at least as large as $\hat{\rho}_{ju}$, and JV below. As $c_j$ increases, JV becomes less profitable relative to FDI. If $c_j = c_l$, and $c_l$ is the maximum possible, JV is dominated for all values of $\rho$. As $F + G$ increases, ceteris paribus, FDI becomes less profitable relative to JV. Results are similar if parameters are such that Possibility 2 of Proposition 1 applies.

Note that if FDI occurs for all beliefs below the threshold, it must occur for all beliefs above the threshold and thus, for all beliefs. That is, a high probability of demand favors FDI. This is because of the drop in profits of the multinational in JV above the threshold. Also, these results show that technological transfer favors joint venture, since lower the cost of production, higher the profits in JV and given that the multinational enjoys the residual, it is better off in a JV with higher technological transfer. Thus, the argument that technological transfer weakens the incentive to form a joint venture is not supported by our model. Similarly, we can show that a joint venture can arise even when there is symmetric information about demand. To see this, we compare profits of the multinational under JV and FDI assuming complete information about demand. FDI profits of the multinational and local firm

\textsuperscript{17}This is determined from the positivity of output for all possibilities. Holding other parameters constant, the maximum value of $c_l$ equals $\frac{3\pi-\pi+2c_m}{4}$. In Example 1a, this value is 2, which is the one assumed.
respectively are:

\[ \tilde{\Pi}_{fdi}^m = \frac{1}{9b}(\bar{a} - 2c_m + 2c_l)^2 - F - G, \]
\[ \tilde{\Pi}_{fdi}^l = \frac{1}{9b}(\bar{a} - 2c_l + c_m)^2 - F. \]

In JV, the multinational maximizes total profits subject to participation constraints of the local firm. Thus, outputs are set to be first-best, yielding the multinational the following profits:

\[ \Pi_{jv}^m = (1 - \rho)\frac{1}{4b}(a - c_j)^2 + \rho\frac{1}{4b}(\bar{a} - c_j)^2 - (1 - \rho)\frac{1}{9b}(a - 2c_l + c_m)^2 - \rho\frac{1}{9b}(\bar{a} - 2c_l + c_m)^2 - F. \]

Expected profits under FDI are:

\[ \Pi_{fdi}^m = (1 - \rho)\frac{1}{9b}(a - 2c_m + c_l)^2 + \rho\frac{1}{9b}(\bar{a} - 2c_m + c_l)^2 - F - G. \]

Thus, JV dominates FDI under full information about demand if and only if expected monopoly profits at cost \( c_j \) exceed total expected profits in duopoly (net of \( G \)) when costs are asymmetric. Once again, perfect technological transfer favors JV. If \( G \) is zero, it is clear that JV dominates if and only if collusive profits under an intermediate level of cost exceed the duopoly profits under different costs. In the extreme, when costs are the same, we know that JV dominates. We can also see in Example 1a that JV dominates. Thus, the rationale for JV is not entirely learning about the market. Our model shows that a joint venture enables the multinational to use market power as well as bargaining power to enjoy higher profits. We next examine the effect of financing on this decision.

### 3 Mode of Entry with Financing Constraints

We assume that the local firm is not able to fund \( F \) itself while the multinational is unconstrained. It therefore either borrows from a bank, if there is
FDI, or from the multinational if there is a joint venture. Since the multinational must cover the fixed cost even when there is no financing constraint, and it is financially unconstrained, it is optimal for it to provide financing to the local firm in a joint venture. This becomes clearer when we set up the contracting problem in JV. We first study FDI with financing.

3.1 FDI

In this case, the multinational’s problem remains the same but the local firm is now a borrower and thus, faces a lender who writes a contract specifying what outputs need to be produced. This contracting problem is similar to the JV contract without financing, except that the cost is $c_l$ and the contractible output is only the local firm’s output, not the total output and therefore, the multinational’s output enters the maximization problem separately. This analysis is similar to that in JJMa (2002) in the context of entry. We assume that beliefs of the lender are the same as that of the multinational.

For convenience, we continue to use $\bar{R}$ to denote the transfer from the local firm to the bank if the observed price is high and let $R$ be similarly defined. Then, the bank’s problem is to choose $(\bar{p}, \bar{R}), (p, R)$ to maximize,

$$
\rho \bar{R} + (1 - \rho)R - F,
$$

subject to the standard IR and IC constraints (here $q$ and $q'$ are such that the

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18 The contracting problem is similar to the JV contract in set-up because the underlying environment is the same. As Stiglitz and Weiss (1981) point out, their model of credit rationing can be used to study agency problems in labor market or regulation. The same logic applies here. Demand can be high or low and the local firm is informed while the multinational and the lender are not. While it is possible that these uninformed agents have different beliefs, we abstract from that to simplify the problem. Also, it is possible that the joint venture operates in a different way where both firms produce jointly and split profits according to a different rule. We follow the approach of Horstmann and Markusen (1996) in setting it up as an agency problem. In the JV contract, $R$ represents a transfer to the multinational from the local firm, contingent on price, while in the loan contract, $R$ denotes repayment to the lender in exchange for the loan. When the observed price is low, the lender and the multinational deduce that demand is low and specify the transfer/repayment to be the entire net profit. As we will see later, when the observed price is high, the stipulated transfer to the principal is higher but less than the net profit. This repayment divided by the loan $F$ can be viewed as the interest rate.
We can see several differences between the contractual problem between the multinational firm and the local firm in a JV, and between the bank and the local firm for financing. One difference is that the multinational is indirectly affected by the financing contract as outputs of the local firm are being specified in the contract. This is similar to results in the existing literature such as Bolton and Scharfstein (1990) where the financial contract affects the product market structure. Another is that the bank has to ensure only that the local firm gets a non-negative profit in the contract since the outside option for the firm is to not produce. This captures our assumption that the local firm is financially constrained. It borrows because of lack of internal funds.\footnote{We are not analyzing the effect of debt-equity mix of the local firm on the multinational’s mode of entry decision. Our focus is on the mode of entry decision given that the firm has no internal funds and has no access to external equity. It would be an interesting extension to study the optimal capital structure of the local firm given that a multinational chooses how to enter the market.}

This contracting problem is standard, with zero reservation utilities for both types. Thus, there is a unique optimal contract as long as $\rho$ is below a threshold. In equilibrium, IR of the low type and IC of the high type bind. The equilibrium outputs are:

\[
(\bar{a} - b\bar{q} - bq_m - c_l)\bar{q} - \bar{R} \geq (\bar{a} - bq - bq_m - c_l)q - \bar{R},
\]
\[
(a - bq - bq_m - c_l)q - R \geq (a - bq' - bq_m - c_l)q' - \bar{R},
\]
\[
(a - bq - bq_m - c_l)q - R \geq 0,
\]
\[
(\bar{a} - b\bar{q} - bq_m - c_l)\bar{q} - \bar{R} \geq 0.
\]
\[ q_m = \frac{a - 2c_m + c_l}{3b}, \]
\[ q = \frac{a - 2c_l + c_m}{3b} + \frac{\rho}{1 - \rho} \frac{a - a}{2b}, \]
\[ \bar{q} = \frac{3a - a - 4c_l + 2c_m}{6b}. \]

One interesting result due to constant marginal costs and linear demand is that the multinational’s output in equilibrium equals output it would produce in the low-demand market\(^{20}\). To ensure that the mark-up is positive, we require that \(a - bq - b q_m - c_l > 0 \rightarrow \frac{\rho}{1 - \rho} < \frac{2(a - 2c_l + c_m)}{3(a - a)}\). Let the resulting upper bound on \(\rho\) be denoted by \(\rho_{fdi}\). Thus, the optimal contract above applies as long as \(\rho < \rho_{fdi}\).

Note that the high-demand type no longer produces the first best output and the distortion in the low-demand output is the same as in the JV contract without financing. Indeed, the local firm produces higher than the first best amount in both states of demand, implying that the multinational’s output is lower than the first best. In fact, the multinational’s optimal response is to produce the first best amount assuming low demand. This is the lowest output the multinational is expected to produce in a Cournot duopoly and thus, its profits are the lowest possible. This result shows that financing problems of the competitor need not benefit the rival. Indeed, due to the strategic environment, the multinational is worse off by the fact that the rival’s outputs are dictated by a third uninformed party.

However, if \(\rho\) exceeds \(\rho_{fdi}\), the multinational’s profits increase because the bank lends only to the high-demand type so that it does not need to offer any incentives and thus, is able to extract all the surplus from the firm. As a result, the equilibrium output specified is first best. This change in the contract reveals the state of demand to the multinational. Further, the multinational

\(^{20}\)This result is different when demand is stochastic as in JJMb (2002). There the expected output of the agent is the same as the output of the low-type which implies that the uninformed rival produces an output higher than the best response to the low-type’s output. In JJM a (2002), on the other hand, a similar outcome is obtained as here, although there it is the marginal cost parameter that is private information of the incumbent, and thus, the logic behind the outcome as well as its interpretation is somewhat different.
becomes a monopolist when demand is low, and it produces the first best duopoly output when demand is high. Both of these profits are higher than profits under asymmetric information, which is the case without financing. Thus, the multinational’s profits under FDI are,

\[
\Pi_{mf}^{fdi} = \frac{(a - 2c_m + c_l)^2}{9b} - F - G, \text{ if } \rho < \rho_{fdi}, \quad (9)
\]

\[
\Pi_{mf}^{fdi} = \rho \frac{(a - 2c_m + c_l)^2}{9b} + \frac{(1 - \rho)(a - c_m)^2}{4b} - F - G, \text{ if } \rho \geq \rho_{fdi}. \quad (10)
\]

Note that when (10) applies, the local firm receives zero, regardless of demand. It does not get a loan when demand is low and it gets zero surplus when demand is high. When (9) applies, the local firm receives zero if demand is low and a positive surplus (determined from the binding IC constraint). This surplus equals

\[
(a - bq - bq_m - c_l)(q - \bar{q}) = \left(\frac{a + c_m - 2c_l}{3} - \frac{\rho \pi - a}{1 - \rho} \right) \frac{\bar{a} - a}{b}.
\]

Figures 2a and 2b illustrate these profits for parameter values considered in Examples 1a and 1b respectively. We summarize the findings discussed thus far, in the following Proposition:

\textbf{Proposition 3:} The multinational firm’s expected profits in FDI when the local firm borrows, are discontinuous at \( \rho_{fdi} \). Further, these profits are lower than without financing constraints, for \( \rho < \rho_{fdi} \), and higher otherwise, becoming equal at \( \rho = 1 \).

Thus, when the local firm is able to borrow regardless of its type, that is, the state of demand, the multinational is worse off in FDI. This occurs when the belief about high demand is low. Otherwise, the multinational benefits from the local firm’s financing constraints. To some extent, this captures the intuition that financing constraints make the local firm a less formidable competitor. However, this is the case only when the lender lends only to the high demand firm thus, removing the information asymmetry between the local firm and the multinational.\textsuperscript{21} Further, we will see below that financing constraints also increase profits in the joint venture. Therefore, the overall

\textsuperscript{21} We are assuming that the financial contract is observed by the multinational.
effect of financing constraints on the mode of entry needs to be examined further.

3.2 JV

We now consider the case when the multinational offers to form a joint venture with the local firm and in the process provides financing. It turns out that the contracting problem does not change except for reservation utilities of the local firm. In particular, providing financing does not reduce the multinational’s profits any further since even without financing constraints, it must ensure that \( F \) is covered. When the multinational provides financing, \( F \) appears as a deduction in the objective function but does not appear in the IR constraints, thus, changing nothing. 22

The reservation utilities that the multinational must guarantee to the local firm are now lower. The low-demand firm gets 0 in the outside option whereas the high-demand firm gets a positive surplus, if \( \rho \) is not too high, otherwise zero. Thus, using the same notation as in the JV contract without financing, the maximization problem of \( M \) changes to choosing \((\bar{p}, \bar{R}), (p, R)\) to maximize,

\[
\rho \bar{R} + (1 - \rho)R - F,
\]

subject to the standard IR and IC constraints (here \( Q \) and \( Q' \) are such that the observed price is the same as needed to mimic the other type.)

\[
(\bar{a} - b\bar{Q} - c_j)\bar{Q} - \bar{R} \geq (\bar{a} - b\bar{Q} - c_j)Q - R,
\]

\[
(a - bQ - c_j)Q - R \geq (a - bQ' - c_j)Q' - R,
\]

\[
(a - bQ - c_j)Q - R \geq 0,
\]

22Financing the local firm imposes no additional burden on the multinational since in the JV relationship, the project essentially becomes the multinational’s and regardless of financing, the multinational must cover the costs.
\[(\bar{a} - b\bar{Q} - c_j)\bar{Q} - \bar{R} \geq \left(\frac{a + c_m - 2c_l}{3} - \frac{\rho}{1 - \rho} \frac{\bar{a} - a}{2}\right)\frac{\bar{a} - a}{b}.\]

Assuming that IR for the low type and IC for the high type bind and solving, we find that equilibrium outputs are the same as without financing. Let the upper bound on \(\rho\) needed to ensure JV with both types, be denoted by \(\rho_{jv} = \frac{\bar{a} - c_j}{\bar{a} - a}\). The incentive constraint of the low type can be verified. Further, we can verify that IR for the high type is satisfied as well: the inequality reduces to,

\[
\bar{a} - b\bar{Q} - c_j \geq \frac{a + c_m - 2c_l}{3} - \frac{\rho}{1 - \rho} \frac{\bar{a} - a}{2},
\]

\[
\bar{a} - c_j \geq 2(c_j + c_m - 2c_l) < 0.
\]

Thus, the optimal JV contract with financing constraints follows the standard analysis, in contrast to the JV solution without financing constraints, where we find that the high-demand type walks away from the JV contract if \(\rho\) is sufficiently high. This is a significant effect of incorporating financing constraints in the model since the optimal contracting problem has a unique solution, regardless of parameter values. Intuitively, the outside option of the local firm is better without financing. Further, the surplus offered to the high-type in JV is higher than the surplus available to it from the lender. The surplus is simply the markup times the extra output the high type produces, which is the same in FDI and in JV. The markup on the other hand is lower in FDI because of competition and higher cost.

Expected profits of the multinational in JV with financing constraints are:

\[
\Pi_{mf}^{jv} = \rho \frac{(\bar{a} - c_j)^2}{4b} + (1 - \rho) \left(\frac{(a - c_j) - \frac{\rho}{1 - \rho}(\bar{a} - a)}{4b}\right)^2 - F, \text{ if } \rho \leq \rho_{jv} \quad (11)
\]

\[
\Pi_{mf}^{jv} = \rho \frac{(\bar{a} - c_j)^2}{4b} - F, \text{ if } \rho \geq \rho_{jv} \quad (12)
\]

Note that profits in (11) are the same as in (4) except for the absence of reservation utility of the local firm under low demand which is zero. This
also implies that with financing, the multinational’s profits in JV decrease in $F$, in contrast with the no-financing case. Since FDI profits with financing also decrease in $F$, the amount of fixed costs of operations has no effect on the choice of mode of entry when financing constraints are included. When $\rho_{jv} \leq \rho$, the multinational specifies zero output for the low demand type and the first best output for the high demand type. This is equivalent to forming JV only with the high-demand firm. Hence, profits are as in (12). Thus, JV yields higher profits to the multinational with financing constraints, ceteris paribus. We summarize these results in the following proposition:

**Proposition 4:** The optimal JV contract is unique. The multinational firm’s expected profits in JV are continuous in $\rho$ when there are financing constraints. Further, they are increasing, and are higher than its profits in JV when there are no financing constraints.

Comparing the shape of the profit functions under JV and FDI, with and without financing, reveals an interesting reversal. Without financing, we find that the multinational’s JV profits increase up to a threshold belief, drop at the threshold and increase at a slower rate after the threshold, whereas with financing constraints, these profits increase continuously, although the profit function becomes linear at the threshold $\rho_{jv}$. On the other hand, FDI profits of the multinational are continuously increasing when there are no financing constraints but discontinuous when there are financing constraints. This comparison can be seen in Figures 1a and 2a, and Figures 1b and 2b.

We now examine the mode of entry with financing constraints. It is straightforward to show that if technology transfer is perfect, JV profits of the multinational are higher than profits under FDI, even when $G$ is zero, for all $\rho < \rho_{fdi}$. The same is true at $\rho = 1$ and thus, by continuity, for a range of beliefs below 1. As for other values of $\rho$, first, we can show that $\rho_{fdi} < \rho_{jv}$, and for values of $\rho$ between these two thresholds, profits in FDI are given by (10) which are higher than in (9), whereas profits in JV continue to be given by (11). Figure 2a, which assumes perfect technology transfer, shows that

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23 Profits in (11) are higher than the FDI profits at $\rho$ equal to zero, since $c_l$ is bounded above. As $\rho$ increases, the FDI profits remain constant while the JV profits increase.
FDI dominates JV for $\rho$ higher than $\rho_{fdi}$ until another threshold is reached beyond which JV dominates. That is, while JV dominates for low values and high values of $\rho$, FDI dominates for an intermediate range of this probability. If we simply compare the sets of beliefs over which FDI dominates, in this example, it is clear that FDI dominates over a smaller, intermediate set of beliefs than without financing. In general, we can show that the range of intermediate beliefs over which FDI dominates depends on the multinational’s cost advantage, $c_l - c_m$. When this differential is small, JV dominates for all beliefs. As this differential increases, ceteris paribus, FDI profits increase and at a higher rate with respect to $\rho$, creating an intermediate range of beliefs where FDI dominates JV. In Figure 2a, the cost-differential is the maximum allowed, thus, favoring FDI. We can also show that this range of beliefs is given by $[\rho_{fdi}, \hat{\rho}]$, $\hat{\rho} < \rho_{jv}$. A high cost-differential favors FDI since it makes the multinational a more formidable competitor. Overall, our results show that the local firm’s financing constraints not only change the range of beliefs over which JV dominates but also make JV more likely since there are parameter values for which, FDI may not occur at all with financing when it occurs without.

Figure 2b examines the second possibility in Proposition 1, where the first-best contract obtains in the absence of financing constraints. We can see some differences from Figure 2a, though the conclusion that JV is relatively more attractive due to financing still holds. With financing constraints, and no fixed costs, we see alternating modes of choice as $\rho$ increases. In contrast, when there is no financing constraint, FDI dominates for all beliefs. Recall that in this example, technology transfer is assumed to be zero and this leads to lower JV profits when $\rho$ equals zero.

Although JV profits increase, and at an increasing rate, when the local firm is financially constrained, it is possible that the increase is not sufficient to make JV optimal for any beliefs. This requires that the technology transfer not be perfect. In this case, if fixed costs are zero, FDI may occur for all beliefs, with and without financing. This is shown in Figure 3 which is based on the same example as in Figure 2a, except that the technology transfer is changed.
to zero. Figure 3 shows that when technology transfer is zero, along with fixed costs, FDI dominates for all beliefs in the absence of financing issues. Once financing constraints are introduced, although JV becomes relatively more attractive, FDI continues to dominate JV for all beliefs. If the cost of entry is positive, JV dominates up to a threshold and FDI above, when there are no financing issues but with financing, FDI dominates only for intermediate beliefs, which is the same conclusion as with perfect technological transfer. Note that if it is $F$ that is positive, there is no change in the mode of entry because profits from JV decrease by the same amount as those from FDI.

We summarize our results in the following Proposition.

**Proposition 5:**

(i) If technology transfer is perfect, JV dominates for all $\rho < \rho_{fdi}$ and for all $\rho \in [\hat{\rho}, 1]$, where $\hat{\rho} \in [\rho_{fdi}, \rho_{jv})$. If $c_l = c_m$, $\hat{\rho} = \rho_{fdi}$ so that JV dominates for all $\rho$. As $c_l$ increases, ceteris paribus, FDI profits increase, while JV profits remain unaffected. There exist parameter values with perfect technological transfer, and a high cost-differential, where FDI dominates for $\rho \in [\rho_{fdi}, \hat{\rho}]$, but overall the set of beliefs over which JV dominates is larger when there are financing constraints.

(ii) If technology transfer is zero, there exist parameter values for which, FDI dominates with or without financing.

(iii) If the optimal contract without financing is first best for low values of $\rho$, financing constraints may lead to alternating choice of mode of entry with FDI dominating for $\rho \in [0, \rho']$, and $\rho \in [\rho_{fdi}, \hat{\rho}]$, for some $\rho' < \rho_{fdi} < \hat{\rho} < \rho_{jv}$, while without financing constraints, FDI dominates for all beliefs.

(iv) Increase in $F$ has no effect on the mode of entry whereas increase in $G$ makes JV more profitable relative to FDI.
A high cost-differential favors FDI since the multinational can make more profits when the rival has high marginal cost. However, our examples show that if technological transfer is perfect, financing constraints lead to JV dominating for a larger set of beliefs. Another effect of financing constraints when technology transfer is high is that JV occurs not only when demand is likely to be low but also when it is likely to be high. FDI is only possible, if at all, for an intermediate range of beliefs, caused by the jump in FDI profits. In contrast, when the local firm is self-financed, FDI dominates JV when demand is likely to be high. This has interesting empirical implications - if local partners are financially constrained, and technology transfer is high in a joint venture, multinationals are likely to compete with them only when their cost advantage is high and they believe demand to be high with a moderate probability. That is, if the multinational expects demand to be low or high with a high probability, it prefers to enter into a joint venture. If in addition, the cost advantage is not too high, it prefers joint venture for all beliefs. On the other hand, if local partners are not financially constrained, multinationals are likely to compete as long as they are not too pessimistic about demand. If technology transfer decreases however, and/or the cost of entry decreases, FDI becomes more attractive relative to JV, with or without financing.

4 Conclusion

We find that financing constraints of the local firm have a significant effect on the mode of entry decision of the multinational. The optimal contract in the joint venture is significantly different, particularly in the high demand state, when the local firm is financially constrained. The FDI profits also change in a way that lends only partial support to the argument that financial constraints of the local firm favor FDI. Overall, financing constraints make JV more appealing for the multinational rather than less - JV becomes more attractive when demand is likely to be low, since reservation utilities decrease for both types. Indeed, as a result, the high-demand type continues to partic-
ipate in the JV even when it earns zero surplus. Further, FDI becomes worse for the multinational because of the third party involvement when the belief about high demand is low. Although FDI profits of the multinational increase beyond a certain threshold belief, we find examples, where the overall set of beliefs over which JV occurs with financing is larger than without financing. We also derive implications of technology transfer, fixed costs and beliefs about demand on the mode of entry with and without financing.

References


Figures

In all diagrams below, the black curves represent profits of the multinational under JV and the solid red line profits under FDI, both without financing.

Example 1a: This example illustrates Possibility 1 in Proposition 1 under perfect technological transfer and no fixed costs. Let $\bar{\tau} = 6, \underline{q} = 4, c_j = c_m = 1, c_l = 2$. The threshold value is $\hat{\rho}_{jv} = 0.45$. FDI occurs for $\rho \in (0.45, 1]$.

Figure 1a: M’s profits in Possibility 1
Example 1b: Let $\bar{a} = 8.5, a = 5, c_j = c_l = 2, c_m = 1$. This example illustrates Possibility 2 in Proposition 1, where the first-best contract obtains upto $\hat{\rho}_{jv}^2 = 0.07$. FDI occurs for all beliefs if fixed costs are zero, otherwise it occurs for $\rho > 0.07$. The dashed red line shows FDI profits assuming a fixed cost of 1.

Figure 1b: M’s profits in Possibility 2
**Example 2:** This example shows the effects of financing on the mode of entry. Green curves represent profits of the multinational under FDI with financing and black dashed curves represent profits under JV with financing. The other curves have the same meaning as in Example 1.

In Example 1a, and Figure 2a, the thresholds are: $\rho = 0.45$, $\rho = 0.6$, $\rho = 0.25$. Under financing, FDI occurs for $\rho \in [0.25, 0.43]$, and JV for all other values. In contrast, without financing, FDI dominates for all $\rho \in (0.45, 1]$.

![Figure 2a: M’s profits in Possibility 1 with financing](image-url)
In Example 1b, and Figure 2b, if \( F + G = 0 \), \( \hat{\rho}_{jv}^2 = 0.07 \), \( \rho_{jv} = 0.46 \), \( \rho_{fdi} = 0.28 \). Without financing, FDI occurs for all beliefs. With financing, FDI occurs for \( \rho \leq 0.15 \) and \( \rho \in [0.28, 0.61] \), JV otherwise.

Figure 2b: M’s profits in Possibility 2 with financing
**Example 3:** Assume $c_j = c_l = 2$, other parameters remaining unchanged. FDI dominates with and without financing constraints if fixed costs are zero.

![Graph showing profits]

**Figure 3:** Example 1a with zero technology transfer