Choosing between foreign direct investment and international subcontracting.

A model of a multinational firm’s decision in a context of moral hazard

Rosa Forte* and António Brandão†

Abstract

The present paper develops a moral hazard model applied to a multinational firm (MNF)’s decision between foreign direct investment (FDI) and international subcontracting. We compare the results of the moral hazard model, characterized by the fact that the MNF is not able to control operations performed by the subcontractor firm, with the traditional model, which considers symmetric information. We conclude that the uncertainty associated with the subcontractor firm’s behaviour, in spite of increasing the preference of the MNF to engage in FDI, does not change the optimal decision, which continues to be to subcontract. The exception occurs in the case that the subsidiary stands as more efficient than the subcontractor firm.

JEL Classification: D82, F23, L24

Keywords: Foreign direct investment, International subcontracting, Moral hazard

* CETE, Faculty of Economics - University of Porto. CETE - Research Center on Industrial, Labour and Managerial Economics - supported by Fundação para a Ciência e a Tecnologia, Programa de Financiamento Plurianual through the Programa Operacional Ciência, Tecnologia e Inovação (POCTI) of the Quadro Comunitário de Apoio III, which is financed by FEDER and Portuguese funds. E-mail: rforte@fep.up.pt

† CETE, Faculty of Economics - University of Porto. E-mail: abrandao@fep.up.pt pt
1 Introduction

Accepting that it is desirable for the multinational firm (MNF) that its production takes place in a foreign country, because, for example, it has lower wage costs, the MNF has to decide on the most appropriate form of production in that country, that is, on the international organization of that production. For two reasons, this article focuses on the choice between foreign direct investment (FDI) or subcontracting production to a foreign firm. First, these are two ways of organizing production which have been used with increasing frequency in the last twenty years. Second, the literature has paid scant attention to the problem of choosing between the two, especially in a more realistic context that involves asymmetric information.

FDI involves the full or partial ownership of production units in the foreign country, whereas subcontracting, taking a contractual form, consists of the means by which a domestic firm asks an outside firm to produce a specified product or component, for which it can supply the inputs and transfer technology and technical assistance to the producer (Webster et al., 1997). We follow Grossman and Helpman (2002), in that our definition of subcontracting or outsourcing means more than the simple buying of raw materials or goods (intermediate or final). It means finding a partner with whom the MNF can establish a bilateral relationship which is regulated by a contract.

Subcontracting may be domestic when both the units are in the same country; otherwise, it is international. As our interest lies in the choice between FDI and subcontracting as a way of organizing international production, we shall be addressing international subcontracting. In addition, our attention is centred on subcontracting for economic reasons (follow Webster et al.
This kind of subcontracting is used when it is possible to take advantage of lower costs by having certain tasks or operations carried out outside the firm, and according to Hibbert (1993) and Ford et al. (1993), seems to be widespread. Compared with other alternatives of foreign production, in particular FDI, subcontracting has the advantage of having lower production costs [Ford et al. (1993), Abraham and Taylor (1996), Vining and Globerman (1999)] but has the disadvantage of allowing to the MNF less (or no) control of the operations that it subcontracts, relying on the performance of the subcontractor firm, especially with respect to quality and delivery dates (Root, 1987).

Concerning the FDI, the kind of FDI relevant for comparison purposes is cost-oriented FDI, follow Young et al. (1989)’s classification. The main goal of this kind of FDI is to acquire goods at a low cost by taking advantage of plentiful labour, energy or other inputs; generally these goods are almost all exported to the domestic country or to third countries. Among the advantages of FDI, Root (1987) highlights the fact that it permits the firm to exploit its competitive advantages in the foreign market better, because it can control the production and marketing, possibilities not permitted by international subcontracting and other contractual agreements. However FDI has the disadvantage of requiring more resources (more capital, management, etc.), that is to say, there are high initial or start-up costs (Root, 1987). FDI may be achieved through a subsidiary or a joint venture. While the subsidiary involves the total (100%) holding of the firm abroad, joint ventures are about sharing assets, risks and profits with more than one firm having a stake in the ownership (the shares) of a firm. The total control conferred

---

1 Even though the relation between the subcontracting and subcontractor firms is defined by means of a contract, this legal document does not ensure that the partners conduct the stipulated activities with the same care and diligence that the firm itself would (Grossman and Helpman, 2002).
by a subsidiary allows the MNF to pursue its own strategy in the target country and obtain all the profits. This is the kind of FDI on which we are going to focus, and for this purpose we shall take it that the relation between the MNF and its subsidiary does not involve asymmetric information.

Apart from the possibility of the MNF’s subsidiary and the foreign contracted firm having different production costs, the two types of foreign production involve different levels of uncertainty, especially behavioural uncertainty, which have a positive effect on transaction costs. In fact, in the case of subcontracting, it is natural that the MNF fails to control / check the subcontractor’s actions, and so this relation involves asymmetric information (a moral hazard situation). We can thus consider that there is a certain uncertainty regarding the behaviour of a subcontractor firm, while the uncertainty relative to the behaviour of a subsidiary is minimal or non-existent, and so the transaction costs will be higher for subcontracting than for FDI. This paper therefore tries to explain the relative importance of the production costs and the transaction costs (arising from information asymmetry) in the choice between FDI and subcontracting.

This work is organized as follows. Section 2 consists of a brief literature review, looking at the importance of subcontracting and FDI in the world economy, the factors determining the choice between FDI and subcontracting, and some studies that model the MNF’s decision with regard to how to penetrate abroad, in a context of information asymmetry. In Section 3 we shall give the hypotheses for the model. In order to spotlight the effects of information asymmetry on the MNF’s choice between FDI and subcontracting, we shall start by describing the most straightforward case of symmetrical information, which means that the MNF can check the level of effort made by the subcontractor firm (Section 4). In Section 5 we tackle the choice of the MNF in a context of moral hazard, that is, the MNF fails to monitor the effort made by the
subcontractor. Section 6 compares the results obtained for information symmetry and the results of moral hazard. Finally, the main conclusions are set forth in Section 7.

2 Literature review

2.1 Evolution of the importance of subcontracting and FDI in the world economy

The growing integration of world markets through trade has led to the integration of the production process, where production or services carried out abroad are combined with the ones carried out at home (Feenstra, 1998). This idea is backed up by the 1998 WTO annual report: firms are more and more able to locate different components of their production process in several countries while keeping a single firm identity. In other words, firms can delegate some of their production processes to their subsidiaries (FDI) or to other firms abroad (subcontracting), and this in turn gives an additional stimulus to trade and means that goods are increasingly becoming “global” products.\(^2\)

Concerning the international subcontracting, we verify that firms, especially MNFs, have used subcontracting widely, not just in secondary activities of their chain of value, but in their principal activities, too, subcontracting a growing block of activities, from the design of the product to its assembly, from research and development to marketing, distribution and after-sales services. In other words subcontracting has become more generalized [Feenstra (1998), Vining

\(^2\) Tempest (1996), discussing the MNF Mattel’s production of the Barbie doll, notes that although the label says *Made in China*, Barbie is a global product. Graziani (2001) describes a similar situation, with respect to the textile and garment industry, illustrated by the case of Italy’s Benetton and America’s Levi. He mentions that some members of the business community have suggested that terms such as *Made in Italy* or *Made in the USA* are obsolete, and that it would be better to use the *Italian style* or the *American style.*
and Globerman (1999), UNCTAD (2002) and Grossman and Helpman (2002)]. Some firms have even become virtual manufacturers, keeping designs for various products, but producing hardly any (Grossman and Helpman, 2002).³

Relative to FDI, its growing importance is reflected in the values of international production as revealed by the evolution of two variables: the Gross Product of foreign subsidiaries and the Sales of foreign subsidiaries at World level, which have risen, according to UNCTAD (2004), more quickly than world GDP and world exports, respectively, which means that their respective importance has also grown.

### 2.2 The decision to make or buy: determining factors

The choice of international production organization, as is the case of choosing between ordering out a product (subcontracting the production of a good) or making it within the firm (through FDI), have been studied in the sphere of industrial organization literature, and two theories have been used: the neoclassical theory of the firm, and the transaction costs theory (Kulkarni and Heriot, 1999).

The neoclassical theory of the firm holds that choosing one or the other institutional format depends on the respective production costs. This theory sees a firm as a production function with various inputs. Production costs depend, therefore, on the cost of inputs and also on the state of the technology that converts inputs into outputs. The choice between subcontracting or FDI thus

³ According to UNCTAD (2002), the evolution of the electronic segment clearly exemplifies the growing use of subcontracting: in this segment, the global market in subcontracting has grown by about 140% between 1998 and 2002 (in 1998 it represented only 58 billion dollars, while in 2002 the figure was 130 billion dollars).
depends on the production costs underlying each of the forms of producing abroad. Bearing in mind that the literature identifies several factors that help subcontracting to have lower production costs than FDI, according to this theory there is no place for FDI, which contradicts the empirical data. The justification for FDI is therefore found in other factors, such as transaction costs. In this way, subcontracting can be pushed aside by FDI because it involves higher transaction costs, since the MNF cannot ascertain the behaviour of the firm it subcontracts. This theory has therefore been criticized for not considering the behaviour implications of the people involved in production.

When based on transaction costs theory (TCT), the choice is influenced by transaction costs (those associated with the transaction between the buyer and the seller). Applying this theory to the choice of organizational format of production induces the firm to choose, ceteris paribus, the organizational form that minimizes transaction costs. This theory, contrary to the neoclassical theory of firm, “(...) is built on a microanalytic framework with strong behavioral reality” (Klein et al., 1990, p. 197). The TCT aims to answer the question of make or buy from the cost point of view, with the transaction costs, such as, costs related with difficulties of negotiation between the buyer and the seller, and implementing and monitoring costs of the agreement between the parties, to have an important role. The latter are linked with checking problems which could arise from inadequate or ambiguous performance measurements, hidden information or moral hazards.

---

4 Concerning the decision to make or buy, Walker and Weber (1984)’ empirical study indicates that the transactions costs are significantly less important than the relative production costs. Park et al. (2000) also acknowledged that the cost of inputs is actually of fundamental importance: “One can easily observe that today’s large firms increasingly use outsourcing due to higher internal labour costs. The current penchant for increasing outsourcing by large firms in the US may be due to the interscale wage differentials between large and small firms” (Park et al., 2000, p. 90).
(Buvik and Anderson, 2002). Transaction costs are thus broadly influenced by some transaction parameters, such as the uncertainty surrounding the exchange of resources between buyer and seller (Kulkarni and Heriot, 1999). This uncertainty essentially concerns behavioural uncertainty, which is attributed to the tendency of the parties to display opportunistic behaviour, making it difficult to appraise the behaviour and actions of the other party involved in the transaction. Behavioural uncertainty leads to higher transaction costs, encouraging the firm to internalize its activities.

This approach is often confused in the literature with the internalization theory, with the use of the terms ‘transaction costs’ and ‘internalization costs’ being blurred [Hennart (1986), Cantwell (1991)]. In fact, the internalization theory can be regarded as the theory of transaction costs in a multinational firm.\(^5\) This has been the predominant theory in the analysis of choosing an institutional format.

### 2.3 Choosing the form of production organization when there is asymmetric information

In relation to studies that model the MNF decision on how to organize production abroad in a context of asymmetric information, Table 1 summarizes some of these studies, showing the level

---

\(^5\) As the literature unanimously recognizes (e.g. Cantwell (1991) and Buckley and Casson (1976)), the origin of the internalization theory goes back to Coase (1937), and to its theory of the firm, and Williamson (1979) was responsible for the reappearance of the concept and its introduction into the organization theory. It was Buckley and Casson (1976) who started to apply the concept of internalization to a MNF in a systematized manner when they suggested that an MNF would internalize its activities abroad (through FDI) if the internalization costs (internal organization costs like communication and administrative expenses) would work out cheaper than exporting or making another contractual arrangement.
of analysis (firm /general equilibrium), the form of organizing production analyzed, the type of information asymmetry portrayed and the goal of each study.

Table 1: Summary of studies on the form of production organization when there is asymmetric information

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Analysis level</th>
<th>Form of production organization</th>
<th>Type of information asymmetry</th>
<th>Goal of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horstmann &amp; Markusen (1987)</td>
<td>Firm</td>
<td>FDI vs licensing</td>
<td>Moral hazard</td>
<td>Exploring the influence of agency costs in choosing between the two modes of entry abroad</td>
</tr>
<tr>
<td>Balachandran &amp; Ronen (1989)</td>
<td>Firm</td>
<td>Subcontracting</td>
<td>Moral hazard with hidden information</td>
<td>Determining the optimum compensation function</td>
</tr>
<tr>
<td>Bhattacharyya &amp; Lafontaine (1995)</td>
<td>Firm</td>
<td>Franchising</td>
<td>Double-sided moral hazard</td>
<td>Determining the optimum compensation function</td>
</tr>
<tr>
<td>Horstmann &amp; Markusen (1996)</td>
<td>Firm</td>
<td>FDI vs licensing</td>
<td>Adverse selection</td>
<td>Exactly the same as their 1987 study</td>
</tr>
<tr>
<td>Choi (2001)</td>
<td>Firm</td>
<td>Licensing</td>
<td>Double-sided moral hazard</td>
<td>Determining the optimum contractual licensing (in terms of remuneration)</td>
</tr>
</tbody>
</table>

As we can see from Table 1, studies up to now have focused on the choice between FDI and licensing. Our work differs from these in that it looks at the choice between FDI and subcontracting. Furthermore, the kind of asymmetric information that we are going to deal with is not the same as that considered by Balachandran and Ronen (1989). Although they examined subcontracting, they did not make a choice between that and FDI, as we do here. The authors analyzed a situation of moral hazard with hidden information (the agent observes a random variable that affects the production costs before taking a decision on production). In other words, asymmetric information arises from the fact that the principal does not see the accomplishment of the state of the nature, and so he does not know whether the effort made (that which he could see) was good enough or not. Our work, however, looks at the moral hazard situation resulting from the fact that the principal cannot monitor the effort made by the subcontractor firm. Contrary to
Grosman and Helpman (2003), who studied the organization of the firm in a context of general equilibrium, and of industry, our work focuses on the bilateral relation between a single producer and a potential supplier, as does most of the literature in this area (albeit of conceptual nature, contrary to our work).

3 Hypotheses regarding the model for the choice of the organization production format

The basic framework used is the principal-agent model (Ross, 1973). This means that we assume that the relation between the MNF and its subsidiary (in the case of FDI) and the relation between the MNF and the local firm (in the case of subcontracting) is materialized by concluding a contract: there is a bilateral relation in which the MNF (principal or contractor) hires the other party (the agent or contractee) to carry out a particular action (in this case to produce a particular good) in the interest of the MNF. As with most of the literature in this area, this approach analyzes the issue of choosing the format for organizing production from the point of view of cost: production cost (as long as we consider the subsidiary of the MNF and the local firm have different production costs) and transaction cost (especially the agency costs arising from contracting under asymmetric information).

In order to construct a mathematically treatable model that is centred on the essential questions considered here, we have to accept certain hypotheses. First, we admit that the good is going to be sold in an international competitive market at price $P$. Second, output is a function $q(\theta, \varepsilon)$ of the state of the nature, the random variable $\theta$, and the effort ($\varepsilon$) of the agent that produces the final good (the subsidiary of the MNF, represented by $f$ or the local agent, subcontractor,
represented by \( s \). We assume that the production function takes the following expression:

\[ q = \varepsilon + \theta \cdot \varepsilon \]  

Along with Barros and Macho-Stadler (1998, p. 91), \( \theta \) can be interpreted as a stochastic productivity parameter, reflecting the state of nature, while the effort \( \varepsilon \) represents a productive input. Note that, if this random element did not exist, the problem of asymmetric information would not exist, since observation of the result would show the effort made, to the extent that it is accepted that the MNF knows the objective function of the outside firm.

Furthermore, we admit that the nature only assumes two possible states \((j=B,M)\): on good and one bad, respectively represented by \( \theta_B \) and \( \theta_M \) with \( \theta_B > \theta_M \) (\( \theta_B \) represents greater productivity while \( \theta_M \) represents lower productivity). Concerning the agent, we assume that he only chooses between two levels of effort: high effort, represented by \( \varepsilon_H \), and low effort, represented by \( \varepsilon_L \). The probabilities of result \( j \) occurring \((j=B,M)\), given the level of effort \( e \), are as follows:

<table>
<thead>
<tr>
<th></th>
<th>High effort</th>
<th>Low effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Pr(q=q_B</td>
<td>\varepsilon_H) ) = ( \rho_B</td>
<td>\varepsilon_H ) = ( \rho_H )</td>
</tr>
<tr>
<td>( \Pr(q=q_M</td>
<td>\varepsilon_H) = \rho_M</td>
<td>\varepsilon_H = 1- \rho_H )</td>
</tr>
</tbody>
</table>

We naturally assume that the probability of getting a good result is greater if the agent makes a high effort than if he makes a low effort, and therefore, \( \Pr(q=q_B | \varepsilon_H) > \Pr(q=q_B | \varepsilon_L) \), which means that \( \rho_L > \rho_H \).

Given that there is uncertainty, we need to consider how the multinational and the agent react to the risk. Preferences relative to risk are expressed by the respective utility functions. In relation to

---

6 The principal is interested in that the agent makes a high level of effort as long as the expected profit is greater than what would be obtained with low effort and low remuneration.
the MNF, it receives production $q$ (the result) which it sells at price $P$ and has to pay the agent remuneration $w$. Furthermore, the establishment of a subsidiary in a foreign country requires a fixed cost for period, $F_i$, representing various administrative and overhead costs. The MNF’s behaviour depends on the following function, which reflects its profit function:

$$\pi_{MNE}(q,w^i) = Pq - w^i - F^i, i = f, s$$

(1)

With

$$F^i = \begin{cases} F, & \text{if } i = f \\ 0, & \text{if } i = s \end{cases}$$

(2)

Function $\pi(q)$ is increasing ($\pi' > 0$) and concave (although not strictly).\(^7\) Once $\pi' = 0$, the MNF is risk neutral.

With respect to the agent, he receives the remuneration $w$ for his participation in the relationship, and makes a certain level of effort that entails some costs for him. We accept that the agent’s behaviour is reflected in the following profit function:

$$\Pi^i(w, \varepsilon) = u^i(w) - d^i(\varepsilon), i = f, s$$

(3)

The above function shows that the agent’s profit depends on his remuneration and on the effort. Concerning the remuneration, the larger it is the greater the profit ($u' > 0$). In addition, we admit that the agent is risk averse, that is, $u'(w)$ is concave in $w$ ($u'' < 0$).\(^8\) We are thus going to accept

---

\(^7\) Note that $\pi(q)$ is a linear function, and therefore a concave function, but not in a strict sense (Chiang, 1984).

\(^8\) Note that we are assuming that the MNF is risk neutral whereas the agent is averse to the extent that, according to Salanié (2002), this is the most natural hypothesis. In fact, we could assume that the MNF is facing several
the following functional form: \( u^i(w) = \sqrt{w^i} \).\(^9\) Regarding the disutility of effort, \( d^i(\varepsilon) \), it is taken that greater effort means greater disutility (\( d^i(\varepsilon) > 0 \)), and that marginal disutility of effort is non-decreasing (\( d^{ii}(\varepsilon) \geq 0 \)). This disutility of effort may be interpreted as the agent’s production costs.

Along with Das (1999) we accept the following functions, \( d^i(\varepsilon) = \frac{\varepsilon^2}{2} \) and \( d^f(\varepsilon) = \frac{\varepsilon^2}{2b} \), \( b > 0 \), for the local firm (subcontractor) and the subsidiary, respectively. This means that to achieve a certain level of effort, the agent incurs in quadratic costs. If \( 0 < b < 1 \), the local firm is more efficient than the MNF’s subsidiary; if \( b = 1 \), the subsidiary is as efficient as the local agent and if \( b > 1 \) then the subsidiary is more efficient than the local firm.\(^10\)

Finally, we accept that the agent is prepared to carry out the desired task for the multinational as long as the profit obtained is at least the same as that it could obtain in its best alternative opportunity (known as the reservation utility level), which in this work we take to be zero.

4 Base model: symmetric information

4.1 General considerations

If there is symmetric information, that is, if both parties in the contractual relation (MNF and agent) have access to the same information, and assuming that the MNF is risk neutral and the independent risks and can therefore spread the risks associated with his relation with the agent. But the agent is normally risk averse since being “small” he finds more difficult to spread the risks.

\(^9\) This functional form is essentially used for mathematical questions. Other forms have in fact been tried, in particular the logarithmic, but their mathematical treatment has been quite difficult.

\(^10\) Ford et al. (1993), Abraham and Taylor (1996), Vining and Globerman (1999) indicate various factors that help the local firm to be more efficient than the subsidiary.
agent is risk averse, the optimum payments scheme consists of offering the agent a fixed remuneration, regardless of the result or output obtained. In fact, as long as the MNF can monitor the agent’s effort, it can deduce the desired effort level, specifying $\varepsilon = \varepsilon^*$ in the contract, and fixing $w(\varepsilon^*)=w^*$. Under symmetric information the optimum contract is a forcing contract, which establishes $w(\varepsilon^*)=w^*$ and $w(\varepsilon \neq \varepsilon^*)=0$, which represents a strong incentive for the agent to choose $\varepsilon = \varepsilon^*$.

Bearing in mind that we accept the existence of uncertainty regarding the nature state, the MNF’s objective function is the expected profit. Furthermore, and considering that we admit that the agent only chooses between two levels of effort, the problem for the MNF consists of determining, for each of these levels, the wages that maximizes its expected profit, subject to the restriction that the subsidiary / local firm (subcontractor) accepts the contract. It then chooses the contract that will allow it to obtain the greatest expected profit – $(w_H, \varepsilon_H)$ or $(w_L, \varepsilon_L)$. Note, however, that the problem of information asymmetry only arises if, under symmetry, asking for higher effort yields more profit than low effort. Thus, for the issue of asymmetric information to be of interest, we have to impose the constraint that the contract $(w_H, \varepsilon_H)$ is better than contract $(w_L, \varepsilon_L)$.

4.2 Direct investment versus subcontracting

To find the optimum contract to offer to its subsidiary, the MNF has to resolve the following maximization problem:

---

11 See Macho-Stadler and Pérez-Castrillo (1997) for the proof of this aspect.

12 This means that when the principal is risk neutral the optimum risk distribution consists of the MNF accepting all the risk, with the agent accepting a fixed salary in all eventualities (no matter the nature state).
\[
\begin{align*}
\text{Max } E[\pi_{MNE}]^{FDI}_{w_e} &= (\rho_B|e_e)P(e_e + \theta_B) + (\rho_M|e_e)P(e_e + \theta_M) - w_e^f - F, \ e = H, L \\
\text{subject to (s.t.)} \\
\Pi^f = u^f(w_e^f) - d^f(e_e) \geq 0, \ e = H, L. 
\end{align*}
\]

The condition (4) represents the agent’s participation constraint or individual rationality condition, meaning that the agent would accept the contract if it gave him at least the reservation utility that, as we have just mentioned, is taken to be zero. In the case being examined here, the subsidiary would produce the good if this did not result in losses (its revenues would have to cover all its costs).

The Lagrangean for this problem is given below:

\[
L = (\rho_B|e_e)P(e_e + \theta_B) + (\rho_M|e_e)P(e_e + \theta_M) - w_e^f - F + \lambda \left[ \sqrt{w_e^f - \frac{e_e^2}{2b}} \right], \ e = H, L. 
\]

As Macho-Stadler and Pérez-Castrilo (1997, p. 22) show, the participation constraint (4) is active, that is, it is satisfied in equality (the associated Lagrange multiplier, \( \lambda \), is strictly positive).\(^{13} \)

In this way we can find the optimum wage, which depends on the effort required:

\[
\sqrt{w_e^f - \frac{e_e^2}{2b}} = 0, \ e = H, L. 
\]

\(^{13} \) In fact, calculating the Lagrangean derivative relative to \( w_e^f \) we have: \( \frac{dL}{dw_e^f} = -1 + \lambda \frac{1}{2\sqrt{w_e^f}} \). Making this derivative equal to zero, we get: \( \lambda = 2\sqrt{w_e^f} \), which is positive.
And so, bearing in mind the two levels of effort, and the hypothesis that $e_L = k e_H$, we get the following wages, for high and low effort, respectively:

\[
\begin{align*}
W_H^f &= \frac{1}{4} \frac{\varepsilon_H}{b^2}; \\
W_L^f &= \frac{1}{4} \frac{k^4 \varepsilon_H}{b^2}.
\end{align*}
\]  
\(5\)

To determine what contract the MNF ought to offer to its subsidiary, we need to calculate the expected profit for the MNF in the two situations. With high effort, therefore:

\[
E[\pi_{MNE}(e_H)]^{FDI} = \rho_H P(e_H + \theta_B) + (1 - \rho_H) P(e_H + \theta_M) - \frac{1}{4} \frac{\varepsilon_H}{b^2} - F
\]  
\(6\)

With low effort:

\[
E[\pi_{MNE}(e_L)]^{FDI} = \rho_L P(k e_H + \theta_B) + (1 - \rho_L) P(k e_H + \theta_M) - \frac{1}{4} \frac{k^4 \varepsilon_H}{b^2} - F
\]  
\(7\)

The MNF will offer to its subsidiary the contract $\left(e_H, W_H^f\right)$ if the profit resulting from this is higher than that which would be yielded by the contract $\left(e_L, W_L^f\right)$, that is, if:

\[
\Delta E[\pi_{MNF}]^{FDI} = E[\pi_{MNF}(e_H)]^{FDI} - E[\pi_{MNF}(e_L)]^{FDI} > 0.
\]

Considering $\theta_B - \theta_M = \theta$ and $\rho_H - \rho_L = \rho$, then, bearing in mind expressions (6) and (7), after simplification we get:

\[
\Delta E[\pi_{MNF}]^{FDI} = \frac{4 \rho P b^2 \theta + 4 P b^2 \varepsilon_H (1 - k) + (k^4 - 1) \varepsilon_H}{4 b^2}.
\]  
\(8\)

The preceding expression achieves a maximum, positive, for the following value of $\varepsilon_H$:

\[
\varepsilon_H = \sqrt{\frac{P b^2}{k^3 + 2 k^2 + 3 k + 1}}
\]
We may thus conclude that the condition $\Delta E[\pi_{MNF}]^{FDL} > 0$ is satisfied, that is, the MNF would offer $(\varepsilon_H, w_H^{s})$, as long as the following condition is met:\footnote{For more details on how we arrive at this condition, see Section 1 of the Appendix.}

$$0 < \varepsilon_H \leq \frac{Pb^2}{k^3+k^2+k+1} \quad \text{(9)}$$

If the MNF wants to subcontract the production of the good to an outside firm, it will have to resolve the following maximization problem:

$$\max_{w^s_s} E[\pi_{MNF}]^{SUB} = (\rho_B \varepsilon) P(\varepsilon + \theta_B) + (\rho_M \varepsilon) P(\varepsilon + \theta_M) - w^s_s, \quad e = H, L$$

s.t.

$$\Pi^s = u^s(w^s_s) - d^s(\varepsilon_s) \geq 0, \quad e = H, L.$$

The Lagrangean relative to this problem is:

$$L = \rho_B \varepsilon P(\varepsilon + \theta_B) + \rho_M \varepsilon P(\varepsilon + \theta_M) - w^s_s + \lambda \left[ \sqrt{w^s_s} - \frac{\varepsilon^2_s}{2} \right], \quad e = H, L$$

In this case, and bearing in mind that the participation constraint is active, as shown earlier, we have:

$$\sqrt{w^s_s} - \frac{\varepsilon^2_s}{2}, \quad e = H, L$$

And so, considering the two levels of effort, and that $\varepsilon_L = k \varepsilon_H$, we have the following wages for high and low effort, respectively:

$$\left( w^s_H = \frac{k^4 \varepsilon_H^4}{4}; w^s_L = \frac{k^4 \varepsilon_H^4}{4} \right) \quad \text{(10)}$$
That is, the MNF can offer the contract \((e_H,w_H)\) or \((e_L,w_L)\), depending on the respective expected profits. With high effort \((e_H)\) the expected profit for the MNF is:

\[
E[\pi_{MNF}(e_H)]^{SUB} = \rho_H P(e_H + \theta_B) + (1 - \rho_H)P(e_H + \theta_M) - \frac{1}{4}e_H^4
\] (11)

With low effort \((e_L)\), the MNF would expect the following profit:

\[
E[\pi_{MNF}(e_L)]^{SUB} = \rho_L P(e_L + \theta_B) + (1 - \rho_L)P(e_L + \theta_M) - \frac{1}{4}e_L^4
\] (12)

As with the FDI option, the MNF would offer the contract \((e_H,w_H)\) if the expected profit from it would be higher than that conferred by the contract \((e_L,w_L)\), that is, if:

\[
\Delta E[\pi_{MNF}]^{SUB} = E[\pi_{MNF}(e_H)]^{SUB} - E[\pi_{MNF}(e_L)]^{SUB} > 0.
\]

Considering \(\theta_B - \theta_M = \theta\) and \(\rho_H - \rho_L = \rho\) and accepting that \(e_L = k e_H\), then, bearing in mind expressions (11) and (12), after simplification we get:

\[
\Delta E[\pi_{MNF}]^{SUB} = \rho P\theta + P e_H(1 - k) + \frac{1}{4}e_H^4(k^4 - 1).
\] (13)

The above expression reaches a maximum, positive, for the following value of \(e_H\):

\[
e_H = \sqrt[k^3+5k^2+8k+1]{\frac{\rho}{P}}.
\]

We can thus conclude that \(\Delta E[\pi_{MNF}]^{SUB} > 0\) is met, that is, the MNF would offer \((e_H,w_H)\), as long as the following condition is found:\textsuperscript{15}

\[
0 < e_H \leq \sqrt[k^3+5k^2+8k+1]{\frac{p}{k^3+5k^2+8k+1}}.
\] (14)

\textsuperscript{15} For more details about how we arrived at this condition, see Section 2 of the Appendix.
Comparing conditions (14) and (9) for its upper limit, we ascertain that:

$$\frac{P}{k^{3}+k^{2}+k+1} - \frac{pb^{3}}{k^{3}+k^{2}+k+1} = \left(1 - b^{3}\right) \sqrt[3]{\frac{P}{k^{3}+k^{2}+k+1}}.$$

The preceding expression will take a positive or negative value, according to the value of $b$. If $b<1$, which happens if the local firm is more efficient than the MNF’s subsidiary, the multinational could require greater effort of the subcontractor firm (the preceding expression takes a positive value). If $b>1$, that is, if the subsidiary is more efficient than the subcontractor firm, the MNF may require greater effort of the subsidiary. That is, the MNF could ask for greater effort from the most efficient firm.

Bearing in mind that the MNF wants to decide whether to make FDI or subcontract the production of the good, its decision will be taken based on the comparison of expected profit in each of the alternatives in the high effort situation. Therefore, assuming that the two constraints given for conditions (9) and (14) are met, that is, that the MNF would offer the contract $\left(\varepsilon_{H}, w_{H}^{f}\right)$ and $\left(\varepsilon_{H}, w_{H}^{s}\right)$ respectively to the subsidiary and the outside firm, we can compare the MNF’s expected profit in the FDI situation, given by equation (6), with the expected profit in the MNF subcontracting situation, given by equation (11). We thus find the difference in expected profit resulting from the two options, which we term $\Delta E[\pi_{MNF}]_{sl}$, and which, after simplification, equals the following expression:

$$\Delta E[\pi_{MNF}]_{sl} = \frac{\varepsilon_{H}}{4} \left(1 - \frac{1}{b^{2}}\right) - F.$$

(15)

Analyzing expression (15), we find the following conclusions. First, if $0<b<1$ (local firm more efficient than the MNF’s subsidiary), then $1 - \frac{1}{b^{2}} < 0$ and, therefore, $\Delta E[\pi_{MNF}]_{sl} < 0$, so that it is
preferable to subcontract. Second, if the subsidiary is as efficient as the local agent \((b=1)\) the subcontracting remains preferable since \(\Delta E[\pi_{\text{MNF}}]_{SI} = -F\). In other words, as long as the production costs are identical, the FDI has the drawback of requiring a fixed cost per period, and so subcontracting is always preferable to FDI, unless the fixed costs are null (in which case it would be indifferent investing directly or subcontracting).\(^{16}\) In this situation, only changes in the fixed costs per periods required by the FDI have impact on the difference in expected profits between FDI and subcontracting. The FDI may be preferable to subcontracting if the subsidiary is more efficient than the outside firms, that is, if \(b>1\). For the case under study here, FDI would only be desirable if \(b > 1\). This shows that given the level of effort, the greater the fixed costs per period required by direct investment, the greater should be the relative efficiency of the subsidiary in order to the alternative FDI can be chosen.

An increase in the efficiency of the subsidiary increases preference for FDI, while an increase in fixed costs reduces this preference. The respective derivates in fact prove these conclusions, since

\[
\frac{d\Delta E[\pi_{\text{MNF}}]_{SI}}{db} = \frac{1}{2} \frac{\epsilon_H^4}{b^3} > 0 \quad \text{and} \quad \frac{d\Delta E[\pi_{\text{MNF}}]_{SI}}{dF} = -1 < 0
\]

In relation to \(\epsilon_H\), its influence on the difference in expected profits between the two strategies is not clear, and depends on the value of \(b\). In fact,

\[
\frac{d\Delta E[\pi_{\text{MNF}}]_{SI}}{d\epsilon_H} = \epsilon_H^3 \left( 1 - \frac{1}{b^2} \right).
\]

Thus, if \(b>1\) (subsidiary is more efficient) the effect is positive, whereas if \(b<1\) (outside firm is more efficient), the effect is negative.

\(^{16}\) FDI could become the preferred situation if, theoretically, we were to admit that the foreign country’s Government would give a subsidy for a period of time equal to or greater than \(F\), with the aim of attracting the MNF’s investment.

\(^{17}\) This value was obtained by making \(\Delta E[\pi_{\text{MNF}}]_{SI}\) equal to zero. This condition imposes \(\epsilon_H > \left( 4F \right)^{\frac{1}{3}}\) such that we get a real solution for \(b\).
To sum up, under symmetric information production costs (reflected in parameter $b$), the effort level (which influences the amount produced) and fixed costs are the determining factors of the choice between FDI and subcontracting. Engaging on FDI means that the MNF’s subsidiary has to be considerably more efficient than the outside firm (to offset the fixed costs required by FDI) and that the level of effort should not be too low (so that the fixed costs are diluted in the greater quantity produced). But as we shall see in the next Section, the introduction of asymmetric information in the relation introduces another route by which direct investment may be preferable to subcontracting.

5 **Asymmetric information: the problem of moral hazard in a subcontracting relation**

5.1 **General considerations**

A moral hazard problem exists when the MNF (principal) fails to directly observe the action or effort of the subcontractor firm (agent), and is thus unable to wholly control its action, or, even when it can observe this action, it is impossible for the MNF to know whether or not it was the best effort decision.\(^{18}\) In this paper we focus on the first kind of asymmetric information. The problem of moral hazard only occurs in the relation of the MNF with the local firm since, as mentioned above, one of the advantages of FDI, in particular when it involves holding all the capital of the subsidiary, concerns the control it confers over the foreign operations. This is in contrast with the reduction in the level of control (of absence of) provided by the contractual forms of organizing production, such as subcontracting.

\(^{18}\) This type of asymmetry is called moral hazard with hidden information.
The classic way to model a moral hazard problem consists of considering that as long as the
effort made by the subcontractor firm is not checkable it cannot be explicitly included in the
contract terms. But the MNF does observe the output \( q \) which is at least partly determined by the
actions of the subcontractor firm. So that the contract can influence the subcontractor firm’s
behaviour, the MNF should offer a payment system based on the result, that is, the multinational
should define a remuneration scheme \( w(q) \) to encourage the subcontractor firm to carry out the
better action, from the MNF’s point of view (level of effort desired). The MNF’s problem is thus
that of choosing the function \( w(q) \) that maximizes its expected profit, subject to constraints
imposed for the optimized behaviour of the subcontractor firm.

5.2 Determining the optimum contract

As mentioned above, in a moral hazard situation (\( MH \)), the multinational should define a
remuneration scheme that depends on the results, that is: \( w_B^* = w(q_B) \) and \( w_M^* = w(q_M) \). To define
this menu of wages, the MNF has to resolve the following maximization problem, accepting that
it is trying to obtain a high effort on the part of the subcontractor firm:

\[
Max_{w_B, w_M} E[\pi_{MNF}]^{SUB}_{MH} = \rho_H (Pq_B - w_B^*) + (1 - \rho_H) (Pq_M - w_M^*)
\]

s.t.

\[
\rho_H \sqrt{w_B^*} + (1 - \rho_H) \sqrt{w_M^*} - \frac{\epsilon_H^2}{2} \geq 0
\] (16)

and

\[
\rho_H \sqrt{w_B^*} + (1 - \rho_H) \sqrt{w_M^*} - \frac{\epsilon_H^2}{2} \geq \rho_L \sqrt{w_B^*} + (1 - \rho_L) \sqrt{w_M^*} - \frac{\epsilon_L^2}{2}
\] (17)
Condition (16) represents the participation constraint on the outside firm, subcontractor, while condition (17) represents the incentive compatibility constraint or incentive restriction. This ensures that the subcontractor obtains a greater expected profit if it makes a high effort than if it makes a low effort.

The Lagrangean for this problem is:

\[
L = \rho_H (Pq_B - w_B^H) + (1 - \rho_H) (Pq_M - w_M^H) + \lambda \left( \rho_H \sqrt{w_B^M} + (1 - \rho_H) \sqrt{w_M^M} - \frac{\epsilon_H^2}{2} \right) + \\
\mu \left( \rho_H \sqrt{w_B^M} + (1 - \rho_H) \sqrt{w_M^M} - \frac{\epsilon_H^2}{2} - \rho_L \sqrt{w_B^H} - (1 - \rho_L) \sqrt{w_M^H} - \frac{\epsilon_L^2}{2} \right)
\]

As Macho-Stadler and Pérez-Castrillo (1997, p. 44) show, both the participation constraint and the incentive restriction are satisfied in equality, that is, they are active since the associated multipliers are strictly positive (\( \lambda > 0 \) and \( \mu > 0 \)). The optimum contract is therefore determined by the two following equations:

\[
\begin{align*}
\rho_H \sqrt{w_B^M} + (1 - \rho_H) \sqrt{w_M^M} - \frac{\epsilon_H^2}{2} &= 0 \\
\rho_H \sqrt{w_B^H} + (1 - \rho_H) \sqrt{w_M^H} - \frac{\epsilon_L^2}{2} &= \rho_L \sqrt{w_B^H} + (1 - \rho_L) \sqrt{w_M^H} - \frac{\epsilon_L^2}{2}
\end{align*}
\]

The resolution of the above system gives the following menu of wages:

\[
(w_B^H, w_M^H) = \left( \left( \frac{\epsilon_H^2 + \rho \epsilon_H^2 - \epsilon_L^2 \rho_H - \epsilon_L^2}{2(\rho_H - \rho_L)} \right)^2, \left( \frac{\rho \epsilon_H^2 - \epsilon_L^2 \rho_H}{2(\rho_H - \rho_L)} \right)^2 \right).
\]

This restriction reflects the problem of moral hazard: once the contract is signed, and since the agent’s effort cannot be checked, he will choose the level of effort that maximizes his objective function. In other words, given the scheme of incentives chosen by the MNF, the subcontractor firm will choose the action most beneficial to him.
Bearing in mind the hypothesis that $\varepsilon_L = k\varepsilon_H$, we then have the following salary menu:

$$(w^*_B, w^*_M) = \left( \frac{1}{4} \varepsilon_H^4 \left( \frac{k^2 + \rho_H - k^2 \rho_H - 1}{-\rho_H + \rho_L} \right)^2, \frac{1}{4} \varepsilon_H^4 \left( \frac{\rho_H - k^2 \rho_H}{-\rho_H + \rho_L} \right)^2 \right). \tag{19}$$

But it should be noted that this solution is only actually optimum if it is better than offering the lowest wage $\left( w^*_B = \frac{1}{4} \varepsilon_H^4 \right)$, which induces the lowest effort ($\varepsilon_L$), which is to say, the associated expected profits, represented by $E[\pi_{MNF}^{SUB}]_{M_H}$, have to be higher than those given by equation (12).

We thus have the following condition that imposes further constraints on the parameters:

$$\Delta E[\pi_{MNF}^{SUB}]_{M_H} = E[\pi_{MNF}^{SUB}]_{M_H} - E[\pi_{MNF}(\varepsilon_L)]^{SUB} > 0.$$  

In relation to the MNF’s expected profit yielded by subcontracting in a moral hazard situation, we find that:

$$E[\pi_{MNF}^{SUB}]_{M_H} = \rho_H (Pq_B - w^*_B) + (1 - \rho_H) (Pq_M - w^*_M).$$

Bearing in mind the menu of wages given by (18) and that $q_B = \varepsilon_H + \theta_B$ and $q_M = \varepsilon_H + \theta_M$, after simplification we have:

$$E[\pi_{MNF}^{SUB}]_{M_H} = \rho_H p (\theta_B - \theta_M) + \rho_H (Pq_H - \theta_M) - \rho_H \left( \frac{\rho_H \varepsilon_H (\varepsilon_H - \varepsilon_H) (\varepsilon_H - \varepsilon_H)}{2(\rho_H - \rho_L)} \right)^2 - (1 - \rho_H) \left( \frac{\rho_H \varepsilon_H (\varepsilon_H - \varepsilon_H)}{2(\rho_H - \rho_L)} \right)^2 \tag{20}$$

Taking $\theta_B - \theta_M = \theta$, $\rho_H - \rho_L = \rho$ and $\varepsilon_L = k\varepsilon_H$, then, bearing in mind expressions (20) and (12),

$$\Delta E[\pi_{MNF}^{SUB}]_{M_H},$$

after simplification, becomes the following:

$$\Delta E[\pi_{MNF}^{SUB}]_{M_H} = P(\varepsilon_H + \rho \theta - k\varepsilon_H) + \frac{k^4 \varepsilon_H^2 (\rho^2 + \rho_H - \rho_H)}{4\rho^2} + \frac{2\rho_H \varepsilon_H^2 (1 - \rho_H)^2 + \rho_H (2\rho_H - \rho_H - \rho_H)}{4\rho^2} \tag{21}$$

The preceding expression should take a positive value so that the asymmetric information problem is of interest. Otherwise, it would be better to only pay the wage that covers the disutility of the
low effort, that is, to offer the symmetry contract \((\varepsilon_L, w^L_i)\). Expression (21) reaches a positive maximum for the following value of \(\varepsilon_H\):

\[
\varepsilon_H = \frac{Pp^2}{(k+1)(\rho^2(k^2+1)+\rho_H(k^2-1))}
\]

We can thus conclude that condition \(\Delta E[\pi_{MNF}]_{MH}^{SUB} > 0\) is satisfied, that is, the MNF will offer the menu of wages \((w^f, w^s)\), as long as the following condition is found.\(^{20}\)

\[
0 < \varepsilon_H \leq \frac{Pp^2}{(k+1)(\rho^2(k^2+1)+\rho_H(k^2-1))}
\]

(22)

Condition (22) restricts the values of \(\varepsilon_H\) that are relevant for analyzing the moral hazard problem.

Since the MNF wants to decide whether to make FDI or to subcontract production of the good to a local firm, its decision will be taken by comparing expected profits in each of the alternatives.

5.3 FDI versus subcontracting

Considering that \(\varepsilon_L = k\varepsilon_H\) and comparing equations (6) and (20), which gives us \(E[\pi_{MNF}(\varepsilon_H)]^{FDI}\) and \(E[\pi_{MNF}]^{SUB}_{MH}\), respectively, we get the difference between the expected profit from FDI and the expected profit from subcontracting in a moral hazard situation, which is, after simplifying, equal to \(\Delta E[\pi_{MNF}]_{MH}\). Thus:

\[
\Delta E[\pi_{MNF}]_{MH} = \frac{2\varepsilon^2_{MNF}(1-b^2)-(\varepsilon_H^2+\varepsilon^2_H)(4Fb^2+\varepsilon_H^2)}{4b^2(-\rho_H+\rho_L)^2} + \frac{8F\rho_H\rho_L^2+\rho_H^2(k^2-\rho_H^2)(2-k^2)+2(\rho_H+\rho_L^2)}{4(-\rho_H+\rho_L)^2}
\]

(23)

\(^{20}\) For more details on how we arrive at this condition, see Section 3 in the Appendix.
As happens with symmetric information, we find that the difference between the expected profit given by FDI and that expected from subcontracting in a moral hazard situation, given by equation (23), is greater as $b$ is greater and $F$ is smaller. In other words, the preference for FDI is still greater the greater the subsidiary’s efficiency and the lower the fixed costs. In fact, calculating the respective derivates, we find that \[ \frac{d\Delta \pi_{\text{MNF}}}{db} \bigg|_{\text{MHL}} = \frac{1}{2} \frac{\epsilon_H^4}{b^3} > 0 \] and \[ \frac{d\Delta \pi_{\text{MNF}}}{dF} \bigg|_{\text{MHL}} = -1 < 0 \].

Contrary to what happens in symmetric information, where, for $b = 1$, only changes in fixed costs lead to changes in the FDI preference, in the moral hazard situation it is found that changes in the probability of each of the nature states occurring (given the effort level) and changes in the level of low or high effort influence this preference. Thus, in relation to these parameters, we find that an increase in the low effort level reduces preference for FDI. In fact, \[ \frac{d\Delta \pi_{\text{MNF}}}{d\epsilon_L} \bigg|_{\text{MHL}} = -\rho_L \epsilon_L (\rho_H - 1) \frac{\epsilon_L^2 - \epsilon_H^2}{(\rho_L - \rho_H)^2} < 0 \]. An increase in the probability that a good state will occur, given the low effort, increases preference for FDI since \[ \frac{d\Delta \pi_{\text{MNF}}}{d\rho_L} \bigg|_{\text{MHL}} = \frac{1}{2} \rho_L \epsilon_L^4 \frac{(\rho_H - 1)(k^2 - 1)^2}{(\rho_L - \rho_H)^3} > 0 \]. Additionally, an increase in the probability that a good state will occur, given the high effort level, reduces the preference for FDI once \[ \frac{d\Delta \pi_{\text{MNF}}}{d\rho_H} \bigg|_{\text{MHL}} = \frac{1}{4} \frac{\epsilon_H^4 (2 \rho_H \rho_L - \rho_H - \rho_L)(k^2 - 1)^2}{(\rho_L + \rho_H)^3} < 0 \]. The effect of an increase in the level of high

\[ b = \frac{(\rho_H - \rho_L) \epsilon_H^2}{\sqrt{(\rho_H - \rho_L)^2 (\epsilon_H^4 - 4F) - \epsilon_H^4 (\rho_H - \rho_L)(k^2 - 1)^2}}. \]
effort on the choice of the MNF is not, at the outset, clear, inasmuch as the value of the respective derivative can take a different sign according to the values of the parameters. In fact:

\[
\frac{d \Delta E[\pi_{MNF}]_{MH}}{d H} = E_H^3 \left[ 1 - \frac{1}{b^2} + \frac{\rho_H \left( k^2 - 1 \right)}{(-\rho_H + \rho_L)^2} \right] \geq 0.
\]

If \( b > 1 \), the above derivative takes a positive value, showing that an increase in the level of high effort leads to an increase in the preference for FDI. If \( 0 < b < 1 \), the final effect also depends on the value of \( k \) and on the probability of the good state occurring, given the level of high effort (\( \rho_H \)), and given the level of reduced effort (\( \rho_L \)).

For us to draw conclusions on the effects of asymmetric information on the choice between FDI and subcontracting, we will compare the base situation in symmetric information with the moral hazard situation.

### 6 Symmetric information versus moral hazard

Comparing the expected profits from subcontracting under symmetric information, given by equation (11), and in moral hazard, given by equation (20), we find that:

\[
\Delta E[\pi_{MNF}]^{SUB} = E[\pi_{MNF}(H)]^{SUB} - E[\pi_{MNF}]_{MH}^{SUB} = \frac{1}{4} \rho_H \frac{(e_H - e_L)^2 (\rho_H - 1)}{(\rho_H - \rho_L)^2}.
\]

Equation (24) takes a positive value. The expected profit from subcontracting is greater under symmetric information than in the moral hazard situation. There is a difference in expected profits in the two situations because of the additional constraint (incentive restriction) imposed on the maximization of profits. This constraint has a positive multiplier (\( \mu > 0 \)), which leads to a reduction in the maximum profits associated because asymmetric information leads to an increase
in remuneration for the subcontractor firm, so as to ensure that it carries out the high level of effort. In this way, the problem of moral hazard implies a cost for the relation, especially for the MNF (agency costs).

As the above explanation shows, asymmetric information penalizes the subcontracting option. And so it is more likely that the MNF will opt for FDI, which means that the value assumed by expression (23) is greater than the value assumed by expression (15), in other words,

\[
\Delta E[\pi_{MNF}] = \Delta E[\pi_{MNF}]_{MH} - \Delta E[\pi_{MNF}]_{SI} > 0,
\]

as demonstrated below.

\[
\Delta E[\pi_{MNF}] = \rho_H \left( \frac{\left( \varepsilon_H^* + \rho_L \varepsilon_H^* - \rho_H \varepsilon_H^* - \varepsilon_H^* \right)}{2(\rho_H - \rho_L)} \right)^2 \left( 1 - \rho_H \right) \left( \frac{\left( \rho_L \varepsilon_H^* - \varepsilon_H^* \right)}{2(\rho_H - \rho_L)} \right)^2 - \frac{\varepsilon_H^*}{4}
\]

(25)

In fact, we know that

\[
\Delta E[\pi_{MNF}]_{MH} = E[\pi_{MNF}(\varepsilon_H)]^{FDI} - E[\pi_{MNF}]_{MH}^{SUB}
\]

and

\[
\Delta E[\pi_{MNF}]_{SI} = E[\pi_{MNF}(\varepsilon_H)]^{FDI} - E[\pi_{MNF}(\varepsilon_H)]^{SUB}.
\]

Considering that \(E[\pi(\varepsilon_H)]^{FDI}\) is the same in the two situations and that the expected profit from subcontracting is lower in the moral hazard situation, we can conclude that asymmetric information increases the preference for FDI, and so expression (25) takes a positive value. Asymmetric information is thus expressed as an extra route by which the MNF may prefer to invest abroad directly, rather than to subcontract.

In the \(F,b\) space in Figure 1, the indifference curve between making FDI and subcontracting for the symmetric information situation is compared with the respective curve for the moral hazard situation. In both cases, the indifference curve shown corresponds to the base situation, that is:

\[\rho_H = 0.7, \rho_L = 0.5, k = 0.8, \varepsilon_H = 3.6.\]
The above Figure shows that the presence of moral hazard in the subcontracting relation shifts the indifference curve between the two options to the left, and so the area of the Figure where the MNF decides to subcontract is quite a lot less in the moral hazard situation than in the symmetric information situation. For a given $F$ and a given $\varepsilon_H$, then, the subsidiary could, under asymmetric information, be less efficient than the local firm, contrary to what happens under symmetric information. As was to be expected, asymmetric information thus increases the MNF’s preference for FDI. But this is only the desirable option if the fixed costs are not too high and the subsidiary has efficiency levels close to, or higher than, those of the outside firm, subcontractor.

7 Conclusion

In the preceding Section we drew attention to the fact that the presence of asymmetric information in relation to subcontracting introduces an extra cost (agency cost) for the MNF, which demotivates it from adopting this strategy when the other option is FDI. However, bearing in mind that direct investment involves certain fixed costs, this strategy is only obviously
desirable if the subsidiary is more efficient than the local firm. This is not likely to be the case (Section 3 mentions that several authors have given different reasons as to why the opposite is likely).

We can therefore conclude that the growing use of subcontracting (see Section 2.1) tends to go along with the conclusions provided by the traditional model of symmetric information, which point out the importance of production and fixed costs in the choice between subcontracting and producing within the firm via FDI. But, contrary to what was expected, the presence of asymmetric information in relation to subcontracting did not prevent this from continuing to be the desirable strategy, even though the benefits of subcontracting were conspicuously less. This aspect leads us to conclude that the existence and growth of FDI observed in the real world (see Section 2.1) is due to factors other than the uncertainty associated with the subcontractor firm’s behaviour.

Appendix

1. Determination of the conditions that satisfy

\[ \Delta \mathbb{E}[\pi_{MNF}]^{FDI} = \mathbb{E}[\pi_{MNF}(\varepsilon_H)]^{FDI} - \mathbb{E}[\pi_{MNF}(\varepsilon_L)]^{FDI} > 0 \]

\[ \Delta \mathbb{E}[\pi_{MNF}]^{FDI} = \frac{4pb^2 + 4pb^2 \varepsilon_H (1-k) + (k^4 - 1) \varepsilon_H^4}{4b^2} \]

Deriving the above expression in order to \( \varepsilon_H \) we get:

\[ \frac{d\Delta \mathbb{E}[\pi_{MNF}]^{FDI}}{d\varepsilon_H} = \frac{1}{b^2} \left( Pb^2 - Pb^2 k - \varepsilon_H^3 + k^4 \varepsilon_H^3 \right) \]

Making the above derivative equal to zero and resolving in order to \( \varepsilon_H \) we have:

\[ \varepsilon_H = \frac{3Pb^2}{k^2 + k^2 + k + 1} \]
\[ \varepsilon_H = -\frac{1}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} + i \frac{\sqrt{3}}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} \]

\[ \varepsilon_H = -\frac{1}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} - i \frac{\sqrt{3}}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} \]

To the extent that the last two solutions are not real numbers, the only solution is, then:

\[ \varepsilon_H = \frac{3}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} \]

Calculating the second derivative of \( \Delta E[\pi_{MNF}]^{FDI} \) in order to \( \varepsilon_H \) we get:

\[ \frac{\partial^2 \Delta E[\pi_{MNF}]^{FDI}}{\partial \varepsilon_H^2} = 3\varepsilon_H^2 \frac{1+k^4}{b^2} < 0 \]

We then find that the second derivative takes a negative value such that the value of \( \varepsilon_H \) determined above corresponds to a maximum for the expression \( \Delta E[\pi_{MNF}]^{FDI} \), that is, graphically this expression exhibits a curvature of type \( \cap \). In addition to this, the expression takes a positive value at this point. In fact, considering \( \varepsilon_H = \frac{3}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} \), we have, after simplifying:

\[ \Delta E[\pi_{MNF}]^{FDI} = \frac{p^2}{4} \left( 4 \rho \theta + \frac{3 \sqrt{3} \pi b^2 (1-k)}{(1+k^2+k^2)^{1/3}} \right) > 0 \]

Furthermore, the inflection point of the curvature, that is, when the second derivative is void \( \left( 3\varepsilon_H^2 \frac{1+k^4}{b^2} = 0 \right) \), it is found in \( \varepsilon_H = 0 \). For this value, \( \Delta E[\pi_{MNF}]^{FDI} \) takes a positive value, thus \( \Delta E[\pi_{MNF}]^{FDI}_{\varepsilon_H=0} = \rho P \theta > 0 \). We can thus conclude that the condition \( \Delta E[\pi_{MNF}]^{FDI} > 0 \) is satisfied as long as:

\[ 0 < \varepsilon_H \leq \frac{3}{2} \sqrt[3]{\frac{p_b^2}{k^2+k^2+k+1}} \]
2. Determination of the condition that satisfies

\[
\Delta E[\pi_{MNF}]^{SUB} = E[\pi_{MNF}(\varepsilon_H)]^{SUB} - E[\pi_{MNF}(\varepsilon_L)]^{SUB} > 0
\]

\[
\Delta E[\pi_{MNF}]^{SUB} = \rho P\theta + P\varepsilon_H(1 - k) + \frac{1}{4}\varepsilon_H^4(k^4 - 1)
\]

The derivative of the above expression in order to \(\varepsilon_H\) is:

\[
\frac{d\Delta E[\pi_{MNF}]^{SUB}}{d\varepsilon_H} = P - \varepsilon_H^3 - Pk + k^4\varepsilon_H^3
\]

Making the above derivative equal to zero and resolving in order to \(\varepsilon_H\) we obtain:

\[
\varepsilon_H = \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}}
\]

\[
\varepsilon_H = \frac{-1}{2} \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}} + i\frac{\sqrt{3}}{2} \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}}
\]

\[
\varepsilon_H = \frac{-1}{2} \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}} - i\frac{\sqrt{3}}{2} \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}}
\]

To the extent that the last two solutions are not real numbers, the only solution is, then:

\[
\varepsilon_H = \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}}
\]

Calculating the second derivative of \(\Delta E[\pi_{MNF}]^{SUB}\) in order to \(\varepsilon_H\) we get:

\[
\frac{\partial^2 \Delta E[\pi_{MNF}]^{SUB}}{\partial \varepsilon_H^2} = -3\varepsilon_H^2 + 3k^4\varepsilon_H^2 = 3\varepsilon_H^2(k^4 - 1) < 0
\]

The second derivative thus takes a negative value such that the value of \(\varepsilon_H\) determined above corresponds to a maximum for the expression \(\Delta E[\pi_{MNF}]^{SUB}\). In addition, the expression takes a positive value at this point. In fact, considering \(\varepsilon_H = \sqrt[3]{\frac{p}{k^3 + k^2 + k + 1}}\), we have, after simplifying:

\[
\Delta E[\pi_{MNF}]^{SUB} = \frac{P}{4} \left(4\rho\theta + \frac{3\sqrt[3]{P}(1 - k)}{(1 + k + k^2 + k^3)^{\frac{1}{3}}}\right) > 0
\]
For its part, the inflection point of the curvature is found in \( \varepsilon_H = 0 \), that is, when the second derivative is void \((3\varepsilon_H^2(k^4 - 1) = 0)\). For this value, \( \Delta E[\pi_{MNF}]^{SUB}_{\varepsilon_H=0} \) takes a positive value, thus \( \Delta E[\pi_{MNF}]^{SUB}_{\varepsilon_H=0} = \rho P \theta > 0 \). We can thus conclude that the condition \( \Delta E[\pi_{MNF}]^{SUB} > 0 \) is satisfied as long as:

\[
0 < \varepsilon_H \leq \sqrt[4]{\frac{P}{k^3 + k^2 + k + 1}}
\]

3. Determination of the condition that satisfies

\[
\Delta E[\pi_{MNF}]^{SUB}_{MH} = E[\pi_{MNF}]^{SUB}_{MH} - E[\pi_{MNF}(\varepsilon_L)]^{SUB} > 0
\]

\[
\Delta E[\pi_{MNF}]^{SUB}_{MH} = P(\varepsilon_H + \rho \theta - k \varepsilon_H) + \frac{k^4 \varepsilon_H \rho^2 (\rho^2 - \rho_H^2 - \rho_{L}^2) (2 - k^2)}{4 \rho^2} + \frac{2 \rho_H \varepsilon_H k^2 (1 - \rho_H) k^2 (2 \rho_H \rho_L - \rho_H - \rho_L^2)}{4 \rho^2}
\]

Deriving the above expressions in order to \( \varepsilon_H \) we obtain:

\[
\frac{d\Delta E[\pi_{MNF}]^{SUB}_{MH}}{d\varepsilon_H} = \frac{P \rho^3 (1 - k) + \varepsilon_H^2 k^2 (\rho_H - \rho_H^2) (2 - k^2)}{\rho^2} + \frac{\varepsilon_H k^4 \rho^2 + \varepsilon_H^2 (2 \rho_H \rho_L - \rho_H - \rho_L^2)}{\rho^2}
\]

Making this derivative equal to zero and resolving in order to \( \varepsilon_H \) we have:

\[
\varepsilon_H = \sqrt{\frac{P \rho^3 (1 - k) + \varepsilon_H^2 k^2 (\rho_H - \rho_H^2) (2 - k^2)}{\rho^2}}
\]

\[
\varepsilon_H = -\frac{1}{2} \sqrt{\frac{P \rho^3 (1 - k)}{-k^4 \rho_H + k^4 \rho_H^4 + 2k^2 \rho_H^2 - 2k^2 \rho_H^2 - \rho_H^2 - \rho_H^2 + 2 \rho_H \rho_L + k^4 \rho^2}} + \frac{\sqrt{3}}{2} \sqrt{\frac{P \rho^3 (1 - k)}{-k^4 \rho_H + k^4 \rho_H^4 + 2k^2 \rho_H^2 - 2k^2 \rho_H^2 - \rho_H^2 - \rho_H^2 + 2 \rho_H \rho_L + k^4 \rho^2}}
\]

\[
\varepsilon_H = -\frac{1}{2} \sqrt{\frac{P \rho^3 (1 - k)}{-k^4 \rho_H + k^4 \rho_H^4 + 2k^2 \rho_H^2 - 2k^2 \rho_H^2 - \rho_H^2 - \rho_H^2 + 2 \rho_H \rho_L + k^4 \rho^2}} - \frac{\sqrt{3}}{2} \sqrt{\frac{P \rho^3 (1 - k)}{-k^4 \rho_H + k^4 \rho_H^4 + 2k^2 \rho_H^2 - 2k^2 \rho_H^2 - \rho_H^2 - \rho_H^2 + 2 \rho_H \rho_L + k^4 \rho^2}}
\]

To the extent that the last two solutions are not real numbers, the only solution, after simplification, is, then:
\[
\varepsilon_H = \sqrt{\frac{p\rho^2}{(k+1)(\rho^2(k^2+1) + \rho_H(\rho_H-1)(k^2-1))}}
\]

Calculating the second derivative of \( \Delta E[\pi_{MNF}]_{MH}^{SUB} \) in order to \( \varepsilon_H \) we get:

\[
\frac{\partial^2 \Delta E[\pi_{MNF}]_{MH}^{SUB}}{\partial \varepsilon_H^2} = 3\varepsilon_H^2 \frac{-k^4\rho_H+k^4\rho_H^2+2k^2\rho_H-2\rho_H^2k^2-\rho_H-2\rho_H\rho_L+k^4\rho^2}{\rho^2}
\]

After algebraic manipulation of the above expression, we obtain:

\[
\frac{\partial^2 \Delta E[\pi_{MNF}]_{MH}^{SUB}}{\partial \varepsilon_H^2} = 3\varepsilon_H^2 \frac{(k^2-1)\left(\rho^2(k^2+1)+\rho_H\left(\rho_H^{-1}\partial\rho_H^{-1}\partial\rho_H^{-1}\right)\right)}{\rho^2} < 0
\]

We thus find that the second derivative takes a negative value such that the value of \( \varepsilon_H \) determined above corresponds to a maximum of the expression \( \Delta E[\pi_{MNF}]_{MH}^{SUB} \). In addition, the expression takes a positive value at this point inasmuch as the point of inflection of the curvature is found on \( \varepsilon_H = 0 \left(\frac{\partial^2 \Delta E[\pi_{MNF}]_{MH}^{SUB}}{\partial \varepsilon_H^2} = 0\right) \), and, for \( \varepsilon_H = 0 \), the expression takes a positive value.

In fact \( \Delta E[\pi_{MNF}]_{MH}^{SUB} |_{\varepsilon_H=0} = P\theta(\rho_H - \rho_L) > 0 \). We can thus conclude that the condition \( \Delta E[\pi_{MNF}]_{MH}^{SUB} > 0 \) is satisfied as long as:

\[
0 < \varepsilon_H \leq \sqrt{\frac{p\rho^2}{(k+1)(\rho^2(k^2+1) + \rho_H(\rho_H-1)(k^2-1))}}
\]

References


