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Multinational Firm Behaviour under Country Risk In the riskiest Countries¹

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Abstract:

This paper investigates the nature of the relationship between direct investment and country risk in southern countries, especially developing countries (vertical investment). Using a theoretical model, we show that a necessary condition exists and is sufficient for business risk to determine the entrepreneur's strategy to undertake an investment project if the mover-owner advantage exists in a country with risk. A Multinational Enterprise can invest in a big number of countries if the gains from invest are higher than country risk cost. The proposed model can be seen as an extension of Lehmann (1999) and Markusen (2004). This model makes the hypothesis that the MNE can only invest under a necessary and sufficient condition to achieve this investment project. This only choice is the condition of investment. The extension of this model is to illustrate under what conditions, a MNE will establish a foreign subsidiary in a risky world. The firm confronts itself to a choice between the investment opportunities and the risk in developing countries.

I. Introduction	1
II. Literature on the Causes of FDI with country risk	2
III. OLI paradigm and country risk	3
1. Ownership advantage and delayed investment	4
2. Internalisation and irreversibility	4
IV. Investment Condition and theoretical implications	5
Conclusion	9

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I. Introduction

Explosion of growth in FDI (foreign direct investment) over the 1990's transported by a big number of multinational firms (MNF), especially in the developing countries, has inspired a stream of literature focusing on the attractive FDI destination. The hysteresis effect (Dixit, 1989, 1992) revealed delays in FDI inflows in the presence of risk in developing countries, showed our attention, if this effect is a consequence of globalization that would have changed the rules of the game or the uncertainty that supplanted the classic determinants of the foreign direct investment (OLI paradigm). The Ownership-Location-Internalisation framework (Dunning, 1988), which justifies FDI flows, are also viewed as factors to delay investment and result in irreversibility (Rivoli and Salorio, 1996; Blandon, 2001). In uncertain environments, ownership and internalization advantages may be negatively rather than positively associated with FDI (Rivoli and Salorio, 1996). The impact of uncertainty through country risk: risk of expropriation, political risk, macroeconomic policy instability (economic and financial risk) is major concerns of potential investors. The condition for foreign investment can also be expressed in terms of the country risk analysis, because investment decisions of firms depend on a large number of factors in environments in which investors have difficulties in making his project. Economists can be useful in evaluating the explicit locational behavior of the MNF confronted with interdependent risky markets. It is optimal for the Multinational Firms to make coherent assessments of projects through the country with risk (Aven and Floerenaes, 2004). In this light, country risk due to deficient markets and institutions reflects uncertainty may be particularly relevant factor determining investment in developing and transition countries.

The aim of this paper is to determine the investment condition in presence of the country risk. To reach this aim, following a brief review of the bases for FDI to explain the strategy behaviour of MNE in first time. In a second time, we drive a synthetic approach on the determinants of the international investment, and we show that investment with country risk can explain reversibility and delayability concepts. In a third time, we spread our discussion on the emergence of these two concepts, and we show that the traditional results can be affected. The theoretical model shows that a necessary condition exists and is sufficient for business risk to determine the entrepreneur's strategy to undertake an investment project in order to exploit market opportunities in host country.

The choice of foreign direct investment location into country risk has important implications. Firstly FDI have an intrinsic character, the investment decision have tendency to delay because irreversibility due to a large cost (Dixit 1989, 1992). Second, Reversibility and delayability are continuous rather than dichotomous concepts (Rivoli and Salorio, 1996). Finally, models revealed substitutability between trade and FDI in the presence of country risk. The investment condition also has implications and presents a comprehensive overview. The investment condition states that the investment strategy of the firm is to invest in a project only if the present value of revenues from investment exceed the total costs², it can be shown that the costs value is increasing with the degree of risk, which means that greater risk leads to less willingness to invest. Yet, the nature of the relationship crucially depends on the theoretical model used and the underlying assumptions with respect to the risk behaviour of the investor.

² It is well-known that giving up an irreversible cost of investment in return for reaping the profits is optimal when the (after tax) value exceeds the cost by a certain market (Penning and Sleuwaegen, 2004).

II. Literature on the Causes of FDI with country risk

The FDI huge literature underlines a number of risk problems. Since the years 1980, the investment with uncertainty has received some attention in the literature. The literature shows on the one hand, that uncertainty can stimulate investment under certain circumstances; on the other hand the sign of the relationship is the opposite.

The authors have stressed the importance of the investment irreversibility and his impact on the relation between investment and uncertainty (Bernanke, 1983; McDonald and Siegel, 1986; Bertola and Caballero, 1994; Dixit and Pindyck, 1994). The investment decision becomes crucial when the uncertainty influences the future returns of investment (Moretto, 2000). The interaction between irreversibility and uncertainty destabilizes the investment, and the macro-level factors are important in the microeconomic investment decision, Bernanke (1983) explains the role of the investment irrevocability decision. Dixit and Pindyck (1994) show that, under certain assumptions, the interaction between irreversibility, the uncertainty on the cash flows and the exact moment to invest determine the optimal choice of the investment. The impact of uncertainty through risk of expropriation, and macroeconomic policy instability are major concerns of potential investors (Thomas and Worrall, 1994).

Rivoli and Salorio (1996) suggest three factors to explain the option to "wait and see»: the irreversibility of the investment, the capacity of firm to delay investment, and the nature of the uncertainty. According to Penning and Sleuwaegen (2004), the mode of entry choice depends on the level of uncertainty, the taxation differential between the country home and the host country, the advantage costs, the institutional procedures, and the degree of cooperation between the partners in the setting of a joint venture. The investor prefers to wait to acquire information rather than to take an immediate decision. Rodrik (1991) puts in evidence on the possibility that the uncertainty can be considered like reason of the under investment in developing countries. He demonstrates that the investment decision is not only accentuated on the other investors decision, reflects the level of the agglomeration effects playing an important role to attract FDI, but also, on the investor perception clean as for the level of political reforms engaged in foreign country. While examining the question of the flows FDI weakness of the rich countries toward the poor countries, Lucas (1990) argues while leaning on the gaps in terms of human capital and the imperfections of the markets of funds, and watch that the optimal politics of the rich countries aiming to delay the inflows of funds toward the developing countries, has for objective to maintain some real wages less raised in the host countries. The investment can be delayed when it becomes less reversible, this is true when firms operate in uncertain environment, and ownership and internalisation advantages associate negatively to the foreign direct investment (Rivoli and Salorio, 1996). Irreversible investment is considered as the "propagating" mechanism of the cycle (Bernanke, 1983).

Although the expansion of the international investment always entails some risks, the firms are exposed to the risk unusually because of their large size investment, and of their government dependence in foreign country (Henisz and Zelner, 2001). Dixit (1992) show that the investment decisions can be delayed in the time facing the economic and political uncertainty,

and the best strategy, is to "wait and to see ". Aizenman and Marion (2004) show that the macroeconomic volatility and the sovereign risk influence the vertical FDI that horizontal FDI.

I argue that the uncertainty is an exogenous problem resolved only with the passage of time, irrespective of investment (McDonald and Siegel, 1986; Rivoli and Salorio, 1996).

The authors analyse the multinationals behaviours. The theoretical contributions converge and concentrate on the OLI paradigm determined by Dunning (1980), like Ethier and Markusen (1996), and Rugman (1986). They explain the investment decision of firm, the firm internalise his production rather than giving up his license on other territory, as a rational reaction on an imperfect market, whereas the advantages of OLI justifying a localisation on a foreign market, can be affected by uncertainty (Rivoli and Salorio, 1996).

In this context, we show that the optimal choice of direct investment is explained by an investment condition; the firm uses and exploit his ownership advantage according to the opportunities and the risks in foreign market (Dunning, 1988; Rivoli and Salorio, 1996). I begin by analysing the impact of the relative risk to the business environment of the foreign country on the entrepreneur's decision when the multinational enterprise is exposed to the risk, and is submitted to gates to the exports. I demonstrate the risk level in which complementarity/substituability relation between FDI and exports can be affected.

III. OLI paradigm and country risk

To examine the international production and especially the FDI, Dunning (1988) integrates some elements in his OLI paradigm (O = "Ownership"; L = "Location"; I = "Internalisation") where each letters indicates one of the advantages of the MNF. His paradigm organized or conceived from the previous themes, presents a synthesis to reply to the FDI thematic. It is an organizational structure and not an FDI theory, examining and justifying the foreign production activities, it prescribes a conceptual framework for "what is" rather than "what should be" (Rivoli and Salorio, 1996). The OLI paradigm is not sufficient to explain the major FDI.

I note that a firm operates in others countries faces several form of risk. The foreign firm must have some advantages those local firms to compensate these risks. First, the firm must have Ownership advantages opposite other competitors firms by the detention of tangible or intangible assets, who allow him to reduce these costs and to face their competitors. This type of argument presents a theoretical foundation to show that foreign direct investment constitutes a believable engagement for the firm. Second, the firm must internalise its international operations and establish subsidiaries abroad by exploiting these assets, instead to yield some licences to the local firms, because it relatively would increase its costs of transaction. Third, the choice of location is related essentially to the specific characteristics of the countries as absolute advantage and economic policies. The production localised side issue the source of the raw materials when the costs of transaction increased. It is necessary the firm has the three advantages at the same time to develop its multinational activities in order to compensate the costs of risk that it will be necessary to support.

The firm operates abroad face intangible factors of confiscation and expropriation risks. The firm must delay his decision of investment because investment is irreversible (sunk cost). The irreversibility notion implies a sunk cost to estimate, the assessment criteria appears dominant in the investment decision, and country risk is an exogenous variable depends on the investor's perception. The effects of risk on the firm decision are: irreversibility and delayed investment³. The irreversible investment can be delayed in uncertainty (Pindyck and Dixit, 1994; Bertola and Caballero, 1991 and 1994; Pattillo, 1998).

Irreversibility and delayed investment are continuous and not dichotomous (Rivoli and Salorio, 1996). The orthodox investment theory doesn't recognize the qualitative and quantitative important implications of the interaction between irreversibility, uncertainty and the investment choice. Therefore, the risk and investment are inseparable; the capital dynamics accumulation is inseparable of the informational dynamics. To refer to Rivoli and Salorio (1996), we debate broadly speaking how the ownership and internalisation advantages can be affected in uncertainty? and the investment decision depends on the interaction between "irreversibility" and "delayed investment".

1. Ownership advantage and delayed investment

Ownership advantage often serves to make FDI delayable. The OLI paradigm implies that the important specific advantage encourage the firm to produce abroad (Rivoli and Salorio, 1996). The investment becomes delayed following the nature specific advantage of the firm. If the firm is a monopoly vis-à-vis his foreign and local competitors, in this case, it can wait. For example, the MNC can wait two years to invest, after this date, the arrival of new competitors on the market can make disappear this opportunity. A non monopolistic firm can lose its position on the market for fear to entry of other competitors on the market; in this case, the firm invests and follows his competitors. In this context, it is the nature of the firm Ownership advantage that permits to undertake or not a project of investment. In this setting, the investment is less delayed if the product cycles life are short, competitiveness is interdependent through the countries, and the host country presents a mover-owner advantage.

2. Internalisation and irreversibility

Internalisation advantage often serves to make FDI irreversible. The investment decision depends on the irreversibility level of the investment project; irreversibility appears when the realization of a project reduces probably the choices of future investments. Two conditions are necessary so that investment very well completely reversible, first the firm must recover its actual investments, it depends on their merchandising that enlarges by the factors joined to the merchandising of the products of the firm on an efficient and liquid market, their using alternatives, and the lemons problem doesn't exist. Secondly, she must recover its investments in intangible goods. Once its conditions are united, the firm has a higher internalisation and in this case, it can delay his investment decision.

³ See Abel and Eberly (1995), Serven (1996), and Rivoli & Salorio (1996).

The choice of investment decision reflects the capacity of the firm to dominate the market, measured by his Ownership advantage, and his faculty to internalize the production, measured by his internalisation advantage. The firm can wait and delay his investment if these Ownership and Internalisation advantages are competitive (figure1).

FIGURE 1

Delay under uncertainty

Nature of Ownership advantage	I	II
	Easy to delay : wait for information to arrive	Get toes wet or investigate alternative mode
Non-monopolistic	III	IV
	Wait for competitors moves and follow if they invest	Can not delay : invest now
	Low	High
	Importance of country "Early-mover advantage"	

Source : Rivoli and Salorio (1996)

In figure 1, the firm tends to imitate his rival under the effect of the competition interaction (case III). The firm strategy is bound to the level of uncertainty, it invests if the risk is weak, and get investment toes wet however investigate alternative fashion if the risk is higher (case II). The monopolistic firm can delay its investment project if the early-mover owner advantage not exists. Non monopolistic firm invests because his advantage cannot be eroded, and it doesn't have enough luck to delay its project of investment when his advantage risks to be duplicated (Blandon, 2001). Caballero (1991), and Abel and Eberly (1994) agree more on this exploration and underline the hypothesis of competitive markets and the constant scale outputs, that uncertainty cannot necessarily entail investment decrease because irreversibility of investment. They show that the links between investment and uncertainty depends on the interrelationship level between irreversibility and the firm competitive advantage.

In our study, we suppose the industrial monopoly firm have an important owner-mover advantage, and the strategy of investment remained to determine (case II). In this subject, we study the multinational firm behaviour when it confronts the country-risk in the static model setting. In this case the foreign direct investment is conceived as choice founded on the relative decisions confronted to the export relative to the abroad production. The fundamental questions we try to answer are linked to the determinants of the entry mode decision. In other terms, I measured the influence of International Risk on Entry Mode Strategy.

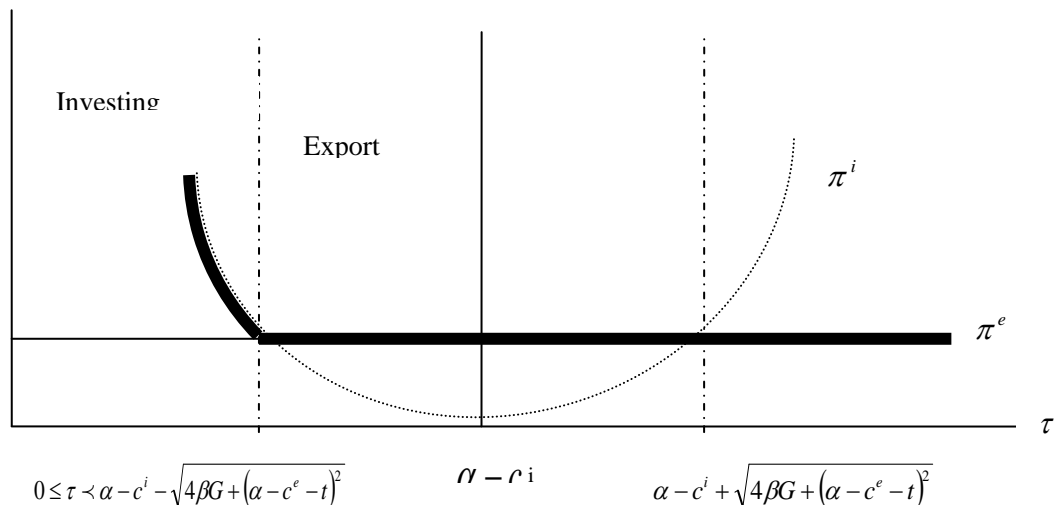
IV. Investment Condition and theoretical implications

Entry mode decisions are believed to be based on investors' perceptions of the international risk. In this consideration, the firm can invest when certain condition is satisfied.

$$0 \leq \tau < \alpha - c^i - \sqrt{4\beta G + (\alpha - c^e - t)^2},$$

Based in our calculation⁴, the firm should invest only if the ratio of the market valuation of capital to its replacement cost exceeds by a margin that is sufficient to compensate the firm for the loss of the option to delay.

According to the theory of uncertain investment, the investment cost is irreversible; A firm should undertake any investment with a positive net present value (Pennings and Sleuwaegen, 2004). Modern ‘options’ intuition shows that this value of waiting is due to the fact that information is incomplete and supposed to become more complete by waiting (see Fig).



Uncertainty increases the delaying effect of irreversibility on investment. The irreversibility of investment creates a higher user cost for capital, and this leads to lower investment compared to firms for which the investment is not/less irreversible (Dixit, Pindyck; 1994).

Abel, Dixit, Eberly, Pindyck (1996) study confirming the co-existence of a real option to delay investment and reverse an increase of investment as a consequence of uncertainty. Our model is a summary of both visions confirming these results.

Conclusion

The effect of the irreversibility of committed specific assets on the choice of transaction is analysed. Whereas the application to timing of entry decisions has become standard (Dixit, Pindyck (1994)), the repercussion on entry mode decisions is more novel and not often evaluated empirically (Rivoli and Salorio, 1996). Other studies show the ambiguous effect of uncertainty on investment. The need for country risk analysis has increased with foreign direct investment by multinational corporations because countries have become increasingly hostile to foreign direct investment. Although country risk assessment services are available, these agencies provide general ratings rather than ratings specific to the actual project being considered by the multinational corporation. This will be the subject of future research.

⁴ See Appendix

Appendix

Equation du Modèle et condition d'investissement avec risque-pays

Il existe deux alternatives d'exploitation du marché étranger pour la firme, soit en exportant, soit en produisant directement sur le marché étranger (investissement direct étranger). Dans le cas d'une intégration verticale, les coûts de production présentent une motivation majeure de l'implantation à l'étranger. Ainsi, nous distinguons entre les coûts du pays d'origine et les coûts du pays d'accueil. L'arbitrage se fait suivant les paramètres t (les coûts d'échange), le différentiel des coûts de production, et τ : le risque que présente le pays d'accueil. Le risque est exogène dans ce modèle.

Nous avons :

$$\pi^e = x[p(x) - c^e - t] \quad (a)$$

L'équation (a) qui exprime le profit à l'exportation est une fonction croissante de la quantité (x) vendue sur le marché étranger, décroissante du coût de production, des coûts de transport et des coûts tarifaires (t).

$$\pi^i - G = x[p(x) - c^i - \tau] - G \quad (b)$$

L'équation (b) qui exprime le profit à l'investissement à l'étranger est une fonction croissante de la quantité (x) vendue à l'étranger et décroissante du coût de production, du risque-pays (τ), et du coût d'entrée irrécupérable " G ".

Les variables π^i et π^e représentent respectivement les valeurs des profits d'investissement et d'exportation avant déduction des coûts fixes, avec comme condition, $c^e - c^i > 0$. Les coûts de production du pays d'accueil sont toujours inférieurs aux coûts de production du pays d'origine.

Si le risque τ est élevé, la localisation de la firme à l'étranger devient improbable, et donc le profit lié aux exportations devient supérieur à celui lié aux investissements, d'où l'inégalité suivante entre les deux profits liés à l'investissement et à l'exportation.

$$\pi^i - G = x[p(x) - c^i - \tau] - G < \pi^e = x[p(x) - c^e - t] \quad (1)$$

La firme maximise ses profits donnés par :

$$\begin{cases} \text{Max } \pi^e(x) = [p(x) - c^e - t]x \\ p(x) = \alpha - \beta x \end{cases}$$

La résolution du programme précédent donne l'expression de la quantité optimale vendue sur le marché considéré, soit :

$$x = \frac{\alpha - c^e - t}{2\beta} > 0 \left(x = \frac{\alpha - c^i - \tau}{2\beta} > 0 \right) \quad (2)$$

$$\text{Avec } \alpha - c^{i,e} > 0 \text{ et } \alpha - a > 0 \begin{pmatrix} a = c^e + t \text{ dans le cas d'exportations et } c^i + \tau \\ \text{dans le cas d'investissement direct à l'étranger.} \end{pmatrix}$$

Dans les deux cas d'exportation ou d'investissement, les deux conditions de positivité sont :

Condition 1 : $t < \alpha - c^e$; les coûts d'échange sont inférieurs au bénéfice à l'exportation.

Condition 2 : $\tau < \alpha - c^i$; le risque est inférieur au bénéfice à l'investissement.

C'est-à-dire aucun des deux projets d'investissement ou d'exportation n'est réalisable si les paramètres de restriction sur t et τ ne remplissent pas les conditions ci-avant.

Les deux profits s'expriment alors par :

$$\pi^e = \frac{(\alpha - c^e - t)^2}{4\beta} \quad (3)$$

$$\pi^i = \frac{(\alpha - c^i - \tau)^2}{4\beta} \quad (4)$$

* **En certitude**, le risque est nul ($\tau = 0$), le profit excède le coût d'implantation $G \left(\pi^i - G > 0 \text{ et donc } G < \frac{(\alpha - c^i)^2}{4\beta} \right)$.

En présence de coûts de transport et de barrières tarifaires importants ($\frac{\partial \pi^e}{\partial t} = -\frac{(\alpha - c^e - t)}{2\beta} < 0$), le profit de l'investisseur excède celui de l'exportateur, d'où l'inégalité suivante :

$$\frac{(\alpha - c^e - t)^2}{4\beta} < \frac{(\alpha - c^i)^2}{4\beta} - G \quad (5)$$

La résolution de l'équation suivante :

$$t^2 - 2(\alpha - c^e)t + 4\beta G + (\alpha - c^e)^2 - (\alpha - c^i)^2 < 0 ,$$

en tenant compte de la condition d'investissement en certitude $G < \frac{(\alpha - c^i)^2}{4\beta}$, donne la condition d'investissement non risqué sur le niveau des coûts d'échange t (les barrières tarifaires et les coûts de transport). Le trinôme est négatif à l'intérieur des racines.

$$\text{Soit } t \in]t_1; t_2[; \text{ avec } t_{1,2} = \alpha - c^e \pm \sqrt{(\alpha - c^i)^2 - 4\beta G}$$

Cette racine n'est pas retenue $\alpha - c^e + \sqrt{(\alpha - c^i)^2 - 4\beta G} > \alpha - c^e$ ($t > \alpha - c^e$), car elle viole les conditions initiales, par contre $\alpha - c^e - \sqrt{(\alpha - c^i)^2 - 4\beta G} < \alpha - c^e$ représente la solution retenue.

Avec

$$\begin{cases} t < \alpha - c^e \text{ représente la condition sur le niveau de la production optimale} \\ \text{et } 0 < \alpha - c^e - \sqrt{(\alpha - c^i)^2 - 4\beta G} < \alpha - c^e \text{ représente la condition de l'investissement} \end{cases}$$

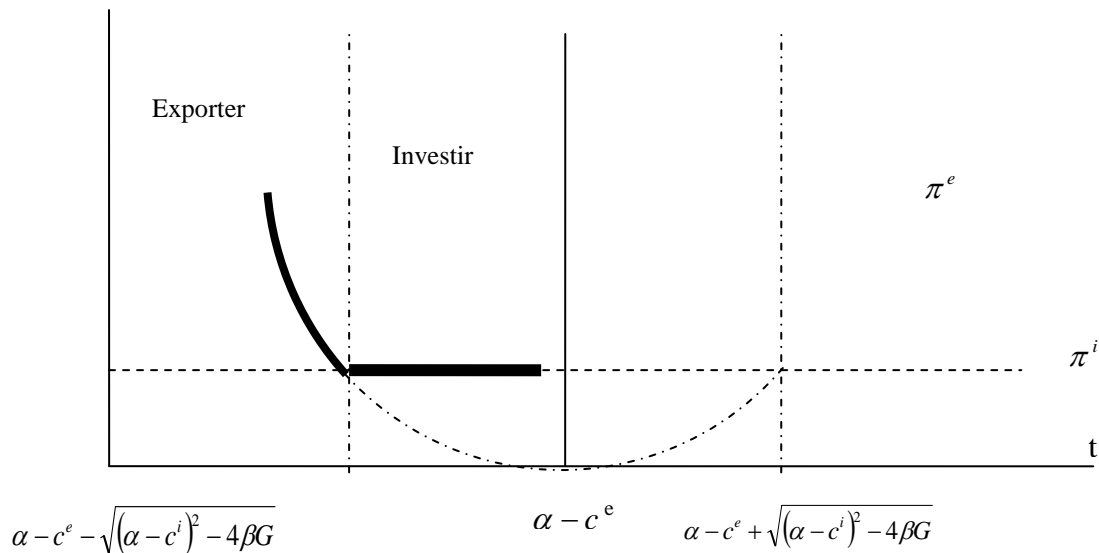
Les conditions d'investissement en certitude sont les suivantes :

$$\begin{cases} G < \frac{(\alpha - c^i)^2}{4\beta} \\ \alpha - c^e - \sqrt{(\alpha - c^i)^2 - 4\beta G} < t < \alpha - c^e \end{cases} \quad (6)$$

Nous déduisons la condition d'exportation en tenant toujours compte des conditions initiales $t < \alpha - c^e$, nous avons $0 \leq t < \alpha - c^e - \sqrt{(\alpha - c^i)^2 - 4\beta G}$, la condition d'exportation en certitude.

Figure 1.2 - Arbitrage entre Investissement direct et exportation en présence de barrières tarifaires

$$\pi^e, \pi^i$$



Le graphique ci-dessus retrace les courbes des profits à l'exportation et à l'investissement. Le profit à l'exportation devient inférieur à celui d'investissement quand le coût d'échange dépasse le bénéfice à l'exportation $\alpha - c^e - \sqrt{(\alpha - c^i)^2 - 4\beta G}$. Dans ce cas l'entrepreneur préfère localiser sa production à l'étranger plutôt que de produire sur place et exporter. Il s'agit de sauter les barrières 'tariff-jumping' pour pénétrer le marché étranger.

Le déplacement de la courbe vers la droite signifie que la multinationale localise sa production à l'étranger et dans ce cas l'IDE se substitue au commerce (voir le parcours en gras, graphique ci-dessus), si les coûts de transport et les barrières tarifaires (t) deviennent élevés (Markusen et Venables, 1995). Ces derniers montrent que lorsque les coûts d'implantation sont faibles (G) et les coûts fixes spécifiques à la firme (F) sont élevés, la multinationale localise sa production à coté de ses marchés et dans ce cas l'IDE se substitue au commerce si les coûts de transport et les barrières tarifaires (t) sont élevés. Ceci est vrai dans le cadre d'un investissement horizontal où la production est destinée au marché du pays d'accueil. Markusen et Venables (2000) développent un modèle en concurrence monopolistique, et montrent la signification de l'impact des coûts d'échange en créant l'incitation à la mobilité qui aboutit à l'agglomération dans un seul pays par l'augmentation du nombre d'effectif des multinationales.

Une augmentation des coûts d'échange entraîne un déplacement vers la droite de la courbe d'investissement.

Markusen (1995) ainsi que Brainard (1993) intègrent d'autres éléments comme la concurrence imparfaite avec les nouvelles théories du commerce international enrichies par l'analyse de la firme multinationale. Si les économies d'échelle sont importantes au niveau des firmes et les coûts de transports sont élevés, la firme peut investir à l'étranger. Si les avantages à proximité des consommateurs sont relativement élevés par rapport à ceux de concentration des activités, dans ce cas, c'est la stratégie horizontale qui sera adoptée par la firme pour servir les marchés locaux. Ceci n'est pas le cas contrairement à une implantation de type vertical où apparaissent des FMN dans des pays différents en dotations factorielles et en taille de marché, les firmes répartissent leurs activités en fonction des avantages comparatifs où les coûts de production sont peu élevés.

Ces études ne prennent pas en compte le facteur risque-pays dans le choix d'implantation des multinationales sachant que dans un environnement incertain, les deux avantages de propriété et d'internalisation peuvent être liés négativement et non positivement à l'IDE. Ce bouleversement théorique se reproduit au moment où les avantages spécifiques font différer l'IDE, alors que les avantages d'internalisation ne servent souvent qu'à le rendre plus irréversible.

Supposons cette fois-ci que la firme opère dans une situation de risque-pays, et les avantages de localisation l'incitent à investir, la condition d'investissement changera t-elle ?

* Avec risque-pays :

Dans un environnement incertain ou risqué ($\tau > 0$), l'inégalité devient :

$$\frac{(\alpha - c^e - t)^2}{4\beta} \succ \frac{(\alpha - c^i - \tau)^2}{4\beta} - G \quad \text{en incertain } (\tau \succ 0) \quad (6)$$

Pour investir, il faut que $\pi^i \succ \pi^e$, nous déterminons à quel niveau de risque $\tau = f(c^{i,e}, G, t)$, la firme peut investir à présent dans un environnement risqué.

Dans ce cas, le profit à l'investissement doit être supérieur à celui à l'exportation.

$$\frac{(\alpha - c^i - \tau)^2}{4\beta} - G \succ \frac{(\alpha - c^e - t)^2}{4\beta} \quad (7)$$

c'est à dire $(\alpha - c^i - \tau)^2 - 4\beta G - (\alpha - c^e - t)^2 \succ 0$

$$\tau^2 - 2(\alpha - c^i)\tau + (\alpha - c^i)^2 - 4\beta G - (\alpha - c^e - t)^2 \succ 0$$

Le trinôme est positif à l'extérieur des racines.

$$\tau_{1,2} = (\alpha - c^i) \pm \sqrt{4\beta G + (\alpha - c^e - t)^2} \succ 0$$

Pour investir maintenant, il faut que $\tau \prec \tau_1$ ou $\tau \succ \tau_2$. En tenant compte des conditions initiales $\tau \prec \alpha - c^i$, nous rejetons dans ce cas τ_2 car :

$$\tau_2 = \alpha - c^i + \sqrt{4\beta G + (\alpha - c^e - t)^2} \succ \alpha - c^i,$$

et donc nous acceptons seulement la seule condition d'investissement à l'étranger en risque-pays qui est

$$0 \leq \tau \prec \alpha - c^i - \sqrt{4\beta G + (\alpha - c^e - t)^2}.$$

Donc quand $0 \leq \tau \prec \alpha - c^i - \sqrt{4\beta G + (\alpha - c^e - t)^2}$, la firme peut investir à l'étranger et dans le cas inverse la firme investit autrement en exportant et attendant. D'après ce calcul, l'implantation à l'étranger n'est possible que si les bénéfices d'entrée préférentielle dans des conditions risquées excèdent les pertes engendrées par le risque potentiel que pourraient obtenir à l'instant actuel l'entrepreneur. Dans le cas inverse, l'investisseur n'a qu'à attendre et exporter jusqu'à ce que les bénéfices d'entrée (

$0 \leq \tau \prec \alpha - c^i - \sqrt{4\beta G + (\alpha - c^e - t)^2}$) excèdent les pertes associées au risque. Selon la théorie d'investissement incertain, le coût d'investissement est irréversible, l'IDE devient possible quand la valeur des recettes dépasse celle des coûts d'une certaine marge positive (Pennings et Sleuwaegen, 2004).

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