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Abstract:

The authors analyze the “direct investment v. export” decision of a multinational firm in competition with a potential entrant in a host country. They consider a workers’ skills asymmetry between the host and the multinational home countries. The possibility to train the hired workers when investing is given to the multinational. The authors illustrate that an improvement in the workers’ skills in the host country does not increase systematically the multinational incentive to invest. Also, they demonstrate that under the multinational’s training assumption, the tariff-jumping investment can always be welfare improving even if it excludes the local firm from the market.

ملخص

يقوم المؤلفون بتحليل قرار "الاستثمار المباشر مقابل التصدير" المتعلق بأي شركة متعددة الجنسيات في موضع منافسة مع متنافسين محتملون بأي دولة مضيفة؛ وما يقومون به هو عبارة عن بحث يتناول عدم التناظر في مهارات العمال بين الدول المضيفة ودول تلك الشركات المتعددة الجنسيات. تستند إمكانية تدريب اعمال المستأجرين خلال عملية الاستثمار إلي الشركات المتعددة الجنسيات. ويبين المؤلفون أن تحسن مهارات العمال في الدول المضيفة لا يعمل بصورة تلقائية على زيادة تحفييز الشركة متعددة الجنسية على الاستثمار. وبالإضافة إلى ذلك، نجد أنهم يبرهنون على أنه طبقا لالتزام المؤسسات المتعددة الجنسيات بمهمة التدريب، فإن الاستثمارات القائمة على تلافي التعريفة الجمركية يمكن أن تؤدي إلى تحسن الأحوال المعيشية حتى لو أدى ذلك إلى إبعاد الشركة المحلية عن السوق.

1. Introduction:

The theoretical literature dealing with the determinants of the multi-nationalization of firms (especially Foreign Direct Investment (FDI) vs. Export to a host market) was renewed with a serial of works based on the imperfect competition hypothesis and the strategic interaction between firms [Smith (1987), Horstmann and Markusen (1987,1991), Motta (1992,1994)]. Early contributions to this strand of literature propose models in which a foreign firm, already established in its own country and facing the "Exportation vs. direct investment" dilemma, competes with a local potential entrant in a single market. These works aim at determining the conditions under which the foreign firm adopts the direct investment as a tariff-jumping strategy and the impact of this strategy on the host-country welfare. The authors deal with these questions by introducing several variables such as market size, exportation costs, sunk costs,etc, which have a priori an impact on the firms' strategies.

For the sake of simplicity, these contributions suppose that the return of the multinational's technology is independent of its implementation country. They don't take into account the fact that, when investing abroad, the multinational leaves its workers which are already experienced and familiar with its technology to operate with the host-country workers who have not necessary the required skills to be efficient. In fact, if we consider the issue of the foreign investment in less developed countries, the workforce's under-qualification, increases the investment's cost and influences consequently the multinational's tradeoff between Exportation and FDI.

A large number of empirical works have considered the latter point. If we focus on the cross-country studies, we distinguish two groups. The first one, which includes Root and Ahmed (1979), Schneider and Frey (1985) and Hanson (1996), shows that no proxy of the human capital is a significant determinant to FDI. The second, is composed of Noorbakhsh et al. (2001) and Nunnenkamp and Spatz (2002). They show a positive relation between human capital and FDI. In spite of this empirical controversy, the few theoretical works dealing with this question lead to the following consensual result: the qualification level has a positive impact on the foreign investment. For instance, Lucas (1990) conjectures that the lack of human capital discourages the foreign investment. Zhang and Markusen (1999), show that the availability of skilled workers in the host country makes it more attractive to foreign investors. Dunning (1988) suggests that the skill and the education level of labor can influence both the volume of the foreign investment and the type of activities that multinationals can undertake in a country.

If we reconsider the relation between the human capital and the FDI under the potential competition assumption, the standard result of the theoretical literature might change. An increase of the workers' qualification in a country improves naturally the return of the FDI. However, it also incites local investors to enter the market. The intensification of the competition after the human capital's raise makes the relation between human capital and FDI ambiguous. This imposes a reconsideration of the question under an endogenous market structure of the host-country.

Part from the exogeneity of the market structure, the previous theoretical works have another common characteristic. All of them consider that the human capital level in the host-country is constant. They exclude the fact that there is several strategies that multinationals can undertake in order to improve the qualification level in the host-country, such as "training".

Nevertheless, the involvement of multinationals in the development of human resources' skills where they invest is supported by a large number of empirical works and study cases. OECD (2002, 2003) and UNCTAD (1994) provide many examples showing that multinationals invest substantially in both general and specific training. They also provide a

considerable support to upgrade the formal education in host countries. Otherwise, many empirical studies show that multinationals train more that local firms [See Tan and Batra (1996), Tan and Lopez-Acevedo (2003), Miyamoto and Todo (2003), and Almeida (2003)]. Hence, the human capital level is not an irreversible variable. The multinational can be incited to improve it in order to increase its return. This is notably the issue of the FDI in less developed countries where the multinationals are not able to reproduce efficiently their technologies without incurring an additional cost of training[1].

Such a scenario is not inherent to the North-South trade relation. The Japanese FDI in USA is another illustration of this point. After the excessive raise of trade barriers imposed by the USA, the Japanese firms persuaded different types of global strategies such as FDI, to supply the US market. However, the relatively low qualification of the US workers leads the Japanese investors to undertake considerable efforts in training [See Urata (1998) and UNCTAD (1994)].

In our paper, we analyze the investment decision of a multinational considering explicitly this potential commitment in training. Furthermore, we consider on the one hand, the interaction between firms and strategies and, on the other hand, the interaction between firms' decisions and the trade policy of the host-country. Our paper can be seen as an extension of Smith (1987) and Motta (1992). Contrary to these works, we introduce the hypothesis of under qualification of workers in the host-country. Moreover, we give to the multinational the strategic possibility to train all or part of the hired workers. Three options are offered to the multinational, i.e. it can put up with the low host-country workers qualification or invest with an involvement in workers training, and it can also choose the exportation instead of investment in order to benefit by the better qualification in its home country.

The consideration of the multinational's ability to train brings new elements to deal with standard questions studied by the previous literature: (i) the private incentive to FDI which may be higher with the training strategy; and (ii) the host-country welfare which may be positively affected by the human capital that is externality generated by the FDI.

Concerning the first question, we show that the multinational has always incentive to train part of the hired workers when investing in the host-country. Owing to the training strategy, the multinational is more likely to adopt FDI. We also demonstrate that an improvement in the human capital in the host-country does not encourage systematically the multinational to FDI.

As for the second question, we illustrate that the multinational's investment can exclude the local firms due to the training. However, the host-country benefits of the higher multinational's return. The trade-off between these two opposite effects leads to new results pertaining to the tariff-jumping impact on the host-country. In fact, contrary to the intuition and previous works [See Smith (1987) and Motta (1992)], we explain how can an anti-competitive tariff, inducing the multinational's investment, improve the host-country welfare.

The rest of this paper is set out as follows: Section 2 presents the model assumptions; section 3 discusses the issue of the game when the multinational is not able to train; section 4 removes this assumption; section 5, analyzes the effect of the tariff-jumping investment on the host-country welfare; and section 6 presents the conclusion.

2. Model Assumptions:

We suppose that the world economy in composed of a foreign and a host countries. In the foreign country, there is a multinational firm $(M)^2$ already established while in the host-country, there is a potential local entrant (L). The two firms produce a homogenous good and supply only to the home country market. The demand function in this market is given by:

$$P(Q) = \mu - Q \quad (1)$$

Where P denotes the price of the good in the host market, μ represents the size of its market and Q is the total quantity sold in the same market.

The production process requires only the labor input. We suppose that the workforces productivity are higher in the foreign country. More precisely, a worker in the foreign country produces one unit of the good (which is the best return that we can get) while a worker of the home country produces g units ($g < 1$). Also assuming that the number of workers in the two countries is very large to satisfy the work's supply of firms. The w denotes the wage in the two countries[3].

To serve the host market, the multinational has to choose between the exportation and the direct investment. Using the first strategy, the multinational makes use of its production facilities and qualified workers. However, it has to incur a per unit transportation cost s. With the second strategy, the multinational avoids all the exportation cost s but has to incur, as the local firm, a fixed cost K.

When investing, it is believed that only the multinational has the possibility to train all (or part of) the hired workers[4]. The aim of the training action is to improve the productivity of workers from g to 1. Also, it is assumed that the training is specific[5] and the multinational incurs all its cost. Thus, the trained workers don't get a higher wages after the skills acquisition. The training cost of N workers, having initially g as productivity, is given by the following expression:

$$\theta(N, g) = \frac{1}{2}(1 - g).N^2 \quad (2)$$

This function reflects diseconomies of scale in the training process because the firms run into constraints of capital equipments as the number of the trainees increases (See Booth and Chatterji (1998)). Moreover, the training costs are line-ray decreasing in g: the higher the initial workers productivity, the lower the costs of the training.

As mentioned, aside from the multinational, there is a local firm which could enter the market. In the case of entry, it has to incur the same fixed cost K. The local firm is supposed not to be able to train. The assumption of asymmetry between local and multinational firms with respect to their ability to train is supported by many empirical works (see Tan and Batra (1996), Tan and Lopez-Acevedo (2003), Miyamoto and Todo (2003) and Almeida (2003)).

We assume that firms' decisions on the entry mode are taken in a sequential way. Because of its proximity from the host market, the local firm is supposed to move first. When analyzing the game described in the figure 1, it is found that: the local firm decides whether to enter (E) or not (NE) in the first stage; while in the second, the multinational decides whether to export (EX), invest (INV) or not to serve the host market (Ø); and finally, in a third stage, a cornet game occurs to determine the number of workers hired which determines the quantities produced at the equilibrium.

It is assumed that the decisions at earlier stages are made in the knowledge of the equilibrium in the later stages. The equilibrium is solved by backward induction. Below, the notations of firms' payoffs conditionally to the strategies adopted in the earlier stages is given.

In the following two sections, the firms' payoffs in the different configurations is provided, and the issue of the game relatively to the host-country workers skills and market size is discussed. While the third section, analyses the impact on the welfare of a host country trade policy.

3. Foreign Investments and Skills in the Host-Country:

All multinationals do not invest in the training of their workers. In the literature, there is some evidence to identify why this is the case (See OECD (2003) for a discussion of this point). In this section, we start to analyze a benchmark case where the multinational has not the ability to train for exogenous raisons. Let's determine the payoffs of the last game's stage.

After deciding on the entry mode, firms that have chosen to sell in the host-country maximize their profits by determining the number of workers to hire in a simultaneous way. Below, the profits of both firms at the equilibrium according to the strategies chosen in the earlier stages are given (for full derivation of results see the appendix).

When the multinational exports and the local firm decides not to enter, an exporting monopoly emerges in the host-country. The local firm gets a nil profit and the profit of the multinational is as follows:

$$\pi_m^{ex}/_{ne} = \begin{cases} \frac{(\mu-s-w)^2}{4} & if \quad \mu > s+w \\ 0 & if \quad \mu < s+w \end{cases} \tag{3}$$

When the multinational decides to export and the local firm enters, they get the following payoffs:

$$\pi_m^{ex}/_{e} = \begin{cases} \frac{[\mu g+w-2g(s+w)]^2}{9g^2} & if \quad \mu > \frac{2g(s+w)-w}{g} \\ 0 & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \tag{4}$$

$$\pi_l^{e}/_{ex} = \begin{cases} \frac{[g(\mu+w+s)-2w]^2}{9g^2} - K & if \quad \mu > \frac{2g(s+w)-w}{g} \\ \frac{(\mu g-w)^2}{4g^2} - K & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \tag{5}$$

When the multinational invests and the local firm enters, the two firms get the same following profit:

$$\pi_m^{inv}/_{e} = \pi_l^{e}/_{inv} = \frac{(\mu g-w)^2}{9g^2} - K \tag{6}$$

When one firm decides to invest while its rival does not sell in the host market, there is a monopoly that holds in the host market. The profit of the investing firm is as follows:

$$\pi_m^{inv}/_{ne} = \pi_l^{e}/_{\varnothing} = \frac{(\mu g-w)^2}{4g^2} - K \tag{7}$$

Once the payoffs are determined, we move to solve the game. The issue depends on the values taken by the different parameters of the model. For simplicity reason, we present the sub-game perfect equilibrium in (μ, g) space at fixed values[6] of K, w and s. This allows us to discuss the equilibrium according to the market size and workers' skills. The results are plotted in the following figure.

The curves μ_1, μ_2 and μ_3 represent the minimum levels of μ that make the local firm's investment profitable given that the multinational has chosen respectively the INV, EXP or Ø. It is noted that the curves μ_1 and μ_3 are also the minimum levels of μ which insure the multinational investment profitability given that the local firm has chosen INV or NE.

$$\mu > \mu_1 \Leftrightarrow \pi_l^e/_{inv} > 0$$
$$\mu > \mu_2 \Leftrightarrow \pi_l^e/_{ex} > 0$$
$$\mu > \mu_3 \Leftrightarrow \pi_l^e/_{\varnothing} > 0$$

(8), (9), (10)

The curves μ_4 and μ_5 represent the minimum levels which yield to the multinational a positive profit given the local firm's strategy.

$$\mu > \mu_4 \Leftrightarrow \pi_m^{ex}/_e > 0$$
$$\mu > \mu_5 \Leftrightarrow \pi_m^{ex}/_{ne} > 0$$

(11) , (12)

Finally, the loci μ6 et μ7 are the multinational's indifference curves between the investment and the exportation according to whether the local firm enters or not at the equilibrium.

$$\mu > \mu_6 \Leftrightarrow \pi_m^{inv}/_e > \pi_m^{ex}/_e$$
$$\mu > \mu_7 \Leftrightarrow \pi_m^{inv}/_{ne} > \pi_m^{ex}/_{ne}$$

(13), (14)

Figure 2 shows how the game's issue changes when the host-country workers' skill increases. Three cases according to the market size are distinguished. When μ is very low, the raise of g has no effect on the equilibrium: No firm invests in the host-country. For medium values of μ, a first increase of g induces the entry of the local firm without modifying the multinational's strategy (EX). In fact, if the difference in workers' skills between the two countries remains considerable after the increase of g, the multinational keeps exporting to benefit of the higher qualification in its home country. A further increase in g may discourage the multinational to export and incites it not to serve the host-country without any increase in the transportation cost. The local firm always keeps its entry decision. In this configuration, a raise in the skill level has the same qualitative effects on the two firms as an increase in the trade cost. At high values of μ, the relationship between the firms' incentive to invest and the qualification level is a monotonical one: the higher the qualification level, the higher the incentive to invest. This result is in agreement with those of the theoretical literature (see the introduction).

If we focus on the effect of the size, our analysis leads to another intuitive result: a higher market size incites firms to invest. Although this result is embodied in the literature (see Horstmann and Markusen (1987, 1992), and Motta (1994)), yet it was challenged by some contributions. In fact, Motta (1992) shows that the interaction between the multinational and the local firm in a simultaneous game can alter the monotony of the relation. Horstmann and Markusen (1996) explain how a multinational, which is not well informed about the host-country market characteristics, can find it more profitable to contract with a local agent instead of investing directly when the market size is large enough to support the FDI. However, all these contributions agree that, in a large market, at least one firm decides to invest. The consideration of the asymmetry in workers' skills between the two countries challenges this result. It gives rise to an equilibrium configuration not revealed by the previous works: the host-country market is large and no firm invests. This is illustrated by the region (1b) in figure 2. In this region, g is very low and the market is large. The multinational decides to export to benefit of the higher skills in their country. Disadvantaged by the low skills of its workers, the local firm responds by not entering.

4. Foreign Investment and Host-Country Workers Training:

The multinational ability to train is considered in this section. Note that when the multinational exports or doesn't serve the host market, the payoffs of both firms do not change with respect to the benchmark case (see expressions (3), (4) and (7)). When investing, the multinational decision on hiring workers changes relatively to the previous case. Here, the multinational has to determine the number of workers to be trained and the number of workers to be affected directly by the production. In the case of entry, the local firm determines the number of workers to be hired. Remember that all decisions on the workers' numbers are taken in a simultaneous way. These payoffs are given by the following expressions (for the full derivation of results see the appendix).

When the multinational invests and the local firm decides to enter, the two firms get the profits:

$$\pi_m^{inv}/_e = \begin{cases} \frac{(3-g)[\mu g+(1-2g)w]^2}{2g^2(5-2g)^2} - K & if \quad \mu < \frac{4w}{g} \\ \frac{(\mu g-w)^2}{9g^2} + \frac{(1-g)w^2}{2g^2} - K & if \quad \mu > \frac{4w}{g} \end{cases}$$

$$\pi_l^e/_{inv} = \begin{cases} \frac{[\mu g(2-g)-(3-2g)w]^2}{g^2(5-2g)^2} - K & if \quad \mu < \frac{4w}{g} \\ \frac{(\mu g-w)^2}{9g^2} - K & if \quad \mu > \frac{4w}{g} \end{cases}$$

(15), (16)

When the multinational invests while its rival does not enter, it gets the following profit:

$$\pi_m^{inv}/_{ne} = \begin{cases} \frac{(\mu-w)^2}{6-2g} - K & if \quad \mu \leq \frac{3w}{g} \\ \frac{(\mu g-w)^2}{4g^2} + \frac{(1-g)w^2}{2g^2} - K & if \quad \mu \geq \frac{3w}{g} \end{cases}$$

(17)

The multinational has the choice between three strategies: investment without training; investment with training; and exportation. Note that the multinational gets higher investment profit when it trains. Thus, the multinational's strategic space is reduced to investment with training and exportation ((INV) will be used to qualify the strategy "investment with training" when (M) is able to train).

Figure 2 presents the sub-game perfect equilibrium in (μ, g) space.

Before discussing the results, remark that the investment doesn't yield the same profit for both firms. We keep μ_1 and μ_3 to designate the minimum level of the investment profitability for the local firm and we denote by μ_8 and μ_9 the minimum levels of μ which insure the multinational investment profitability given that the local firm has chosen INV or NE.

$$\mu > \mu_8 \Leftrightarrow \pi_m^{inv}/_e > 0$$
$$\mu > \mu_9 \Leftrightarrow \pi_m^{inv}/_{ne} > 0$$

(18), (19)

As figure 2 shows, the multinational's training changes considerably the game's issue especially when the workers skills are low in the host-country. Remember that, in the benchmark case, the multinational is incited to export when g is low (see the region (1b) in figure 1). With the training strategy, the multinational can improve its return. Furthermore, if the market is large enough to cover the fixed costs, the multinational's strategy switches to the investment even if g is very low. Note that under the latter condition, the non entry constitutes a dominant strategy for the local firm. This analysis presents the training as a

crucial condition that gives rise to the multinational investment. In fact, if we focus on the FDI in developing countries, we can see that it is often accompanied by training efforts. Many stylized facts support this result (for example see OECD (2003)).

Figure 2 leads to another unexpected result: the relation between the export vs. direct investment, decision and the workers skills' level in the host-country is not systematically monotone. At the point *U*, the host-country is endowed with a low skilled workers. The local firm decides not to enter the market regardless its rival strategy. The multinational chooses between exporting and the direct investment by comparing their respective costs. At the considered point, the best response of the multinational is to invest. As g rises, which corresponds to a move from the point *U* to the point *V*, the local firm finds it profitable to enter, if the multinational doesn't invest (the host market is not large enough to hold the investment of both firms). At the equilibrium, the local firm enters and the multinational responds by exporting. If g increases further (till the point *X*), the market size of the host-country is still allowing only one firm to invest. If the local firm enters, the multinational decides not to invest. Furthermore, the exportation quantity is nil that's why the multinational decides not to serve the market. Finally, a further increase in g to the point *Z*, gives to both firms the incentive to invest.

5. Training and Tariff-Jumping Investment:

There is a great literature dealing with the impact of trade policy on the investment decision in a country and its consequences on its welfare. The first contributions consider the market structure as exogenous. They disregard the interactions between local and foreign producers. Their main result is that an inducing-investment tariff is always welfare improving. Recent contributions have reconsidered the same question with more formal analysis based on concepts of the game theory. Thus, Smith (1987) analyses the strategic aspect of the direct investment and the relation between the trade policy and the incentives to invest in a host-country. He shows that the tariff does not induce systematically the investment of the multinational. His analysis reveals two important cases. In the first, a tariff increase allows the local firm to enter. As a reaction, the multinational deviates from the investment to the exportation. In the second case, the tariff induces the investment of the multinational which excludes the local firm from the market. Thus, the tariff can increase or decrease the competition that makes its effect on the welfare ambiguous. Motta (1992) keeps the same framework as Smith (1987) and proposes a more formalized contribution. He concludes that the tariff-jumping investment improves the host-country welfare only when the local firm would not have entered the market under free trade. Horstmann and Markusen (1992) adopt a more general framework with two countries. In each country, there is a firm already established. Both firms have the possibility to produce locally or to a set up a plant abroad. They show that a low tariff variation can cause a considerable welfare variation (eventually a decrease). In fact, the market structure endogeneisation creates a discontinuity in the welfare function which limits the applicability of the optimal tariff theory. The latter contribution was extended by numerous works. Venables and Markusen (1998) introduce the free entry hypothesis and consider an asymmetry on the market size and the labor endowment between the two countries. They rely on numerical solutions to shows that the FDI is often beneficial to the two countries. De Santis and Stähler (2004) consider the market entry and develop a way to solve analytically the model. They investigate the impact of an asymmetry in the headquarters costs on the firm's decisions and the countries' welfare. They show that, when the headquarters costs are large in the foreign country, the FDI improves the foreign country welfare and reduces the domestic country one. However, when these costs are symmetric, they show that the FDI is beneficial to the two countries irrespective of market structure effects. As mentioned in the introduction, all these contributions do not consider the

possibility of the foreign firm(s) to train the hired workers when investing in the host-country. This strategy affects the quantities produced and the payoffs earned by both firms (see section 2). Thus, it's legitimate to reconsider the effects of the tariff-jumping investment on the market structure and the welfare of the host country under this assumption. To this end, we suppose that the host-country adopts a per-unit specific tariff t on the multinational's exports (the tariff is considered as exogenous and we take t = 0:05, for all the following figures). The host-country welfare is defined as the sum of consumers surplus, local firm's profit and the tariff revenue. We denote by $Q_{(I,j)}$ and $W_{(I,j)}$ respectively the total quantity consumed and the welfare of the host-country when the equilibrium (I, j) occurs.

This section studies the effect of the host-country tariff on the game's issue and its consequences on the welfare. The welfare analysis is limited to cases where the tariff induces the FDI. We deal with two cases according to whether the multinational trains or not.

5.1 Non-Training Case

After the host-country protection, the per-unit exportation cost raises from s to $s+t$. When the multinational exports, the profits of both firms change when they move from free trade to protection. As a result, many changes occur in figure 1: the curves μ_4 and μ_5 move upwards while the curves μ_2 and μ_6 move downwards. These changes are illustrated in figure 3.

Figure 3 shows that the tariff affects the game's issue in many ways. In the region (II), the tariff does not change the game's issue. In fact, the local firm keeps not entering the market because g is very low. For the same reason, the multinational continues with exporting. In the regions (I) and (III), the tariff compels the multinational to give up serving the market with no changes on the local firm's strategy. In the region (IV), we find the opposite effect: the multinational is still exporting and the local firm's strategy switches to the entry. The regions (V) and (VI) constitute the only situations where the tariff induces the investment of the multinational. Let's move to study the welfare variation in the latter case.

Under the free trade, the multinational exports and the local firm enters. The host-country welfare is given by the following expression:

$$W_{(E,EX)} = \frac{[w(1+g) - g(2\mu - s)]^2 + [w(g-2) + g(\mu + s)]^2}{18g^2} - K \tag{20}$$

After the tariff adoption and the multinational's move to the investment, the host-country welfare becomes:

$$W_{(E,INV)} = \frac{g^2(\mu^2 - 3K) + w^2 - 2\mu g w}{3g^2} \tag{21}$$

Using these two expressions, the host-country welfare variation is given by the following expression:

$$W_{(E,INV)} - W_{(E,EX)} = -\frac{[w - g(w+s)]^2}{6g^2} \leq 0 \tag{22}$$

Note that this variation is negative. Thus, the host-country is always worse-off after the tariff adoption. Motta (1992) finds the same result. Furthermore, he shows that the multinational's investment improves the consumer surplus and reduces the local firm profit with respect to the free trade. In our model, this is not always true even if the resultant effect is the same. We can easily verify that the following conditions are satisfied:

$$Q_{(E,INV)} > (\leq)\ Q_{(E,EX)} \Leftrightarrow g > (\leq)\ \frac{w}{w+s}$$
$$\pi_l^e/_{inv} < (\geq)\ \pi_l^e/_{ex} \quad \Leftrightarrow \quad g > (\leq)\ \frac{w}{w+s} \qquad (23), (24)$$

It is remarked that the effect of the tariff-jumping investment on the surplus of the different actors depends on the host-country workers' productivity. Remember that the move from the exportation to the investment causes two opposite effects on the output and the profit of the multinational. The positive effect comes from escaping the transportation costs while the negative one results from the lower host-country workers productivity. When g is very low (insert equation), the low productivity effect is more important than the tariff-jumping effect. As a result, the multinational gets a lower output and profit when it invests while the local firm's output and profit increase. However, the increase in the local firm's output does not make up for the decrease of the local firm's output which leads the consumers surplus to decline. In the alternative case (insert equation), we find the same results as Motta (1992).

5.2 Training Case

This section analyses the impact of the tariff on the game's issue when the multinational is able to train its hired workers. Figure 4 illustrates all these changes.

This figure shows that the multinational adopts the tariff-jumping investment in the two regions (I), and (II) with (*I*) = (*Ia*) $\cup$ (*Ib*) and (*II*) = (*IIa*) $\cup$ (*IIb*) $\cup$ (*IIc*). In the first, the local firm maintains the non entry strategy. Thus, the equilibrium moves from a monopoly where the multinational exports to a monopoly with the multinational as an investor [(*NE*,*EX*) $\Rightarrow$ (NE; INV)]. In the second region, the local firm is excluded from the market and the equilibrium moves from a duopoly with export to a monopoly with investment [(E;EX)) (NE; INV)].

In the previous section, we have shown that the tariff induces the multinational's investment only if the market size and the workers qualification are sufficiently high to provoke the entry of the local firm in the free trade situation. When the multinational's ability to train is considered, the tariff becomes more effective to induce the foreign investment. As shown in the regions (I), the tariff-jumping investment occurs even if the host-country market size and the workers qualification are very low.

In the following, we move to study the welfare variation in the tariff–jumping investment cases already exposed.

In the region (I), the total quantity consumed in the host-country under free trade is given by:

$$Q_{(NE,EX)} = \frac{\mu - w - s}{2} \qquad (25)$$

After the tariff adoption, this quantity is given by the following expression:

$$Q_{(NE,INV)} = \begin{cases} \frac{\mu - w}{(3-g)} & if \quad \mu < \frac{3w}{g} \\ \frac{\mu g - w}{2g} & if \quad \mu \geq \frac{3w}{g} \end{cases} \qquad (26)$$

The variation analysis of the host-country welfare, which is reduced to the consumers surplus, reveals two cases:

Case 1: (insert equation), this corresponds to the region (1b) in figure 4. It is verified that the following condition holds:

$$Q_{(NE,INV)} > (\leq)\ Q_{(NE,EX)} \Leftrightarrow g > (\leq)\ \frac{w}{w+s} \tag{27}$$

Figure 5 shows that, for all points of the region (1b), the condition (insert equation) is satisfied. Thus, it is concluded that:

$$Q_{(NE,INV)} > Q_{(NE,EX)} \tag{28}$$

Case 2: (insert equation), this corresponds to the region (1a) in figure 4. It is verified that the following condition holds:

$$Q_{(NE,INV)} > (\leq) Q_{(NE,EX)} \Leftrightarrow \mu < (\geq) \tilde{\mu} \tag{29}$$

Furthermore, the upper born of the zone (1a) which corresponds to the curve μ_7 is given by the following expression:

$$\mu_7 = \tilde{\mu} - \frac{\sqrt{(t^2 - 4Kc)(1+c)}}{c} \tag{30}$$

Note that (insert equation). Thus, for all points of the region (1a), the property (29) already proved in the region (1b) is satisfactory.

It is concluded that the tariff-jumping investment is always beneficial to the host-country when the local firm has chosen not to enter under the free trade regime.

Now, we focus on the region (II). Using the two expressions (21) and (27), the host-country's indifference curve ($W_{(E,EX)} = W_{(NE,INV)}$) and the consumers' indifference curve ($Q_{(E,EX)} = Q_{(NE,INV)}$) are plotted (See figure 4). We denote respectively these two curves by μ_W and μ_Q. It is verified that:

$$\begin{aligned} W_{(E,EX)} &< (\geq)\ W_{(NE,INV)} \Leftrightarrow \mu < (\geq)\ \mu_W \\ Q_{(E,EX)} &< (\geq)\ Q_{(NE,INV)} \Leftrightarrow \mu < (\geq)\ \mu_Q \end{aligned} \tag{31), (32}$$

Figure 4 shows that the tariff-jumping investment is not systematically welfare reducing when it excludes the local firm from the market. In the region (IIa), the host-country is endowed with a low market size and a low workers qualification. Thus, in the free trade situation, the multinational decides to export and incurs the transportation cost. The local firm produces with a very low return. In effect, the total quantity produced at the equilibrium is very low. After protecting the host-country, the multinational moves to the investment which gives it a monopoly position. Remember that the multinational trains the hired workers when it invests. In doing so, it escapes the transportation cost and produces with a high return. This explains the fact that the produced quantity in the monopoly situation is higher than the duopoly one (insert equation). Furthermore, the increase of the consumers surplus exceeds the losses caused by the local firm exclusion. That's why, the host-country is better-off after the tariff-jumping investment (insert equation. In the region (IIb), the consumers are always better-off after the tariff-jumping investment. However, the consumers' gain is lower than the welfare loss caused by the local firm disappearance. Thus, the host-country is worse-off with the tariff. Finally, in the (IIc), both the consumers and the host-country are worse-off after the tariff-jumping investment.

6. Conclusion:

Through this paper, we analyzed the 'direct investment v. export' decision of a multinational considering the asymmetry between the multinational home country and the host-country workers skills. Also the possibility was given to the multinational to train the hired workers in the host-country. Contrary to previous works, our results show that an improvement in the workers' skill in the host-country do not increase systematically the multinational incentive to invest.

Also, it was illustrated that a host country may benefit from an increased human capital level, thanks to direct investment from the multinational. However, in certain circumstances, this may lead to the eviction of a local firm. It was also shown that the positive effect may overwhelm the negative impact of the local firm's disappearance. In our model, the FDI appears as a source of gain to the host country even in the pessimistic scenario when it doesn't confer an externality on domestic firms through staff turnover and doesn't provoke the entrance of local firms through vertical linkages. This result is solely explained by the effect of the workforce's qualification on the consumers surplus. In particular, it does not take into account the potential positive externalities of the increase in human capital in the long run (i.e. the entry of potentially more productive local firms). It seems clear that if we were to include this effect, our results would be reinforced.

Furthermore, our model considers that the only solution for the under qualification in the host-country is a private commitment of multinational firm in training policy. An alternative solution would be a partial or total funding of the worker's training by public authorities. This strategic option would prevent the local firm's eviction from the market. However, such a commitment from the host public authority could be direct (linked to an appropriate educational policy) or indirect (via a training subsidy extended to the local firm). The subsidy's legitimacy in this context could shed light on the standard literature

dealing with the strategic industrial policies. Indeed, one would then have to analyze the trade-off between public funding (via a subsidy) and private (via the multinational firm) of education and training. This trade-off is even more interesting to study that; (i) in the case of a host public funding, the State may guaranty a local firm's entry into the market; and (ii) in the private funding case, the public resources are not affected, but sees the eviction of a local firm. Our model is thus adapted to analyze this type of situations, given the introduction of explicit assumptions. A development of our model in this direction would constitute a natural extension of the present work.

7. Appendix: Payoff Levels:

7.1 Case 1: L enters and the M do not serve the market.

The return of the local firm is given by:

$$q_L = g\, n_L \qquad \text{(A1)}$$

The ex ante profit of the local firm is given by:

$$\pi_l^e/_\varnothing = (\mu - q_L)q_L - wn_L - K \qquad \text{(A2)}$$

After the substitution of (A1) into (A2), the maximization of the latter with respect to n_L yields the following solution:

$$n_L^* = \frac{\mu g - w}{2g} \qquad \text{(A3)}$$

The profit at the equilibrium is given by the following expression:

$$\pi_l^e/_{\varnothing} = \frac{(\mu g - w)^2}{4g^2} - K \qquad \text{(A4)}$$

7.2 Case 2: L enters and M exports.

In this case, the respective return of M and L are given by the following system:

$$\begin{cases} q_M = n_M \\ q_L = g\ n_L \end{cases} \qquad \text{(A5)}$$

The profits are given by the two expressions:

$$\pi_m^{ex}/_e = (\mu - q_L - q_M - s)\ q_M - w\ n_M \qquad \text{(A7)}$$
$$\pi_l^e/_{ex} = (\mu - q_L - q_M)\ q_L - w\ n_L - K \qquad \text{(A8)}$$

After substituting (A5) into the two expressions (A7) and (A8), the simultaneous maximization of the latter respectively with respect to nM and nL gives the following solutions:

$$n_M^* = \begin{cases} \frac{\mu g + w - 2g(s+w)}{3g} & if \quad \mu > \frac{2g(s+w)-w}{g} \\ 0 & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \qquad \text{(A9)}$$

$$n_L^* = \begin{cases} \frac{\mu g - 2w + g(s+w)}{3g} & if \quad \mu > \frac{2g(s+w)-w}{g} \\ \frac{(\mu g - w)^2}{4g^2} & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \qquad \text{(A10)}$$

The profits at the equilibrium are as follows:

$$\pi_m^{ex}/_e = \begin{cases} \frac{[\mu g + w - 2g(s+w)]^2}{9g^2} & if \quad \mu > \frac{2g(s+w)-w}{g} \\ 0 & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \qquad \text{(A11)}$$

$$\pi_l^e/_{ex} = \begin{cases} \frac{[g(\mu+w+s)-2w]^2}{9g^2} - K & if \quad \mu > \frac{2g(s+w)-w}{g} \\ \frac{(\mu g - w)^2}{4g^2} - K & if \quad \mu < \frac{2g(s+w)-w}{g} \end{cases} \qquad \text{(A12)}$$

7.3 Case 3: L do not enter and M exports.

The solution of this configuration can be derived from the precedent in the special case where $n_L = 0$:

At the equilibrium, we get the following solution:

$$n_M^* = \frac{\mu - s - w}{2} \qquad \text{(A14)}$$

Hence, the multinational profit at the equilibrium is:

$$\pi_m^{ex}/_{ne} = \frac{(\mu - s - w)^2}{4} \qquad \text{(A15)}$$

7.4 Case 4: L do not enter and M invests.

The outputs equilibrium in this configuration is the same of them the case 1.

7.5 Case 5: L enters and M invests.

In this configuration, both firms produce with the same return (q = g n) and incur the same fixed cost (K).

The ex ante profits are given by:

$$\pi_l^e/_{inv} = (\mu - q_L - q_M)q_L - wn_L - K \quad \text{(A16)}$$

$$\pi_m^{inv}/_e = (\mu - q_L - q_M)q_M - wn_M - K \quad \text{(A17)}$$

Hence, the equilibrium is symmetrical:

$$n_L^* = n_M^* = \frac{\mu g - w}{3g^2} \quad \text{(A18)}$$

The profits of both firms at the equilibrium are equal. They are given by the following expression:

$$\pi_l^e/_{inv} = \pi_m^{inv}/_e = \frac{(\mu g - w)^2}{9g^2} - K \quad \text{(A19)}$$

7.6 Case 6: L do not enter and M invests with training.

As a monopoly, M has to determine the number of workers to train (nM1) and the numbers of workers to affect directly to production without a preliminary training (nM2) to maximize its profit. Given that M's return is given by (qM = nM1 + g nM2), the ex ante M's profit is:

$$\pi_m^{inv}/_{ne} = (\mu - q_M)\, q_M - w\,(n_{M1} + n_{M2}) - \frac{1}{2}(1-g).n_{M1}^2 - K \quad \text{(A20)}$$

A simple maximization of (A20) with respect to nM1and nM2, leads to the following equilibrium workers' numbers:

$$n_{M1}^* = \frac{w}{g} \quad \text{(A21)}$$

$$n_{M2}^* = \frac{(\mu g - 3w)}{2g^2} \quad \text{(A22)}$$

It's clear that (insert equation). In this case, the equilibrium M's profit is:

$$\pi_m^{inv}/_{ne} = \frac{(\mu g - w)^2}{4g^2} + \frac{(1-g)w^2}{2g^2} - K \quad \text{(A23)}$$

When (insert equation), M trains all the hired workers. In fact, (insert equation) and (insert equation) is as follows:

$$n_{M1}^* = \frac{(\mu - w)}{6 - 2g} \quad \text{(A24)}$$

This yields the following equilibrium profit:

$$\pi_m^{inv}/_{ne} = \frac{(\mu - w)^2}{6 - 2g} - K \quad \text{(A25)}$$

7.7 Case 7: L enters and M invests with training.

In this case, M has to determine the number of workers to train (nM1) and the numbers of workers to affect directly to production without a preliminary training (nM2). L has to determine the number of workers hired (nL). The return of both firms is:

$$\begin{cases} q_M = n_{M1} + g\ n_{M2} \\ q_L = g\ n_L \end{cases} \qquad (A26)$$

The expressions of the ex ante profits are:

$$\pi_l^e/_{inv} = (\mu - q_L - q_M)q_L - wn_L - K \qquad (A27)$$

$$\pi_m^{inv}/_e = (\mu - q_L - q_M)q_M - w(n_{M1} + n_{M2}) - \frac{1}{2}(1-g).n_{M1}^2 - K \qquad (A28)$$

The simultaneous maximization of both (A27) and (A28) with respect to nL, nM1 and nM2 gives the following solutions:

$$n_L^* = \frac{(\mu g - w)}{3g^2} \qquad (A29)$$

$$n_{M1}^* = \frac{w}{g} \qquad (A30)$$

$$n_{M2}^* = \frac{(\mu g - 2w)}{3g^2} \qquad (A31)$$

Under the assumption (insert equation), we have (insert equation). Hence, at the equilibrium the profits are given by:

$$\pi_l^e/_{inv} = \frac{(\mu g - w)^2}{9g^2} - K \qquad (A32)$$

$$\pi_m^{inv}/_e = \frac{(\mu g - w)^2}{9g^2} + \frac{(1-g)w^2}{2g^2} - K \qquad (A33)$$

If (insert equation) which corresponds to (insert equation) = 0, M and L respond by choosing nL and nM1 in the following manner:

$$n_L^* = \frac{\mu g(2-g) - (3-2g)w}{(5-2g)g^2} \qquad (A34)$$

$$n_{M1}^* = \frac{(\mu g - w) + 2w(1-g)}{(5-2g)g} \qquad (A35)$$

Note that (insert equation). However, (insert equation) holds only if (insert equation). Thus under this condition, the profits of both firms are:

$$\pi_l^e/_{inv} = \frac{[\mu g(2-g) - (3-2g)w]^2}{g^2(5-2g)^2} - K \qquad (A36)$$

$$\pi_m^{inv}/_e = \frac{(3-g)[\mu g + (1-2g)w]^2}{2g^2(5-2g)^2} - K \qquad (A37)$$

The best response of M is given by the expression (A24). Thus, its profit is given by (A25).

Notes

1. In India, "Simens" provides a three-year training program for 140 young workers. "Intel" adopts a training strategy in all countries where it invests: Argentina, Brazil, Costa Rica, China, Malaysia, Russia, Poland etc.

2. M will be called multinational even if it's a potential one.
3. This assumption is kept to simplify the analysis. Our main results are qualitatively unchanged when we suppose that the host-country wage is lower than the foreign-country one.
4. The assumption of asymmetry between local and multinational firms with respect to their ability to train is supported by many empirical works (see the introduction).
5. For example, we consider here the specificity of the training as a result of M's superiority in term of specific organization, specific technology and method of management. Moreover, this superiority is effective if, and only if, the workers are sufficiently trained.
6. For all simulations, we take $w = 1$; $s = 6$; $K = 20$.
7. Fosfury et al (2001) focus on this positive effect of the FDI.

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