

Tariff-jumping FDI when quality matters

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Abstract

In this paper, we consider a situation where there are two firms, an incumbent domestic firm offering a high-quality good and an emerging multinational offering a product of lower quality. We analyse how the assumption of fixed costs of quality versus variable costs of quality - combined with the hypothesis of price versus quantity competition - affects the optimal trade policy, as well as the emerging multinational's incentive to invest rather than export.

Keywords: Vertical product differentiation, Bertrand and Cournot competition, trade policy, FDI

JEL classification numbers: L13, F13.

1 Introduction

Multinationals from emerging and developing countries are increasingly contributing to the growth of world foreign direct investment (FDI) flows. Developing economies' outward FDI stocks as a percentage of GDP rose from 3.8% in 1990 to 12.2% in 2003. Measured as a share of gross fixed capital formation, some countries invest more abroad than some developed ones: for example, Singapore (36%), Taiwan (10%), Chile (7%) and Malaysia (5%), compared to the United States (7%), Germany (4%) and Japan (3%). Others, such as India, China, Brazil, are at the take-off stage. According to UNCTAD (2004), the top 50 multinationals from the South are becoming 'transnationalized' at a faster rate than their developed-country counterparts.

This phenomenon is actually not new. Previous research on the so-called 'Third World Multinationals' (Wells, 1983) aimed at identifying their characteristics and pattern of FDI. These 'emerging multinationals' were usually smaller, more labor-intensive and technology-flexible than the developed-country multinationals. Also, their output was generally lower in quality and their competitive

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advantages were based on price rather than product differentiation. They invested in neighbouring developing countries where levels of industrialization and technological capabilities were lower, but where they would have a competitive edge over developed countries' firms due to closer demand conditions between home and host markets. Although this interpretation seems relevant to an analysis of downstream South-South FDI, it appears less relevant for explaining the existence of upstream South-North FDI, a topic, in fact, little explored.

In the late 1980s, countries such as South Korea and Taiwan, direct invested in a significant manner not only in developing countries but also in developed ones, before they were considered to have joined the ranks of industrialized nations (Van Hoesel, 1999; Sachwald, 2001). More recently, China and South Africa have been also targeting developed-country markets: the US is the second destination, after Hong Kong, for Chinese multinationals, and 75% of South Africa's FDI stock is in Western Europe.

A first intriguing issue relates to the nature of emerging multinationals' competitive advantages, which – according to received foreign investment theory (Caves, 1996) – are a necessary precondition for overcoming entry barriers to foreign markets. Considering that multinationals from the South are unlikely to possess intangible assets in the form of advanced technology or brands, notably vis-à-vis domestic firms in the North, they are more likely to target the lower-end segments of developed-country markets rather than focus on differentiation through quality and innovation. This was the case for Korean multinationals, where their early expansion in the US and EU was not based on R&D or marketing advantages, but on producing low cost mature products (Perrin, 2001).

The tariff-jumping motivation is another prospective influence to examine when one analyzes the growth of South-North FDI. The role of trade barriers' circumvention has been emphasized as a pull factor when it comes to explaining the remarkable growth of Japanese investment in the US and the EU (Azrak and Wynne, 1995; Barrel and Pain, 1999; Belderbos, 1997). As with the Japanese case, Korean firms have been sensitive to developed countries' trade restrictions and tariff-jumping has been an important determinant of Korean FDI, particularly in the electronics industry (Coestier and Perrin, 2005). This seems to be a necessary option for strongly export-oriented firms which are overly dependent on world demand, and thus need to protect their market share in case of trade barriers. Trade frictions between developed and developing countries are still frequent: e.g. the US and the EU launched, respectively, 42 and 17 anti-dumping actions between July 2003 and June 2004, of which 84% and 94% targeted developing and emerging economies. China was the top 'offender' with 19 cases, followed by India, Thailand and South Korea (WTO, 2004). Thus, emerging multinationals facing protectionist threats may well have a strong incentive to support their exports and expand their market presence by 'jumping' trade restraints through international production.

In this paper, we characterize this situation in a simple model where there are two firms, an incumbent domestic firm offering a high-quality good and an emerging multinational offering a product of lower quality. In contrast to the pioneering literature on strategic investment (Smith, 1987; Motta, 1992), which

emphasized the entry-deterring nature of FDI, emerging multinationals' direct investment in developed countries can be seen as a response to trade restraints which threaten to increase costs vis-à-vis local rivals (tariff-jumping FDI). This follows Belderbos' (1997a) analysis on tariff-jumping FDI in a Cournot setting. We analyse how the assumption of fixed costs of quality versus variable costs of quality - combined with the hypothesis of price versus quantity competition - affects the optimal trade policy, as well as the emerging multinational' incentive to invest rather than export. Both type of assumptions might be important. Variable costs of quality in contrast to fixed costs are reflected in market prices. In a context of product differentiation, product market competition matters. Under Bertrand competition, firms compete for the marginal consumer and the higher the quality differential, the higher the profits of both firms. Under Cournot competition, the profit of each firm increases with its own quality and decreases with the rival's quality.

The paper is organized as follows. In the next section, we present the basic model. In section 3, we examine the optimal protection situation when quality matters. Section 4 is devoted to the exports vs FDI decision. This is followed by concluding remarks.

2 The model

We consider an industry characterized by vertical product differentiation. There are two firms, the domestic firm labelled Firm 1 that produces high quality, and the foreign/emerging multinational firm labelled Firm 2 that produces low quality. Both firms sell their products to domestic consumers who are willing to buy one unit at most of the good, and have heterogeneous preferences identified by their taste for quality, θ , which is uniformly distributed on the interval $[\underline{\theta}, \bar{\theta}]$,

with density equal to 1.

The net utility of consuming good i for the consumer with taste θ is

$$U = \begin{cases} \theta s_i - p_i & \text{if he buys one unit of the good of quality } s_i \text{ at price } p_i \\ 0 & \text{otherwise} \end{cases}$$

where s_i refers to quality and p_i is the unit price of good i . Quality is exogenous and s_1 denotes the high quality and s_2 the low quality offered in the market ($s_1 > s_2$). The consumer who is indifferent between consuming high, or low,

quality good is identified by the taste parameter

$$\tilde{\theta}_1 = \frac{p_1 - p_2}{s_1 - s_2}$$

assuming $p_1 > p_2$. The consumer indifferent between buying the low quality good and not buying at all is identified by the taste parameter

$$\tilde{\theta}_2 = \frac{p_2}{s_2}$$

Consumers described by $\tilde{\theta}_2 > \theta > \underline{\theta}$ will not buy at all¹. Hence, demands for, respectively, the high (s_1) and low (s_2) quality good are:

$$x_1(p_1, p_2) = \bar{\theta} - \frac{p_1 - p_2}{s_1 - s_2}; \quad x_2(p_1, p_2) = \frac{p_1 - p_2}{s_1 - s_2} - \frac{p_2}{s_2} \quad (1)$$

and the respective inverse demands:

$$p_1(x_1, x_2) = \bar{\theta}s_1 - x_1s_1 - x_2s_2; \quad p_2(x_1, x_2) = (\bar{\theta} - x_1 - x_2)s_2 \quad (2)$$

Firm i 's cost function is:

$$C(s_i, x_i) = h(s_i)x_i + c(s_i)$$

where x_i is the output. In the following, we shall consider that the cost of quality improvement either falls into fixed costs, in which case, $h(s_i) = 0$, or into variable costs, in which case, $c(s_i) = 0$. When quality costs are fixed costs, they are considered as sunk costs in the market competition stage.

As noticed above, quality is considered as fixed: the quality choice is not investigated. We further assume that the foreign firm has a cost advantage over the domestic firm which means that the foreign firm supplies low quality and the domestic firm supplies high quality; $h(s_1) > h(s_2)$ and $c(s_1) > c(s_2)$ so that $C(s_1, x_1) > C(s_2, x_2)$ for all $x_1 = x_2$. This assumption is consistent with the results established by Motta (1993) and Herguera et alii (2002) that product differentiation always arises at equilibrium.

For the sake of simplicity, we assume that the foreign firm incurs the same cost of quality under investment or export (either fixed or variable). The decision to invest or export depends on the nature of additional costs the foreign firm prefers to avoid. Investment implies an additional fixed cost denoted G while it allows to save on exporting costs, that is unit transport cost, d , and potential tariff, t . Note that given these assumptions, whatever the positive tariff level and whatever the assumption on quality costs, the marginal cost under investment is lower than the marginal cost under export. It is less costly, in terms of variable production costs, to set up local production to substitute for exports. This is a necessary condition for the multinational to have incentives to invest rather than export when the government of the potential host country imposes a tariff.

¹We have to assume that the market is not covered for demand functions to be inverted.

3 Optimal protection when quality matters

In this section, we characterize the optimal protection when goods of different qualities are traded and firms compete either in quantity or price.

We derive the duopoly equilibrium solutions under each competitive setting, and the socially optimal tariff.

3.1 The Cournot case :

3.1.1 Duopoly equilibrium : the export case

We consider the situation where Firm 2 chooses to export on the foreign market and that the government imposes a tariff, t . The level of policy is chosen by the government before the market competition stage. The free trade situation is obtained setting $t = 0$.

The profit functions of Firms 1 and 2 are

$$\pi_1(x_1, x_2) = (\bar{\theta}s_1 - x_1s_1 - x_2s_2)x_1 - h(s_1)x_1 - c(s_1)$$

$$\pi_2(x_1, x_2) = (\bar{\theta} - x_1 - x_2)s_2 x_2 - (t + d + h(s_2))x_2 - c(s_2)$$

Both firms compete to attract consumers. In the Nash equilibrium, each firm maximizes its profit with respect to quantity, given the quality pair (s_1, s_2) .

Best response functions :

$$x_1(x_2) = \begin{cases} \frac{\bar{\theta}s_1 - x_2s_2 - h(s_1)}{2s_1} & \text{if } x_2 < \frac{\bar{\theta}s_1 - h(s_1)}{s_2} \\ 0 & \text{otherwise} \end{cases}$$

$$x_2(x_1) = \begin{cases} \frac{(\bar{\theta} - x_1)s_2 - h(s_2) - (t+d)}{2s_2} & \text{if } x_1 < \bar{\theta} - \frac{(t+d+h(s_2))}{s_2} \\ 0 & \text{otherwise} \end{cases}$$

Using the reaction functions, we find that quantities are²:

$$x_1(t) = \frac{\bar{\theta}(2s_1 - s_2) + t + d + h(s_2) - 2h(s_1)}{(4s_1 - s_2)} \quad (3)$$

$$x_2(t) = \frac{s_1 \bar{\theta}s_2 - 2(t + d + h(s_2))}{s_2(4s_1 - s_2)} + \frac{h(s_1)}{(4s_1 - s_2)} \quad (4)$$

²The condition $x_2(t) > 0$ defines a maximum value for t , denoted $t_{\max} = \frac{1}{2} \left[\left(\bar{\theta} + \frac{h(s_1)}{s_1} \right) s_2 - 2d - 2h(s_2) \right]$, which is positive under the following assumption H1: $\bar{\theta} + \frac{h(s_1)}{s_1} > \frac{2d - 2h(s_2)}{s_2}$. This assumption guarantees that, in equilibrium, whatever the entry strategy adopted by the foreign firm (export with or without tariffs or investment), it has a strictly positive demand.

These yield the following prices

$$p_1(t) = \frac{s_1 \bar{\theta} (2s_1 - s_2)}{4s_1 - s_2} + \frac{s_1 (t + d + 2h(s_1) + h(s_2))}{4s_1 - s_2} - \frac{h(s_1) s_2}{4s_1 - s_2} \quad (5)$$

$$p_2(t) = \frac{\bar{\theta} s_1 s_2 + (t + d + h(s_2))(2s_1 - s_2) + h(s_1) s_2}{(4s_1 - s_2)} \quad (6)$$

and equilibrium profits,

$$\begin{aligned} \Pi_1(t) &= p_1(t)x_1(t) - (h(s_1)x_1(t) + c(s_1)) = s_1 (x_1(t))^2 - c(s_1) \\ \Pi_2(t) &= p_2(t)x_2(t) - (h(s_2)x_2(t) + c(s_2)) = s_2 (x_2(t))^2 - c(s_2) \end{aligned}$$

The tariff contributes to an increase of the high quality firm output and a decrease in the foreign firm output. Prices of both firms increase with respect to free trade.

3.1.2 The socially optimal tariff :

We now focus on the host country. The government selects a tariff to maximize domestic welfare defined as the sum of domestic consumers surplus, domestic firm's profit, and tariff revenue. Indeed, when the emerging multinational exports, setting a tariff allows an increase of the high quality/domestic firm's profit and gives a tariff revenue to the government of the importing country.

When the multinational firm exports, consumers' surplus at the optimum is given by:

$$CS(t) = \int_{\frac{p_2(t)}{s_2}}^{\frac{p_1(t)-p_2(t)}{s_1-s_2}} (\theta s_2 - p_2(t)) f(\theta) d\theta + \int_{\frac{p_1(t)-p_2(t)}{s_1-s_2}}^{\bar{\theta}} (\theta s_1 - p_1(t)) f(\theta) d\theta$$

that is, with a uniform distribution for which the density is 1

$$\begin{aligned} CS(t) &= \left(\frac{p_1(t) - p_2(t)}{s_1 - s_2} - \frac{p_2(t)}{s_2} \right) \left[\frac{s_2}{2} \left(\frac{p_1(t) - p_2(t)}{s_1 - s_2} + \frac{p_2(t)}{s_2} \right) - p_2(t) \right] \\ &+ \left(\bar{\theta} - \frac{p_1(t) - p_2(t)}{s_1 - s_2} \right) \left[\frac{s_1}{2} \left(\bar{\theta} + \frac{p_1(t) - p_2(t)}{s_1 - s_2} \right) - p_1(t) \right] \end{aligned}$$

where $p_1(t)$ and $p_2(t)$ are given respectively by (5) and (6).

Tariff revenue is equal to the product of the tariff by the demand for the low-quality good

$$TR(t) = t \left[\frac{s_1 \bar{\theta} s_2 - 2(t + d + h(s_2))}{(4s_1 - s_2)} + \frac{h(s_1)}{(4s_1 - s_2)} \right]$$

And the profit of the high quality/domestic firm is

$$\Pi_1(t) = s_1 \left[\frac{\bar{\theta}(2s_1 - s_2) + t + d + h(s_2) - 2h(s_1)}{(4s_1 - s_2)} \right]^2 - c(s_1)$$

Defining the host country welfare as

$$W(t) = CS(t) + TR(t) + \Pi_1(t)$$

and maximizing with respect to t gives the following FOC (the second order condition being satisfied; $-3s_1/(4s_1 - s_2)s_2 < 0$)

$$\frac{s_1(\bar{\theta}s_2 - 3t - d - h(s_2))}{(4s_1 - s_2)s_2} = 0$$

Such that the socially-optimal tariff, t^* , is equal to

$$t^* = \frac{\bar{\theta}s_2 - (d + h(s_2))}{3} \quad (7)$$

The optimal tariff is proportional to the foreign firm's quality level and quality cost, and the size of the market. It is independent of the domestic firm characteristics.

In a Cournot setting with homogeneous product, Belderbos (1997a) establishes that the socially optimal tariff depends on the difference between the demand curve intercept and the marginal cost of the multinational. Otherwise stated, the optimal tariff is higher the greater the potential profits of the multinational. A similar result holds with differentiated product.

3.2 The Bertrand case

3.2.1 Duopoly equilibrium : the export case

The profit functions of Firms 1 and 2 are

$$\pi_1(p_1, p_2) = [p_1 - h(s_1)] \left(\bar{\theta} - \frac{p_1 - p_2}{s_1 - s_2} \right) - c(s_1)$$

$$\pi_2(p_1, p_2) = [p_2 - h(s_2) - t - d] \left(\frac{p_1 - p_2}{s_1 - s_2} - \frac{p_2}{s_2} \right) - c(s_2)$$

Maximizing profits with respect to price for both firms and using the reaction functions, we obtain the following prices:

$$p_1^b(t) = \frac{2\bar{\theta}s_1(s_1 - s_2) + s_1(d + t + 2h(s_1) + h(s_2))}{(4s_1 - s_2)} \quad (8)$$

$$p_2^b(t) = \frac{\bar{\theta}s_2(s_1 - s_2) + 2s_1(d + t + h(s_2)) + s_2h(s_1)}{(4s_1 - s_2)} \quad (9)$$

Because imposing a tariff on exports increases the marginal cost of the multinational firm, both firms charge higher prices.

We obtain the following demand functions³:

$$x_1^b(t) = \frac{2\bar{\theta}s_1(s_1 - s_2) + s_1(d + t - 2h(s_1) + h(s_2)) + h(s_1)s_2}{(s_1 - s_2)(4s_1 - s_2)} \quad (10)$$

$$x_2^b(t) = \frac{s_1}{s_2} \frac{\bar{\theta}(s_2s_1 - s_2)}{(s_1 - s_2)(4s_1 - s_2)} + \frac{s_1}{s_2} \frac{(d + t + h(s_2))(s_2 - 2s_1)}{(s_1 - s_2)(4s_1 - s_2)} + \frac{s_1h(s_1)}{(s_1 - s_2)(4s_1 - s_2)} \quad (11)$$

The equilibrium profits then are

$$\Pi_1^b(t) = \frac{(p_1^b(t) - h(s_1))^2}{s_1 - s_2} - c(s_1) \quad (12)$$

$$\Pi_2^b(t) = \frac{s_1}{s_2} \frac{(p_2^b(t) - t - d - h(s_2))^2}{s_1 - s_2} - c(s_2) \quad (13)$$

3.2.2 The socially optimal tariff :

As previously, the government selects a tariff to maximize domestic welfare defined as the sum of domestic consumers surplus, domestic firm's profit and tariff revenue.

When the multinational firm exports, consumers' surplus at the optimum is given by:

$$CS^b(t) = \left(\frac{p_1^b(t) - p_2^b(t)}{s_1 - s_2} - \frac{p_2^b(t)}{s_2} \right) \left[\frac{s_2}{2} \left(\frac{p_1^b(t) - p_2^b(t)}{s_1 - s_2} + \frac{p_2^b(t)}{s_2} \right) - p_2^b(t) \right] + \left(\bar{\theta} - \frac{p_1^b(t) - p_2^b(t)}{s_1 - s_2} \right) \left[\frac{s_1}{2} \left(\bar{\theta} + \frac{p_1^b(t) - p_2^b(t)}{s_1 - s_2} \right) - p_1^b(t) \right]$$

where $p_1^b(t)$ and $p_2^b(t)$ are given respectively by (8) and (9).

Tariff revenue is equal to the product of the tariff by the demand for the low-quality good

$$TR(t) = t \left[\frac{s_1}{s_2} \frac{\bar{\theta}(s_2s_1 - s_2)}{(s_1 - s_2)(4s_1 - s_2)} + \frac{s_1}{s_2} \frac{(d + t + h(s_2))(s_2 - 2s_1)}{(s_1 - s_2)(4s_1 - s_2)} + \frac{s_1h(s_1)}{(s_1 - s_2)(4s_1 - s_2)} \right]$$

³The condition $x_2^b(t) > 0$ defines a maximum value for t , denoted $t_{\max}^b = h(s_1)s_2 + \bar{\theta}s_2(s_1 - s_2) + (d + h(s_2))(s_2 - 2s_1)$, which is positive under the following assumption H2: $h(s_1)s_2 + \bar{\theta}s_2(s_1 - s_2) > (d + h(s_2))(2s_1 - s_2)$. As in the Cournot case, this assumption guarantees that, in equilibrium, whatever the entry strategy adopted by the foreign firm (export with or without tariffs or investment), it has a strictly positive demand.

And the profit of the high quality/domestic firm is

$$\Pi_1^b(t) = \frac{(p_1^b(t) - h(s_1))^2}{s_1 - s_2} - c(s_1)$$

Maximizing the host country welfare with respect to t gives the following FOC (the second order condition being satisfied; $s_1(-3s_1 + 2s_2)/(s_1 - s_2)(4s_1 - s_2)s_2 < 0$)

$$\frac{s_1(\bar{\theta}s_2 - d - t - h(s_2))(s_1 - s_2) - t(2s_1 - s_2)}{s_2(s_1 - s_2)(4s_1 - s_2)} = 0$$

Such that the socially-optimal tariff, t^{**} , is equal to

$$t^{**} = \frac{\bar{\theta}s_2(s_1 - s_2)}{(3s_1 - 2s_2)} - (h(s_2) + d) \frac{(s_1 - s_2)}{(3s_1 - 2s_2)} \quad (14)$$

The optimal tariff is proportional to the degree of product differentiation, the foreign firm's quality level and quality cost, and the size of the market.

3.3 Protection when quality matters

We first derive some considerations on the optimal protection in an non-competitive environment. Focusing on the alternative assumptions on costs of quality, one can establish,

Proposition 1 *As the market internalizes the cost of quality, whatever the type of competition, protection is higher under fixed costs than under variable costs of quality.*

Proof. Direct when considering the optimal tariffs, t^* and t^{**} , and assuming either fixed costs of quality, $h(s_2) = 0$, or variable costs of quality, $h(s_2) > 0$.

This result is straightforward as variable costs are reflected in market prices, whatever the type of competition, contrary to fixed costs which rather influence the number of active firms present in a market.

Now considering a particular type of quality costs and comparing the assumption of quantity versus price competition, we obtain that :

Proposition 2 : *Whatever the nature of quality costs, either fixed or variable, protection is higher under Cournot competition than under Bertrand competition.*

Proof. Remind that, by assumption, $s_1 > s_2$. Under variable costs of quality, one must compare $t^* = \frac{\bar{\theta}s_2 - (d+h(s_2))}{3}$ to $t^{**} = \frac{\bar{\theta}s_2(s_1-s_2)}{(3s_1-2s_2)} - (h(s_2) + d) \frac{(s_1-s_2)}{(3s_1-2s_2)}$. Under fixed quality costs, $t^* = \frac{\bar{\theta}s_2 - d}{3}$ must be compared to $t^{**} = \frac{\bar{\theta}s_2(s_1-s_2)}{(3s_1-2s_2)} - \frac{d(s_1-s_2)}{(3s_1-2s_2)}$.

Product market competition matters. Indeed, with Bertrand competition, firms compete for the marginal consumer so that profitability is influenced by the quality differential. The more differentiated the products, the less intense is the competition and the higher the profits of each firm. While with Cournot competition, the profit of each firm increases with its own quality and decreases with the quality of the other.

The results established in Propositions 1 and 2 are illustrated with a numerical example given in the following table. Considering possible parameters values: $\bar{\theta} = 1; d = 0.05; s_1 = 0.8; s_2 = 0.7; h(s_1) = 0.15; h(s_2) = 0.1; G = 0.005; c(s_1) = \frac{s_1^2}{200}; c(s_2) = \frac{s_2^2}{200}$;

type of quality costs	optimal protection Cournot	optimal protection Bertrand
fixed costs	0.216667	0.065
variable costs	0.1833	0.055

Table 1: Proposition 1 and 2 : optimal protection when quality matters

We now turn to the analysis of the tariff-jumping FDI motivation.

4 FDI or exports ?

We remind ourselves that, when the emerging multinational chooses to invest, it saves on transport costs and tariff while it incurs an additional fixed cost G . Choosing between exporting and investing for the emerging multinational firm thus results in a trade-off between a reduced marginal cost and an additional fixed cost G . Considering that the tariff-jumping motivation is a response to trade restraints, the decision to invest is directly influenced by the tariff level. We develop the idea that there exists a tariff value, the threshold tariff, that prevent the foreign firm to export. We now characterize this threshold tariff under each competitive setting.

4.1 The threshold tariff

In a Cournot setting, the profit of Firm 2 in case of investment is:

$$\pi_2^I(x_1, x_2) = (\bar{\theta} - x_1 - x_2)s_2x_2 - h(s_2)x_2 - (c(s_2) + G)$$

while Firm 1's profit is:

$$\pi_1(x_1, x_2) = (\bar{\theta}s_1 - x_1s_1 - x_2s_2)x_1 - h(s_1)x_1 - c(s_1)$$

yielding the Nash equilibrium:

$$\begin{aligned} x_1^I &= \frac{\bar{\theta}(2s_1 - s_2) - 2h(s_1) + h(s_2)}{4s_1 - s_2} \\ x_2^I &= \frac{\bar{\theta}s_1 + h(s_1)}{4s_1 - s_2} - \frac{2h(s_2)}{4s_1 - s_2} \frac{s_1}{s_2} \end{aligned}$$

and the following Firm 2's profit

$$\pi_2^I = \frac{[(\bar{\theta}s_1 + h(s_1))s_2 - 2h(s_2)s_1]^2}{s_2(4s_1 - s_2)^2} - (G + c(s_2)) \quad (15)$$

This profit must be compared to

$$\Pi_2(t) = s_2(x_2(t))^2 - c(s_2) = \frac{(\bar{\theta}s_1s_2 - 2s_1(d + t + h(s_2)) + h(s_1)s_2)^2}{s_2(4s_1 - s_2)^2} - c(s_2) \quad (16)$$

Choosing between exporting and investing for the emerging multinational firm results in a trade-off between a reduced marginal cost and an additional fixed cost G . A necessary and sufficient condition for the emerging multinational

to invest is that the profit realized under FDI is at least greater than the profit obtained under exports, $\pi_2^I \geq \Pi_2(t)$. This holds if

$$\frac{4(d + t)s_1 [h(s_1)s_2 + s_1(\bar{\theta}s_2 - d - t - 2h(s_2))]}{s_2(4s_1 - s_2)^2} \geq G \quad (17)$$

This condition, satisfied as an equality, defines an interval for tariff values, $[t_1, t_2]$, such that for all $t \in [t_1, t_2]$, the emerging multinational invests. These values are given in Appendix A. The length of this interval depends, among other thing, on the quality costs and the fixed cost of direct investment.

In a Bertrand setting, the profit of the foreign firm in case of investment is:

$$\pi_2^{b,I} = (p_2 - h(s_2)) \left(\frac{p_1 - p_2}{s_1 - s_2} - \frac{p_2}{s_2} \right) - (G + c(s_2))$$

Maximizing both firms' profits with respect to prices yields the following Nash equilibrium

$$\begin{aligned} p_1^{b,I} &= \frac{s_1 [2\bar{\theta}(s_1 - s_2) + h(s_2 + 2h(s_1))]}{4s_1 - s_2} \\ p_2^{b,I} &= \frac{s_2\bar{\theta}(s_1 - s_2) + h(s_1) + 2s_1h(s_2)}{4s_1 - s_2} \end{aligned}$$

and the following Firm 2's profit

$$\pi_2^{b,I} = \frac{s_1((h(s_1) + \bar{\theta}(s_1 - s_2))s_2 + h(s_2)(2s_1 - s_2)^2)}{(s_1 - s_2)s_2(4s_1 - s_2)^2} - (G + c(s_2))$$

This profit must be compared to

$$\begin{aligned} \Pi_2^b(t) &= s_2(x_2(t))^2 - c(s_2) \\ &= \frac{s_1(s_2(d + t + h(s_1) + h(s_2) - \bar{\theta}s_2) + s_1(-2(d + t) - 2h(s_2) + \bar{\theta}s_2))^2}{(s_1 - s_2)s_2(4s_1 - s_2)^2} - c(s_2) \end{aligned}$$

A necessary and sufficient condition for the emerging multinational to invest is that the profit realized under FDI is at least greater than the profit obtained under exports, $\pi_2^{b,I} \geq \Pi_2^b(t)$. This holds if

$$G \leq \frac{(d + t)s_1(2s_1 - s_2) [2s_2(\bar{\theta}(s_1 - s_2) + h(s_1)) - (2s_1 - s_2)(d + t + 2h(s_2))]}{s_2(s_1 - s_2)(4s_1 - s_2)^2} \quad (18)$$

This condition, satisfied as an equality, defines an interval for tariff values, $[t_1, t_2]$, such that for all $t \in [t_1, t_2]$, the emerging multinational invests. These values are given in Appendix A. The length of this interval depends, among other thing, on the quality differential, the quality costs, the fixed cost of direct investment.

Observe that, in a duopoly situation, not all values of this interval are acceptable. Denoting $\tilde{t} \equiv \text{Min}\{t_1, t_2\}$, and taking into account the limit values for t defined previously (*cf.* footnotes 2 and 3), one can establish the following proposition:

Proposition 3 *In a oligopolistic situation, there exists a tariff threshold value, \tilde{t} , that depends on both assumptions on quality costs and competitive environment, such that,*

For all $t < \tilde{t}$ the emerging multinational exports;

For all $t > \tilde{t}$, the emerging multinational invests.

Proof. Direct from the text.

To penetrate the foreign market, the emerging multinational considers the tariff threshold value, \tilde{t} , as well as the tariff indeed imposed by the government. The firm proceeds to tariff-jump if the government sets a tariff at least equal to this threshold value, \tilde{t} .

Given the foreign firm behavior with respect to the tariff level we have just described, what type of trade policy should be chosen by the host country ?

4.2 The host country trade policy

Let assume that the socially optimal tariff is greater than the tariff threshold value, \tilde{t} , defined previously. With this tariff value, the emerging multinational prefers to invest and we obtain the duopoly equilibrium under investment. From the host country point of view, what situation maximizes the domestic welfare ? Free trade or FDI ?

In the Cournot duopoly equilibrium under investment, consumers surplus is reduced because of the prices increase but the high quality/domestic firm profit increases. With respect to the free-trade situation, one has a net positive effect on domestic welfare if and only if

$$\Delta W = (CS_I - CS(0)) + (\pi_1^I - \Pi_1(0)) > 0$$

After simplifying, one obtains the following expression

$$\Delta W = \frac{d[2h(s_1)s_2 - (d + 2h(s_2))s_1]}{2s_2(4s_1 - s_2)}$$

The sign of ΔW depends on the sign of the term in bracket so that it is positive if

$$\frac{2h(s_1)}{s_1} > \frac{d}{s_2} + \frac{2h(s_2)}{s_2} \quad (19)$$

In the Bertrand setting, FDI is preferred to the free-trade situation, from a domestic welfare point of view if and only if

$$\Delta W = (CS_I^b - CS^b(0)) + (\pi_1^{b,I} - \Pi_1^b(0)) > 0$$

After simplifying, one obtains the following expression

$$\Delta W = \frac{ds_1[2h(s_1)s_2 - (d + 2h(s_2))s_1]}{2s_2(4s_1 - s_2)(s_1 - s_2)}$$

The sign of ΔW depends on the sign of the term in bracket so that it is positive if

$$\frac{2h(s_1)}{s_1} > \frac{d}{s_2} + \frac{2h(s_2)}{s_2} \quad (20)$$

One has the following proposition

Proposition 4 *From the host country point of view, whatever the competitive setting, (i) when the cost of quality is fixed, free trade is preferred to FDI; (ii) with variable costs of quality, FDI is preferred to free trade if and only if the cost configuration is such that $\frac{2h(s_1)}{s_1} > \frac{d}{s_2} + \frac{2h(s_2)}{s_2}$.*

Proof. Direct from the text.

In other words, the host country optimal trade policy is independent of the type of competition but depends on the assumption of quality costs and quality levels.

Finally, is the setting of the socially optimal tariff by the host country the optimal trade policy ? No, if the socially optimal tariff is circumvented, the second best trade policy is to set a tariff slightly lower than the tariff threshold value, \tilde{t} , decreases of profits and consumers surplus generated by this trade policy being more than offset by the tariff revenue. This second best policy may also be preferred by the foreign firm as well as the domestic firm, as the numerical example given in Appendix B illustrates.

5 Conclusion

In this paper, we consider a situation where there are two firms, an incumbent domestic firm offering a high-quality good and an emerging multinational offering a product of lower quality. With respect to protection, we establish that the optimal tariff depends on the costs of quality. As the market internalizes the costs of quality, whatever the type of competition, protection is higher under fixed costs than under variable costs of quality. Whatever the nature of quality costs, either fixed or variable, protection is higher under Cournot competition than under Bertrand competition.

With respect to the emerging multinational' incentive to invest rather than export (tariff-jumping FDI), the decision relies on the comparison between variable costs and fixed costs : investing abroad increases fixed costs while exporting increases variable costs. We show that in a oligopolistic situation, there exists a tariff threshold value under which the multinational exports and above which the multinational invests. In order to penetrate the foreign market, the emerging multinational considers the tariff threshold value as well as the tariff imposed by the host country. The multinational proceeds to tariff-jump if the host country sets a tariff at least equal to the threshold value. This threshold value is influenced by both types of assumptions.

Finally, we derive some conclusions on the host country optimal trade policy. In case the socially optimal tariff is circumvented, setting a tariff slightly lower than the tariff threshold value may be welfare improving. Such a second best policy may also be preferred by the foreign firm as well as the domestic firm.

Appendix A

In the Cournot setting, the interval of tariff values is,

$$\begin{aligned}
 t_1^c &= \frac{1}{2s_1}(-2ds_1^2 - 2h(s_2)s_1^2 + h(s_1)s_1s_2 + \bar{\theta}s_1^2s_2 - \\
 &\quad s_1(4h(s_2)^2s_1^2 - 4h(s_2)h(s_1)s_1s_2 - 16Gs_1^2s_2 \\
 &\quad - 4\bar{\theta}h(s_2)s_1^2s_2 + h(s_1)^2s_2^2 + 8Gs_1s_2^2 + 2\bar{\theta}h(s_1)s_1s_2^2 + \bar{\theta}^2s_1^2s_2^2 - Gs_2^3)^{1/2}) \\
 t_2^c &= \frac{1}{2s_1}(-2ds_1^2 - 2h(s_2)s_1^2 + h(s_1)s_1s_2 + \bar{\theta}s_1^2s_2 + \\
 &\quad s(4h(s_2)^2s_1^2 - 4h(s_2)h(s_1)s_1s_2 - 16Gs_1^2s_2 \\
 &\quad - 4\bar{\theta}h(s_2)s_1^2s_2 + h(s_1)^2s_2^2 + 8Gs_1s_2^2 + 2\bar{\theta}h(s_1)s_1s_2^2 + \bar{\theta}^2s_1^2s_2^2 - Gs_2^3)^{1/2}
 \end{aligned}$$

In the Bertrand setting, one has,

$$\begin{aligned}
 t_1^b &= \frac{1}{\sqrt{s_1}(2s_1 - s_2)}(\sqrt{s_1}(s_2(d + h(s_1) + h(s_2) - \bar{\theta}s_2) + s_1(-2(d + h(s_2) + \bar{\theta}s_2) \\
 &\quad - ((-2h(s_2)s_1(h(s_1) + \bar{\theta}(s_1 - s_2))(2s_1 - s_2)s_2 \\
 &\quad + h(s_2)^2s_1(-2s_1 + s_2)^2 + s_2(-16Gs_1^3 + s_1(24Gs_1 + (h(s_1) + \bar{\theta}s_1)^2)s_2 \\
 &\quad - s_1(9G + 2\bar{\theta}(h(s_1) + \bar{\theta}s_1)) + (G + \bar{\theta}^2s_1s_2^3)))^{1/2}) \\
 t_1^b &= \frac{1}{\sqrt{s_1}(2s_1 - s_2)}(\sqrt{s_1}(s_2(d + h(s_1) + h(s_2) - \bar{\theta}s_2) + s_1(-2(d + h(s_2) + \bar{\theta}s_2) \\
 &\quad + ((-2h(s_2)s_1(h(s_1) + \bar{\theta}(s_1 - s_2))(2s_1 - s_2)s_2 \\
 &\quad + h(s_2)^2s_1(-2s_1 + s_2)^2 + s_2(-16Gs_1^3 + s_1(24Gs_1 + (h(s_1) + \bar{\theta}s_1)^2)s_2 \\
 &\quad - s_1(9G + 2\bar{\theta}(h(s_1) + \bar{\theta}s_1)) + (G + \bar{\theta}^2s_1s_2^3)))^{1/2})
 \end{aligned}$$

Appendix B

A numerical example

The alternative situations are described in the following tables.

Cournot Situation

Parameters values : $\bar{\theta} = 1; d = 0.05; s_1 = 0.8; s_2 = 0.7; h(s_1) = 0.15; h(s_2) = 0.1; G = 0.005$

Trade policy	Domestic firm profit	foreign firm profit	Welfare host country
free trade ; $t = 0$	0.072	0.0412857	0.179643
$t_1 = 0.00720728$	0.102895	0.00829143	0.201765
$t^* = 0.183333$	0.102895	0.00396254	0.20269
FDI	0.06272	0.00829143	0.179786

Table 2: Cournot situation with variable costs

Parameters values : $\bar{\theta} = 1; d = 0.01; s_1 = 0.8; s_2 = 0.7; c(s_1) = \frac{s_1^2}{200}; c(s_2) = \frac{s_2^2}{200}; G = 0.005$

Trade policy	Domestic firm profit	Foreign firm profit	Welfare host country
free trade ; $t = 0$	0.11232	0.0502129	0.269371
$t_1 = 0.0125796$	0.139947	0.01923	0.293392
$t^* = 0.105$	0.171022	0.00161349	0.301562
FDI	0.10048	0.01923	0.2688

Table 3: Cournot situation with fixed costs

Bertrand situation

Parameters values : $\bar{\theta} = 1; d = 0.05; s_1 = 0.8; s_2 = 0.7; h(s_1) = 0.3; h(s_2) = 0.1; G = 0.005$

Trade policy	Domestic firm profit	Foreign firm profit	Welfare host country
free trade ; $t = 0$	0.0259003	0.0234411	0.143635
$t_1 = 0.00720728$	0.0271705	0.0214106	0.145228
$t^* = 0.0835714$	0.0424956	0.00554654	0.153292
FDI	0.0241884	0.0214106	0.144938

Table 4: Bertand situation with variable costs

Parameters values : $\bar{\theta} = 1; d = 0.01; s_1 = 0.8; s_2 = 0.5; c(s_1) = \frac{s_1^2}{200}; c(s_2) = \frac{s_2^2}{200}; G = 0.005$

Trade policy	Domestic firm profit	Foreign firm profit	Welfare host country
free trade ; $t = 0$	0.105691	0.0128852	0.352435
$t_1 = 0.0125796$	0.110228	0.0102109	0.355869
$t^* = 0.105$	0.146404	-0.000845978	0.367679
FDI	0.10215	0.0102109	0.352356

Table 5: Bertrand situation with fixed costs

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