The Effects of Antidumping Policy on Trade Diversion: A Theoretical Approach

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Abstract

The purpose of this paper is to contribute theoretically to the literature on the effects of antidumping policy on trade diversion. Trade diversion refers to a shift in trade flows away from firms whose imports are under scrutiny for dumping (named firms) to firms that import the same product but are not faced by any investigations (non-named firms). Previous empirical studies show that import diversion in Europe - compared to the United States - is limited, suggesting that EU's antidumping policy is more effective in keeping imports out. The explanations formulated to account for the heterogeneity in trade diversion are the lower duty levels and the greater extent of uncertainty surrounding the EU antidumping policy. This paper develops a model to explain the empirical evidence and formulates new explanations on the effects of antidumping policy on trade diversion.
Keywords and Phrases: Trade Diversion, Antidumping, Cournot Competition, Signal Extraction.

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1 Introduction

Consecutive multilateral negotiations at the level of the WTO have resulted in the reduction of import tariffs, but not much initiative has been directed toward nontariff barriers. Moreover, recent trends in the usage of unfair trade laws indicate that they are being used more frequently, by more countries, and against more products (Stiglitz (1997) and Prusa (2005)). Advocates of unfair trade measures claim that it deters unfair trade and guarantees a more healthy competitive environment for the industries who petition the law suits. Opponents, on the other hand, claim that the abuse of these laws represents one of the most ominous threats to international trade (Stiglitz (1997)). Nonetheless, there is a growing consensus among advocates and opponents of the need to better understand the effects of nontariff barriers on both domestic and foreign firms.

Antidumping (henceforth, AD) is the most popular trade defense instrument, used intensively by the United States and the European Union to protect their producers from, supposedly, unfair foreign competition. However, unlike traditional forms of protection, current AD measures are selective and less transparent than tariffs (Ethier and Fischer, 1990), giving rise to less desirable externalities. One of these externalities is trade diversion, that is the shift in trade flows away from the alleged or named countries to the benefit of non-named countries that import the same good.

Previous studies have quantitatively measured the amount of trade diversion for the United States (Prusa, 1997), the European Union (Konings, Vandenbussche and Springael, 2002) and Mexico (Niels 2003). An interesting result drawn from these studies is that although AD protection induces substantial trade diversion from named to non-named countries in the United States (Prusa 1997), it does so to a less significant degree in the European Union (Konings et al 2002) and Mexico (Niels 2003), implying that AD measures are more effective in reducing foreign imports in either Europe or Mexico. Three main explanations are advanced to explain the lower amount of trade diversion found for Europe (Konings et al). The first is that the lower duty levels in the EU limits the benefits of protection for the non-named countries. The second is the lack of transparency regarding the antidumping procedure in Europe that could explain a more prudent reaction by exporters from non-named countries to the EU. And finally, the higher degree of market fragmentation in Europe could explain the lower degree of import diversion. To date, these studies have mainly focused on

whether there is substantial trade diversion and have not provided a theoretical explanation.

This paper endeavours to provide a theoretical explanation for the empirical evidence of country level heterogeneity in trade diversion as a response to AD policy. In particular, it addresses two of the three explanations advanced by the empirical literature, namely the duty level and the transparency of the AD policy. As for the first, the result is straightforward and intuitive, it reaches the same conclusion as the one formulated by the empirical literature. It concludes that the lower level of duty leads to less trade diversion because it limits the benefits for the non-named countries to increase their exports to the EU. As for the second, regarding the opacity of AD policy leading to lower trade diversion, the theoretical model shows that under some conditions trade diversion can also be low under a transparent AD policy. This is an interesting result because it provides a new explanation to the literature on the effects of AD policy on trade diversion.

The underlying argument in this paper is conceptually simple. While named firms directly face an AD tariff, non-named firms face the uncertainty of being future AD targets. To understand the consequences of this uncertainty on trade diversion it is helpful to know how firms forecast the future. It is argued in the model that firms receive some public information - through signaling, that reveals the future intentions of the AD authority, and the more transparent the AD policy, the more accurate the signal. Transparency in this paper implies that the firms face less uncertainty when forming their expectations. For example, if the public signal reveals the information that the government is anxious to protect the domestic industry, then under a perfectly transparent AD policy, non-named firms would be responsive and reduce their exports. However, under opacity, firms will not be as responsive for they do not know how the government would react in the future. Although non-named firms reduce their trade flows, the model shows that they do to a less significant degree than under transparency.

This result clearly has relevance for European AD policy, because up to now the literature on the AD effects on trade diversion has seemed to conclude that the low amount of import diversion in Europe suggests that the AD policy is more efficient in protecting the domestic industry from foreign imports (Konings and al 2002). And since the AD policy in the EU is not as transparent as the one the the US, it is doing a better at protecting the domestic market. The theoretical result in this paper, however, points out

that it is debatable.

The theoretical model developed in this paper formalizes the idea that AD policy does not only affect the imports of targeted countries but also the imports of non-named countries, due to information asymmetries surrounding the decision making process of the investigations. The analysis is conducted using a model of Cournot competition, with information transmission that is revealed a form of a noisy signal, involving three firms and a government administrative authority in a two-stage game. In the first stage, the government imposes an optimal duty on the named firm by maximizing its objective function described by a weighted average of the domestic firm's profit, consumer surplus and the AD tariff revenu . In the second stage, firms set their output quantities in the presence of a publicly available stochastic signal S, that informs the firms on the future use of AD policy.

Earlier papers have analyzed theoretically information transmission in Cournot and Bertrand competition where firms observe a signal (Gal-Or, 1986; Cooper and Riezman, 1989), and recent papers have applied the model to study trade policy design (Caglayan, 2000; Caglayan and Usman (2004)). The present paper contributes to the line of theoretical literature that focuses on AD policy in imperfectly competitive markets.

The rest of the paper is structured as follows: Section 2 presents the assumptions and the information structure of the model. Section 3 analyzes the model by using the concept of backward induction and compares the output of the firms when they receive some information about the future AD policy in the form of a noisy signal and a benchmark case, in which trade diversion is total. Section 4, analyzes the first stage and the government's objective function. Section 5, aims to explain the differences in trade diversion between the EU and the US. Section 6, provides an extension to the model by explaining how the named firm gets targeted in the first place. Finally, Section 4 concludes.

2 Setup of the Model

Consider three asymmetric risk-neutral Cournot firms, a home (h) and two foreign firms, one named (n^*) and one non-named (nn^*). All firms produce a homogeneous good that is sold on the domestic market. The point of departure of the game is as follows. First, the AD administration names one

of the foreign firms by imposing an AD duty on the firm. Second, all firms set their output quantities in the presence of a publicly available stochastic signal S which informs them on the intentions of the AD administration in using future AD policy on the non-named firm. The information content of the signal depends on the transparency of the AD policy. The present analysis focuses mainly on how the exports of the non-named firm to the domestic country is affected given the information content of the signal.

The domestic firm has constant marginal cost of production c^h and its output for the home market is Q^h. Among the foreign firms, one has a low constant marginal cost denoted by c_L^* and the other a high marginal cost c_H^* such that: $c_H^* > c_L^*$. In particular, it is assumed that marginal cost of the foreign firms include transport costs per unit. Note that, in order for the government to use AD policy, a foreign firm has to be causing injury to the home market, i.e., it must be that the marginal cost including transport cost has to be lower than the domestic cost of production. Consequently, it is assumed that both foreign firms have a cost advantage over the home firm, such that: $c^h > c_H^* > c_L^*$.

For simplicity, it is assumed at first that the government chooses to name the low cost foreign firm in an AD investigation. This simplifying assumption will be relaxed in section 6 of the paper, where the naming procedure of the firms is endogenised. Accordingly, the low cost foreign firm is referred to as the named firm and the high cost firm as the non-named. Therefore, the exports of the named and non-named foreign firm to the home market are respectively denoted by Q^{n^*} and Q^{nn^*}.

The inverse market demand function for the product is assumed to be linear and is given by

$$P(Q) = \alpha - \beta Q$$

where $P(Q)$ denotes the market price and Q the total demand. The demand parameters are non-stochastic and positive: $\alpha, \beta > 0$ and $\alpha > c^h$. At equilibrium, market demand equals the total supply of the individual outputs such that

$$Q = Q^h + Q^{n^*} + Q^{nn^*}$$

If t denotes unit duty tariff, then the marginal cost of serving the relevant market for the named firm is $c_L^* + t$. The home firm and the foreign named firm's profit functions are respectively

$$\Pi^h = [P(Q) - c^h]Q^h$$

$$\Pi^{n^*} = [P(Q) - (c_L^* + t)]Q^{n^*}$$

While the named firm is directly faced with a tariff, the non-named firm faces the uncertainty of being targeted in the future by an AD measure. In particular, it is assumed the marginal cost of the non-named firm is $c_H^* + \tau$, where τ is a stochastic variable drawn from some distribution with a strictly positive mean $E(\tau) = \bar{\tau} > 0$ and variance $Var(\tau) = \sigma_\tau^2$ whenever $t > 0$. It should be stressed that when $t = 0$ then $\tau = 0$. Indeed, under such a setting since the government does not impose any AD duty on the named firm, the non-named firm does not face any uncertainty as well. In addition, let $\Delta_H = c - c_H^*$ represent the cost difference between the home and the non-named firm. It is assumed that $\bar{\tau} = \bar{\tau}(\Delta_H)$ and that $\partial\bar{\tau}/\partial\Delta_H > 0$, implying the higher the cost advantage of the non-named firm, the higher the risk of causing injury and consequently facing a higher duty. Thus the non-named firm's profit functions is

$$\Pi^{nn^*} = [P(Q) - (c_H^* + \tau)]Q^{nn^*}$$

Before proceeding, it is important at this point to formalize the information structure of the model. Asymmetric information is modeled by a random variable τ, which indicates the future uncertainty surrounding the non-named firm being targeted with an AD duty. Ex post, when uncertainty is realized, $\tau > 0$ means that the non-named firm will face an AD duty. Ex ante however, before uncertainty is realized, firms have two sources of information. The first is their general knowledge about the future outcome, that is they know that they could be future targets. Mathematically, this translates in having prior knowledge on the distribution of τ. The second,is the additional information they gain (at the beginning of the second stage) in the form of a noisy signal

$$S = \tau + \epsilon$$

where ϵ is a white noise with mean $E(\epsilon) = 0$ and $Var(\epsilon) = \sigma_\epsilon^2 \geq 0$. The extent to which the firms take this information into consideration depends on how clearly the signal informs them about the future AD policy.

The definition of transparency in this paper focuses on the quality of information the signal contains. It does not refer to having perfect information about the future. Transparency refers to how clearly the firms, after having received a publicly available information, can extract useful information about the future state of the world - which still remains uncertain. For example the more transparent the AD policy, the more clear the signal

- translated by a low σ_ϵ^2, consequently leading firms to anticipate more precisely the future AD policy. Under opacity, i.e. a high σ_ϵ^2, the firms cannot extract clearly from the signal how the government intends to use the AD mechanism in the future.

Some further consideration are needed to make the computation simple. It is assumed that ϵ and τ are independently distributed, which implies that $Cov(\tau, \epsilon) = 0$. Under the above assumptions, and using the result from Ericson (1969), the conditional expectation of τ given a signal S is

$$\begin{aligned} E(\tau|S) &= E(\tau) + \delta(S - E(\tau)) \\ &= \bar{\tau} + \delta(S - \bar{\tau}) \end{aligned} \tag{1}$$

where $\delta = \sigma_\tau^2/(\sigma_\tau^2 + \sigma_\epsilon^2)$ is a measure of the quality of information and therefore transparency. Expression (1), is a Bayesian updated expectation that describes how information is used to update prior expectations. It corresponds to a weighted average of the prior belief $E(\tau)$ and the new information obtained from the signal.[1]

To summarize, in this two stage game of incomplete information, the time and information structure of the firms results as:

Stage I. The AD authority imposes an optimal tariff on the named firm by maximizing the weighted sum of tariff revenues, consumer surplus, and producer's surplus.

Stage II. The firms set output quantities Q^h, Q^{n^*} and Q^{nn^*} in the presence of a publicly available stochastic signal S.

[1]For example, if the signal is equal to zero ($S = 0$), the non-named firm receives the information that it will not be subject to a future AD duty. Moreover, if the AD procedure is fully transparent so that $\sigma_\epsilon^2 = 0$, then the expected future AD duty given the signal is

$$E(\tau|S) = \bar{\tau} + \frac{\sigma_\tau^2}{\sigma_\tau^2 + 0}(0 - \bar{\tau}) = 0$$

In this case trade diversion is maximum because the firms trust completely the information they receive.

3 Equilibrium Strategies

As explained in the previous section, AD policy will affect the equilibrium volumes in the market for all firms. The present section characterizes the (Bayesian) equilibrium strategies, while comparing them to benchmark (denoted by subscript B)where the non-named firm does not face any threat as to the use of future AD actions. It corresponds to the case where trade diversion is total. In terms of the present model, the non-named firm receives perfect information that it will not be subject to an AD duty. More precisely, the benchmark scenario allows one to compare how information uncertainties can effect the equilibrium outputs. In the course the analysis, these equilibria are derived by the standard backward induction method.

3.1 Total Trade Diversion as The Benchmark

It is straightforward to show that total trade diversion - the case where the intended effect of antidumping policy in reducing fierce competition for the domestic producer is totally offset by the increase in competition from non-targeted firm - corresponds to the situation where the non-named firm knows with certainty that it will not be targeted by an AD action. Here, each firm maximizes its profit by setting its output to solve

$$\max_{Q^i \geq 0} \Pi^i, \quad i \in \{h, n^*, nn^*\}$$

If optimal production resulting from the Cournot maximization problem for the home, named and non-named firms are positive, the output of each firm in the industry resulting from an imposition of a duty tariff, obtained from the first order conditions for the home, named and non-named firm are:

$$Q_B^h = \frac{\alpha + (c_L^* + t) + c_H^* - 3c^h}{4\beta} \tag{2}$$

$$Q_B^{n^*} = \frac{\alpha + c^h + c_H^* - 3(c_L^* + t)}{4\beta} \tag{3}$$

$$Q_B^{nn^*} = \frac{\alpha + c^h + (c_L^* + t) - 3c_H^*}{4\beta} \tag{4}$$

Having derived the optimum quantities, one can now consider what happens to the total supply and the price in the domestic market in presence of AD protection. It is easy to verify that in absence of AD duty, the total output is higher and the price of the good lower than in the presence of an AD

measure.

The result obtained in the benchmark case is standard. The imposition of a duty on the named firm can be seen as an upward shift of the home and non-named firm's best response function. In other words, the antidumping measure, decreases the volume of imports for the named firm and increases the output of both the domestic and non-named firm. The Benchmark scenario puts to doubt the effectiveness of AD policy as a tool for protection.

3.2 Equilibrium Strategies with Uncertainty

In this section, it is assumed, that the antidumping authority in the relevant market, imposes a duty t on the named firm and at the same time the firms receive a signal about the future intentions of the government. In the following scenario, the firms determine their output level conditional on the signal. They choose their quantities by maximizing the conditional expected payoff

$$\max_{Q_i^* \geq 0} \; E(\Pi^i|S), \quad i \in \{h, n^*, nn^*\}$$

By using equation (1) and since the signal is common to all firms, the output $E(Q^i|S)$ is denoted by Q_S^i. The equilibrium strategies for the home, *named* and *non-named* firms are

$$Q_S^h = Q_B^h + \frac{1}{4\beta}\big(\bar{\tau} + \delta(S - \bar{\tau})\big) \tag{5}$$

$$Q_S^{n^*} = Q_B^{n^*} + \frac{1}{4\beta}\big(\bar{\tau} + \delta(S - \bar{\tau})\big) \tag{6}$$

$$Q_S^{nn^*} = Q_B^{nn^*} - \frac{3}{4\beta}\big(\bar{\tau} + \delta(S - \bar{\tau})\big) \tag{7}$$

Notice that the optimal outputs are composed of a the benchmark quantities and a stochastic part. Consequently, two effects are at play. First, the duty effect decreases the output of the named firm and increases the quantity of the home and non-named firm. Second, the signaling effect decreases the output of the non-named firm but at the same time increases the output of the home and named-firm. Indeed, once the non-named firm faces uncertainty, it becomes more prudent in increasing its import, giving opportunity to the home firm to increase its output and to the named firm to regain a part of its market share. Bare in mind that the second effect can be equal to zero, it corresponds to the extreme case of a perfectly transparent AD policy is ($\delta = 1$) and firms receiving information that the non-named firm

will not be subject to a future AD duty ($S = 0$). The interesting conclusion is that these two effects both work out to the advantage of the home firm, and this leads to the following proposition:

Remark 1 *When firms update their belief with a signal that reveals information about the future intention of the AD administration in protecting the home country:*

1. *the imports from the non-named firm are lower than (or equal to) the benchmark quantity*
2. *the imports of the named firm are higher than (or equal to) the benchmark quantity*
3. *the production of the domestic industry is higher than (or equal to) the benchmark quantity*

Again it is interesting to consider what happens to the total supply and the price in the domestic market with respect to the benchmark scenario. It is easy to verify that in the presence of the signaling effect, the total output is lower (or equal) and the price of the good higher than (or equal to) the benchmark.

4 The Governments Objective Function

This section analyzes the first stage of the game. It is assumed that the government maximizes its objective function described by a weighted average of the domestic firm's profit, the consumer surplus and the antidumping tariff revenue:

$$G = \omega \; CS + \Pi^h + tQ^{n^*} \tag{8}$$

where $\omega \in [0, 1]$ is the weight attached to the consumer surplus. The reason for choosing a weight on the consumer surplus rather than the producer surplus is to be able to compare the institutional difference between the United States and the European Union. Indeed, in the United states since there is no community interest clause in the AD law, this is interpreted by $\omega = 0$, that is the government imposes a tariff without taking into account the consumer surplus. On contrary, in Europe, the AD law includes a community interest clause and this is hence interpreted by $\omega = 1$. In reality, ω could be somewhere in between zero and one, but for analytical purposes

only the two extreme cases are taken into account. As done previously, this section starts by determining the optimal tariff the benchmark and then proceeds to the general case where the government has private information about its future intentions.

4.1 The Benchmark: Total Trade Diversion

Assuming an interior solution where the domestic market is supplied by both domestic production and imports from the foreign industry, the maximization of government objective function is:

$$G_B = \omega \ \frac{\beta Q^2}{2} + \Pi^h + tQ_B^{n^*}$$

The optimal anti-dumping policy under complete information is obtained by setting $\partial G/\partial t$ to zero

$$t_B^o = \frac{(6-3\omega)\alpha + (\omega-2)c^h + (\omega-10)c_L^* + (\omega+6)c_H^*}{22-\omega} \tag{9}$$

Further differentiation yields the second-order condition for the maximization of the objective function and it requires that $\omega < 22$. Since the outputs of the domestic and foreign industry are assumed to be positive quantities, the optimum anti-dumping duty for the government is unambiguously positive.

4.2 Objective Function with Uncertainty

In the case where the firms receive a signal about a possible future tariff, the government objective function becomes

$$G_S \ = \ \omega \ \frac{\beta \left[E(Q|S)\right]^2}{2} \ + E(\Pi^h|S) + t \ E(Q^{n^*}|S) \tag{10}$$

The optimal anti-dumping policy under incomplete information is obtained by setting $\partial G_S/\partial t$ to zero. This gives:

$$t_S^o = \frac{(\omega+6)}{(22-\omega)}\big(\bar{\tau} + \delta(S-\bar{\tau})\big) + t_B^o \tag{11}$$

Proposition 1 *The optimal tariff under incomplete information is positive and is greater or equal to the optimal benchmark tariff*

Intuitively, when firms observe the home government's future policy to form their Bayesian updated expectations, they are still unsure of the policy outcome, since the the signal is noisy. The uncertainty about becoming future targets of AD measures makes the non-named firm prudent and so it does not increase its imports as much to the home market compared the benchmark scenario. This decrease in trade diversion provides an opportunity for the home market to increase its own output and moreover provides an opportunity for the named country to gain back some of the market share it had lost because of the AD tariff. From equation (11) , the AD authority takes the latter effect on the named countries into account and therefore sets a higher level of tariff than the benchmark scenario.

5 Explaining Heterogeneity in Trade Diversion between the European Union and the United States

The purpose of this section is to do a comparative statics analysis to point out the heterogeneity in trade diversion between the two extreme welfare cases in the model which for convenience have been labeled United States and European Union. Three major conclusions are reached. The first is standard, the model shows that lower trade diversion in Europe is in part due to lower duty levels. The second shows that trade diversion can also be low when there is political transparency. In fact, it shows that under a transparent policy, firms respond correctly to the signal and if the latter divulges that the government is anxious to protect the home firm then the non-named firm will decrease its output. Although this conclusion leads to an interesting result it does not account for the empirical evidence that overall trade diversion is lower in Europe. The final, shows that under opacity - firms are not certain about the future behavior of the AD authority - the higher the cost advantage of the non-named firm, the higher the expectation of causing injury and therefore the more prudent will be the non-named firm in increasing its output.

5.1 The Community Interest Clause

Lower duty levels result from the European AD law which includes a community interest clause. Consequently the AD authority puts more weight on the consumer surplus when computing the optimal tariff level. This can be shown - and it remains valid for the benchmark tariff - how the optimal tariff

(11) depends on the the weight (ω) the government puts on the consumer surplus. The effect of ω on t_S^o can be assessed by totally differentiating the first order condition of the government objective function with respect to ω

$$\frac{dt_S^o}{d\omega} = -\frac{\partial^2 G_S}{\partial\omega\partial t} / \frac{\partial^2 G_S}{\partial t^2} < 0 \tag{12}$$

where

$$\frac{\partial^2 G_S}{\partial\omega\partial t} = -\frac{Q_S}{4} < 0 \tag{13}$$

Q_S denotes the total supply the individual outputs with signaling. Since the denominator in (12) is the second-order condition for welfare maximization, which is negative. Thus, the more weight the government puts on consumer surplus, the lower the duty imposed on the named firms. The following conclusion can hence be reached:

The optimum anti-dumping duty (specific tariff) is positive and decreasing in the weight on the consumer surplus in the objective function of the government.

Hence the model gives one possible explanation for the observation that trade diversion in the United States is higher than in Europe since there is no community interest clause in the American AD law. This implicates that when the consumer surplus is not taken into account (i.e. $\omega = 0$), the government imposes a higher tariff leading to more trade diversion. The effect of a higher tariff resulting from a lower ω on the the non-named equilibrium quantities in (7), can be assessed by totally differentiating $Q_S^{nn^*}$ with respect to ω:

$$\frac{dQ_S^{nn^*}}{d\omega} = \frac{\partial Q_S^{nn^*}}{\partial t_S^o} \frac{dt_S^o}{d\omega} < 0 \tag{14}$$

This leads to the following proposition:

Proposition 2 *Trade Diversion is higher in the United States and it results from the fact that the government imposes higher duties on named countries.*

Since expression (14) is unambiguously negative, the less weight government puts weight on consumer surplus, the higher the tariff duty and therefore trade diversion.

5.2 Political Transparency

The quality of information δ in the government's signal S is regarded as a measure of political transparency about how clear is the government about its AD policy. To understand the effect of political transparency on trade diversion, $Q_S^{nn^*}$ is totally differentiated with respect to δ:

$$\begin{aligned} \frac{dQ_S^{nn^*}}{d\delta} &= \frac{\partial Q_S^{nn^*}}{\partial t}\frac{dt}{d\delta} + \frac{\partial Q_S^{nn^*}}{\partial \delta} \\ &= -\frac{(30+\omega)(S-\bar{\tau})}{(22-\omega)2\beta} \end{aligned} \tag{15}$$

Which leads to the following proposition:

Proposition 3 *As the AD policy becomes more transparent, δ increases, and firms become more responsive to the public signal:*

1. *if $S > \bar{\tau}$, the future intentions of the government to impose an AD duty is higher than what the firms expect and thus leads to lower trade diversion*

2. *if $S < \bar{\tau}$, the future intentions of the government to impose an AD duty is lower than what the firms expect and thus leads to higher trade diversion*

Proposition 3 suggests that when the non-named firm receives information that a home sector is very likely to be protected in the future $S > \bar{\tau}$, under a transparent policy it will be prudent and reduce its output to the home market. On the contrary, under opacity, the non-named firm will not be as prudent because it does not rely on the information it has receives. As a result, the non-named firm does not decrease its imports as much. In other words, proposition 4 suggests that transparency is for governments because forces firms to respond correctly to any signal that reveals information about the future. Although this leads to an interesting conclusion it does not provide an explanation as to why trade diversion is lower in Europe as opposed to the United States.

It is finally interesting to investigate how trade diversion is effect as the expectation has a cost advantage over the home firm. As evoked previously, the cost advantage $\Delta_H = c - c_H^*$ is reflected by the difference in marginal costs of the home and non-named firm and the higher Δ_H the higher the

expectation of being targeted in the future - $E(\tau)$. Again this effect is determined by totally differentiating $Q_S^{nn^*}$ with respect to Δ_H:

$$\begin{aligned} \frac{dQ_S^{nn^*}}{d\Delta_H} &= \frac{\partial Q_S^{nn^*}}{\partial t}\frac{dt}{d\Delta_H} + \frac{\partial Q_S^{nn^*}}{\partial \Delta_H} \\ &= -\frac{15-\omega}{\beta(22-\omega)}(1-\delta)\bar{\tau}' \end{aligned} \tag{16}$$

Since $\bar{\tau}' = \partial\bar{\tau}/\partial\Delta_H > 0$ by assumption, equation (16) is negative. Note that when the signal is perfect ($\delta = 1$) then the effect of an increase in $\bar{\tau}$ on trade diversion is nil. This makes sense because when the information quality is perfect, firms rely completely on the signal and not on what they anticipate τ to be. On the other hand, as the information quality δ of the signal deteriorates, trade diversion decreases. This leads to the following proposition:

Proposition 4 *Under opacity, $\delta < 1$, the higher the cost advantage of the non-named firm leading to a higher expectation $E(\tau)$ and thus lower trade diversion.*

This last proposition provides a further explanation to the empirical evidence that lower trade diversion in Europe as opposed to the United States is in part due to the lack of transparency regarding the future use of AD policy.

6 Extension: Endogenising The Naming Process

Up to now the model has not taken into account why the named firm gets named in an AD investigation and not the other exporter to the home country. The present section aims to introduce a further initial stage in the game - Stage 0 - which makes the naming procedure of a country endogenous in an AD investigation. In Stage 0, the government has to choose which of the two firms to name. Clearly, the government would choose to name the firm that would give the home country the highest welfare. Let G_L (G_H) and t_L^o (t_H^o) respectively denote the governments objective function and optimal tariff when the administration names the low cost (high cost) foreign firm.

The equilibrium strategies in the initial stage of the game is characterized as follows:

Proposition 5 *Under a perfectly transparent AD policy, $\delta = 1$, the AD authority will always target the low cost foreign firm. However, under opacity, $\delta = 0$, the AD authority will target the low cost (high cost) firm when:*

$$c_H^* - c_L^* \quad \begin{matrix} > \\ (<) \end{matrix} \quad \frac{(\omega + 6)\left[\overline{\tau}(\Delta_L) - \overline{\tau}(\Delta_H)\right]}{16} \tag{17}$$

where $\Delta_L = c^h - c_L^*$, $\Delta_H = c^h - c_H^*$ and $\overline{\tau}(\Delta_L) > \overline{\tau}(\Delta_H)$

Proof The proof of the proposition proceeds as follows. The objective function of the government is approximated for both firms by using the Taylor expansion around $t = 0$:

$$G_L(t_L^o) = G_L(0) + G_L'(t_L^o)t_L^o + \frac{1}{2}\, G_L''(t_L^o)\, t_L^{o^2} \tag{18}$$

$$G_H(t_H^o) = G_H(0) + G_H'(t_H^o)t_H^o + \frac{1}{2}\, G_H''(t_H^o)\, t_H^{o^2} \tag{19}$$

By having used the optimal tariffs, the first order conditions - $G_L'(t_L^o)$ and $G_H'(t_H^o)$ - are both equal to zero. Furthermore, it is straightforward to show that $G_L(0) = G_H(0)$ due to the assumption that when $t = 0$ then $\tau = 0$. Thus, by subtracting equation (18) from (19) the following is obtained:

$$G_L(t_L^o) - G_H(t_H^o) = \frac{\omega - 22}{32\beta}(t_L^o - t_H^o)(t_L^o + t_H^o)$$

Now the government will choose to name the low (high) cost foreign firm whenever:

$$\begin{aligned} \frac{\omega - 22}{32\beta}(t_L^o - t_H^o)(t_L^o + t_H^o) \quad &> \ (<) \quad 0 \\ &\Leftrightarrow \\ G_L(t_L^o) \quad &> \ (<) \quad G_L(t_L^o) \end{aligned} \tag{20}$$

and simplifying expression (20) leads to:

$$16(c_H^* - c_L^*) - (\omega + 6)(1 - \delta)\left[\overline{\tau}(\Delta_L) - \overline{\tau}(\Delta_H)\right] \ > \ (<) \quad 0 \tag{21}$$

Indeed, since $\Delta_L = c^h - c_L > \Delta_H = c^h - c_H^*$ consequently $\overline{\tau}(\Delta_L) > \overline{\tau}(\Delta_H)$ and thus expression (21) can be positive or negative.

Under complete transparency, $\delta = 1$, expression (21) will always be strictly positive. However, once $\delta < 1$, the decision becomes ambiguous. By taking the case of complete opacity, i.e. $\delta = 0$, the government will name the low (hight) cost firm if and only if:

$$c_H^* - c_L^* \underset{(<)}{>} \frac{(\omega + 6)\left[\overline{\tau}(\Delta_L) - \overline{\tau}(\Delta_H)\right]}{16} \tag{22}$$

Q.E.D.

Note that under a transparent AD policy, the most cost advantageous foreign firm will always be named in the AD investigation. However, as transparency fades, the home government might be tempted to name the high cost foreign firm.

7 Conclusion

The empirical literature has studied how antidumping policy affects import flows from countries that were under investigation to countries that were also importing the same product but that were not under investigation. In particular the study on trade diversion in Europe (Konings and al 2002) contrasted the findings for the United States (Prusa 1997). The results suggested that import diversion in Europe is quite low, leading to the conclusion that antidumping policy is more effective in Europe.

This paper attempted to develop a theoretical model to explain the empirical evidence regarding the heterogeneity in trade diversion across countries. The countries chosen were the United States and the European Union. Three conclusions were reached. The first implied that lower duty levels in the European Union limits the benefits of protection for the non-named countries and therefore explains in part the lower amount of trade diversion in Europe. The second showed that the lack of transparency forms an additional trade barrier, because independently of what the firms believe the future to be, they restrict their trade volume to the domestic market. The third provided a new conclusion and demonstrated that trade diversion can also be low under a perfectly transparent policy, given that firms respond to the signal they receive. This conclusion suggests that transparency provides an additional tool that governments can use to restrict trade flows but once governments choose opacity, they can no longer use the signaling device to

reveal its future intentions to the market. The paper provided a further (new) result regarding the naming process of the firms, it suggests that with the lack of transparency, because of low trade diversion, the AD authority might be tempted to name the high cost foreign firm instead of the low cost foreign firm.

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