Alternative Effects of Antidumping Policy: Should Mexican Authorities be Worried?

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Fecha de recepción: 2 de febrero de 2004; fecha de aceptación: 8 de octubre de 2004.

Abstract: Administered protection is not the only outcome of antidumping measures. This paper suggests a basic model of repeated interaction between a domestic and a foreign firm. Competing in prices in the importing market, antidumping action serves as the means to enforce and sustain tacit collusion between the firms. The main result is that price distortions by antidumping policy are a departure point for the achievement of the collusive outcome. Discount factors of future profits are altered relative to those observed under free trade, delaying domestic firm's propensity to collude and prompting foreign firm's.
Keywords: price competition, repeated interaction, tacit collusion, antidumping.

Resumen: La protección administrada no es el único resultado del uso de medidas antidumping. Aquí se sugiere un modelo de interacción repetida entre una firma doméstica y una extranjera, que compiten en precios en el mercado de importación, donde las medidas antidumping actúan como medio para alcanzar y sostener un acuerdo de colusión tácita. El resultado principal es que la distorsión de precios causada por la política antidumping es el punto de partida para alcanzar el acuerdo colusivo. Los factores de descuento de ganancias futuras de las empresas se ven alterados en relación con sus valores de libre comercio, retrasando la propensión a coludirse de la firma doméstica y acelerando la de la firma extranjera.
Palabras clave: competencia en precios, interacción repetida, colusión tácita, antidumping.

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Introduction

According to the World Trade Organisation (WTO) dumping occurs when the price of an exported good is lower than the home market price of that good. In other words, exports are sold at unfair value in the importing country because their price is lower than the price consumers pay for the same good in the exporting country. Article VI of the General Agreement on Trade and Tariffs (GATT) allow country members to levy duties on dumped imports under three conditions to be satisfied altogether:

1) Dumping exists (dumping margin).
2) The domestic industry is suffering material injury, is threatened of material injury or its establishment is materially retarded because of imports.
3) There is a causal relationship between the two.

Although GATT's Antidumping Code was submitted in 1976, many country members already counted with their own national antidumping (AD) rules, and it was only after 1979 Tokyo Round Agreement that the increasing use of AD measures raised big concerns on the actual motives of its use. Amendments to the rules in the Tokyo Round agreement introduced sales below cost as a dumping practice and removed the need to proof material injury, which boosted AD actions from less than a dozen cases per year in the 1960's to about 250 cases per year in recent years (Prusa and Skeath, 2001).

Study of the motives of the surge in the use of AD has been developed mainly by focusing on the AD practice of "traditional users" such as the US and the EU, who together with Canada, Australia and New Zealand have been the major users of AD measures. Nevertheless, developing countries such as Mexico, Brazil, Argentina, India, South Korea, among others, the "new users", have filed since the late 1980's more AD petitions than the traditional users (see below).[1]

The aim of this paper is to show that AD policy may serve as a mean to achieve tacit collusion between the domestic and the foreign firms or industries involved in an AD petition in the importing market. The analysis focuses on the proceedings of the Mexican AD policy, which are different from other AD legislations, specifically in the US

[1] See Miranda *et al*. (1998) for worldwide use of antidumping. Zanardi (2002) gives a more recent account of the use of AD measures worldwide.

and EU. Private settlements between the parties involved in the AD investigations are not allowed, and price undertakings are rarely observed.[2] It also intends to address the topic from a developing country's point of view and to build on current debates on antidumping and its abuse.[3] The question posed in the title of the paper also intends to motivate for an active debate on the effects of AD policy beyond its traditional protectionist outcome. Increasing awareness of the potential welfare losses arising from anticompetitive outcomes led by the use of AD should bring both AD and competition authorities closer in to a more efficient dialogue for addressing the problem of AD.

Within a duopoly price-competition framework, the model here presented arrives at standard results on that the introduction of AD policy distorts firms' pricing strategies. The consequence is a higher price level in the importing market relative to the free trade Nash-equilibrium, i.e. no AD policy. The observed price increase serves as a departing point towards the achievement of a collusive price agreement between the domestic and the foreign firm. When the benchmark game is infinitely repeated, the filing of an AD petition acts as the punishment strategy from deviation, making the collusive outcome subgame perfect. The threshold value of the discount factors[4] that make the collusive conditions hold are altered when AD policy is introduced, relative to those prevailing under free trade. This results in a higher discount factor for the domestic firm to engage in the collusive agreement and smaller for the foreign firm.

The structure of the paper is as follows. Section I describes why it is relevant to study AD. Section II briefly reviews the general literature on AD and section II.1 on the relationship between AD and collusion. Section III and III.1 illustrate the current trends of AD measures worldwide and in Mexico, respectively. Section IV sketches the AD proceedings under the Mexican legislation. Section V through V.3 develops the model. And section VI concludes with some final remarks.

[2] A price undertaking is a commitment by the foreign firm to raise its export price or reduce the quantity exported. Both the private settlement and the price undertaking result in the suspension or termination of the case. Prusa (1992) first introduced the collusive consequences of withdrawn cases in the US.

[3] Despite the fact that new users are currently very active players in the AD field, research focusing on them is still scarce. See for instance Prusa and Skeath (2000), Esquivel and Solis (2002), Niels (2002).

[4] A discount factor can be interpreted as the patience of firms to achieve long-term gains.

I. Relevance of the Study of Antidumping

It is important to say, first, that this paper deals with the analysis of the use of AD rather than dumping mainly because price discrimination is far considered a common practice in international trade.[5] Viner (1923) considered dumping or price discrimination an efficient monopoly practice accepted when consumers benefited from low prices. For instance, a monopoly will export at a low price to obtain economies of large scale or maintain full capacity without reducing its domestic price providing consumers in the importing market with a flow of cheap goods. Similarly, Brander and Krugman (1983) show how a monopoly price discriminates across markets and reciprocal dumping arise (competitors dumping to each others' domestic market). Dumping below cost has also been showed to be efficient under demand uncertainty (Davies and McGuiness, 1982; Ethier, 1982), under imperfect information of future rents (Clarida, 1993), or with incomplete and asymmetric information (Hartigan, 1994). Nevertheless, the regard of dumping as an unfair trade practice as well as the increasing use of AD measures has made researchers focus on the causes and effects of the latter.[6] As said above, research bias towards traditional users does not give account of the matter in developing countries. Moreover, the debate on AD was an important component of the agenda in the last WTO conference in Doha, and in consequence incorporated as a core issue in the ministerial meeting of Cancún.[7]

II. Previous Work on Antidumping

There is a large strand of literature concerned on the protectionist use of AD since more trade liberalisation practices have been encouraged and traditional trade barriers eliminated; AD measures being the only permitted protectionist device. Much of the analysis of the use of AD here is based on macroeconomic and political factors that induce domestic firms to claim AD action.[8] AD is also considered as a

[5] See Dale (1980) for a clear appraisal of the economic foundations of dumping and antidumping.

[6] See Finger *et al*. (1982), Ethier and Fischer (1987), Fischer (1992), Anderson (1992) for first addressing of antidumping.

[7] However, due to the failure of the ministerial meeting in Cancún, no agreement was reached with this regard. See Evenett (2003), for instance, for comments on the failure of Cancún.

[8] See Finger *et al*. (1982), Yarrow (1987), Feinberg (1989), Knetter and Prusa (2003), Niels (2002).

necessary condition for the enforcement of trade liberalisation practices and a guarantee for the domestic industry against unfair trade practices.[9] Similarly, another large strand of the literature has addressed the issue relying on the industrial organisation framework for the analysis. The focus is on the strategic behaviour of firms, i.e. the choice of price or quantity levels, facing AD actions where trade protection is endogenous to firms'strategic behaviour.[10]

Bolingen and Prusa (2001) provide an extensive description of the work carried out on the different market outcomes resulting from the introduction of AD policy. They can range from trade and investment diversion to collusion.

II.1. Antidumping and Collusion

Evidence of collusive agreements between domestic and foreign firms or among domestic firms by means of AD action has been proved in different occasions. One case, for instance, involved a cartel of US producers of ferrosilicon who claimed AD action against five foreign competitors. With the cartel's sales restrictions accepted as proof of injury, duties were levied in 1993. The cartel then invited Brazilian producers, who started to export to the US, to form part of the agreement, but as the offer was not accepted AD action was claimed again and duties imposed. Later, the cartel was discovered and members found guilty. Similarly, in New York in 1995, a foreign firm argued that an AD action was exercised against it as a response by the domestic firm for the negative to accept a collusive agreement (Taylor, 2001, p. 2).

Looking at the relationship between cartels and AD within the European Community (EC), Messerlin (1990) observes that, during 1980-87, those cases claiming AD action in the chemical industry had a twin case in an anticartel investigation. About 25% of the EC anticartel cases were related to products also involved in AD cases, suggesting that the imposition of duties grants a high level of protection to the industry, which is essentially needed for the generation of a more stable and strong cartel. Therefore, he suggests that AD actions should be subordinated to competition law.

[9] See Kholer (2001).

[10] Leidy and Hoekman (1990), Fischer (1992), Anderson (1992), Reitzes (1993), Prusa (1994), Kolev and Prusa (1999), Pauwels, Vandenbussche and Waverbergh (2001).

A great number of AD cases in the US are withdrawn before reaching a final decision. It is calculated that trade restrictions generated by withdrawn cases during the period 1980-82 were at least as much as those generated by cases that ended up in an AD duty. Accordingly, withdrawn cases, which can result from a private settlement between the foreign and domestic firms or from an agreement between the foreign firm and the domestic government to restrain the quantity or increase the price of imports, may produce a collusive outcome with AD policy facilitating practice (Prusa, 1992). This is possible since a settlement reached by rival firms can benefit both and there exists an antitrust exemption that supports the achievement of a settlement and allows the petitioner to withdraw when this is reached (Prusa, 1992, p. 6).[11] AD proceedings in the US provide the possibility for settlements reached either privately or under government intervention before the AD authority submits the final decision of the petition. Using a bargaining game to solve for the optimal settlement in a duopoly Bertrand-Nash framework, Prusa's model predicts that firms will always prefer a settlement to the authority's final decision. By negotiating, the foreign firm will at least avoid paying for the duty and the domestic firm will at least get the duty outcome profits. Therefore, that any settled outcome can result in collusive behaviour evidence that firms use AD for motives different from those originally intended by the law.

Different studies followed Prusa's work in the investigation of the incentives of firms to choose whether to withdraw the AD petition or wait for the authority's final decision. Bargaining power and coordination costs of the domestic and foreign firm affect their decision to whether or not accept the settlement. However, profits under a settlement are greater than expected profits under the imposition of duties, thus supporting the hypothesis that AD is used as a mean to achieve collusion (Zanardi, 2000). Asymmetric information is another reason why withdrawn cases are observed (Panagariya and Gupta, 1998). In their model, firms will always privately negotiate on the price under complete information, and the case is withdrawn with the likely joint profit maximisation similarly to Prusa (1992). Nevertheless, when information is asymmetric, for instance, on the possible level of the duty (i.e. one firm knows the level of the duty and the other does not), the outcome may rather result in the firms waiting for the final decision and duties paid.

[11] This is the Noer-Pennington doctrine. See Taylor (2001) below.

Taylor (2001), contrarily, argues that settlements that induce the withdrawal of petitions have no collusive effects. Moreover, any collusive agreement triggered by the use of AD law cannot be exempt of antitrust action and the Noer-Pennington doctrine does not allow for such exemption, but considers any private attempt to affect prices or quantities illegal. Empirical evidence shows that only two out of sixteen withdrawn cases during 1990-97 show price and quantity collusive consistent movements.[12] Nevertheless, the author argues that these exceptional cases might owe this behaviour to factors rather different from collusion, for instance, product market share and non-subject to antidumping investigation suppliers, though this is not addressed in the paper.

When AD policy is introduced, it can also have an important impact on the initial market structure of the industry. AD policy can be either pro-competitive or anticompetitive depending on *i)* the specification of the government's welfare objective function, *ii)* the cost asymmetry between domestic and foreign firms, and *iii)* the degree of product differentiation between the firms (Veugelers and Vandenbussche, 1999). These three key factors together determine the type of AD measure imposed by the government, the incentives of firms to collude and the resulting market structure when AD policy is introduced. Accordingly, when firms are symmetric and products homogeneous, a cartel formed by domestic and foreign firms will prevail with or without AD policy and similarly, when cost asymmetries are small and the government maximises total national welfare, the existence of AD policy promotes the formation of a cartel.

Finally, Staiger and Wolak (1986) show that AD policy is used as a punishment device, named the filing of an AD petition, allowing firms to coordinate their capacity strategies towards the monopoly outcome in a low demand environment.

So far, I have presented enough evidence that supports the hypothesis that firms use AD measures in order to pursue specific outcomes that are not solely related to the deterrence of unfair trade practices (by the imposition of duties), as aimed by AD policy. And these outcomes are achievable because the threat of the imposition of duties is credible and then, in some cases, duties need not to be imposed or even the petition reached its final decision.

[12] The products that showed price increase and quantity decrease are steel wire rod (from Belgium) and bulk ibuprofen (from India).

III. Worldwide Antidumping Trends

National AD rules were introduced in the early 1900 by Canada, New Zealand, Australia and the United States with the aim of sheltering domestic firms from foreign rivals that could exert monopoly power after predatory pricing practices. It was only after a law submitted by the United States in 1921 and followed by many other countries when AD law considered unfair the subside of low-price exports by home protected foreign firms or cartels. Signature of the 1947 GATT agreement brought together all national AD rules, with big influence of the US own AD law.[13] From then to the early 1970's, there were not many AD cases: the US, the EU, Australia, Canada, South Africa and New Zealand were the major users of AD measures. During this period, less than 5% of all cases resulted in duties (Bloningen and Prusa, 2001).

After the Tokyo Round, the use of AD changed sharply. As many as twice the cases filed during the 1970's were filed in the 1980's. From 1980 to 1985, traditional users filed more than 99% of all AD petitions, whereas by the mid 1990's more than half of the petitions were filed by new users (see Figure 1). During the period 1987-97, China, the US, Korea, Japan and Brazil were the most targeted countries by AD actions; and base metals, chemicals, machinery and electrical equipment and plastics the most targeted industries (see Table 1).

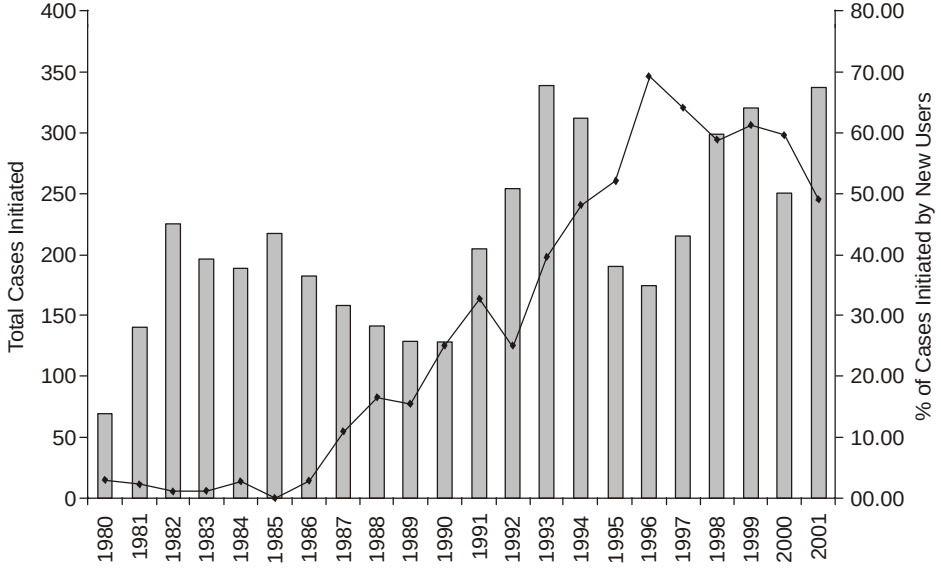
Table 1. Main Target Countries and Industries in AD Investigations (1987-97)

Rank	*Target country (% of total)*	*Target industry (% of total)*
1	China (11.3)	Base metals (25.3)
2	United States (8.6)	Chemicals (16.8)
3	Korea (6.3)	Machinery and electrical equipment (13.5)
4	Japan (6.3)	Plastics (11.4)
5	Brazil (4.8)	Textiles (6.9)
6	Taiwan (4.6)	Pulp and paper (5.1)
7	Germany (4.2)	Glass and ceramics (3.4)
8	Thailand (2.8)	Prepared foodstuffs (2.8)
9	India (2.8)	Other manufactures (2.5)
10	United Kingdom (2.5)	Minerals (2.4)

Source: Niels, 2002, table 2.2.

[13] See Barcelo (1991) and Horlick and Shea (1995) on the history of AD.

Figure 1. Worldwide AD Cases Initiated, 1980-2001



III.1. Antidumping Trends in Mexico

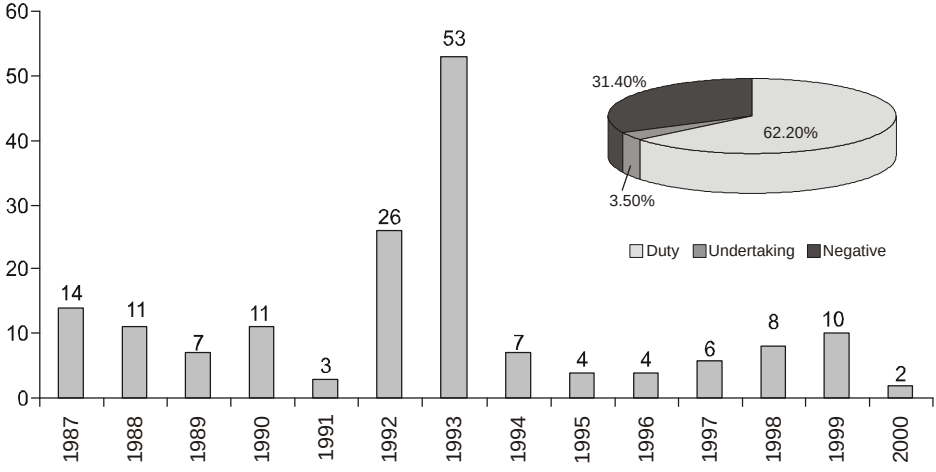
AD rules in Mexico were adopted as the country became a member of GATT in 1986 and outlined by the Ministry of Trade and Industry (currently The Ministry of the Economy) through the Unfair Trade Practices Regulations. Currently, the International Trade Practices Unit at the Ministry of the Economy is in charge of the administration of the AD process. The legal framework is contained in the Foreign Commerce Law Regulations published in 1993.[14]

Mexico's AD (and CVD)[15] cases are registered from 1987 in the Mexican Official Journal. Nevertheless, Mexico's participation in AD activities dates from time before. Prusa and Skeath (2000) point out that Mexico was investigated for dumping exports before it had set up its own national rules. Many other new users were also investigated for dumping exports before having their own AD policy. This, argues the author, suggests that motives different from those to fight unfair trade practices, such as retaliation, are a driving force for the use of AD measures in developing countries.

[14] See Malpica de la Madrid (1998) for the legal structure of the Mexican AD system.

[15] A CVD (countervailing duty) is aimed to defend the domestic industry against the damage caused by subsidies given to imports at their local sources (www.economia.gob.mx).

Figure 2. Number and Outcome of Mexican Antidumping Investigations



Source: Niels, 2002.

Niels (2002) describes the evolution of AD activity in Mexico from 1987 to 2000 based on a database (SIAM) built by the Directorate General for Economic Studies of the Mexican Federal Competition Commission. During that period, a total of 172 AD cases had been investigated from which 107 (62.2%) resulted in the imposition of duties, 6 (3.5%) in undertakings, and 54 (31.4%) in a negative outcome (no duty imposition)[16] (see Figure 2).

With regard to the targeted countries and industries, Table 2 shows the regions and number of investigations involved. North America is the most targeted region, which is not surprising as more than 70% of Mexican exports are directed to the US; however, the success rate for the region is below the total success rate, which according to Niels suggests the political influence on the use of AD, e.g. avoiding to quarrel with trade partners. East Asia, the EU and the rest of the world show a success rate above the total rate. The steel industry has filed the largest number of AD petitions (30.8% of the total), followed by the chemical industry (22.7%), textiles (9.9%), plastics (7.0%) and electrical equipment (5.2%). The methodology used to determine the fair or normal

[16] This figure is different from the one given by the antidumping authority because of the specification of the data in the SIAM database, i.e. the number of investigations by product or by country.

Table 2. Target Regions and Number of Mexican Antidumping Investigations and Success Rate (1987-2000)

Target region	*Number of investigations*	*Share of investigations (%)*	*Success rate (%)*[a]
North America (US and Canada)	59	34.3	63.8
Latin America (Brazil, Venezuela, Colombia, Argentina and Chile)	30	17.4	55.2
East Asia (China, South Korea, Taiwan, Japan, Hong Kong and Malaysia)	46	26.7	74.4
EU	17	9.9	82.4
Eastern Europe and former USSR (Russia, Ukraine, Belarus, Kazakhstan, Estonia, Lithuania, Tajikistan, Uzbekistan and Bulgaria)	15	8.7	66.7
Rest of the world (Australia, India, Pakistan and South Africa)	5	2.9	80.0
Total	172	100	67.7

[a] The proportion of investigations resulting in a positive outcome, i.e. duties or undertaking.
Source: Niels, 2002.

value of the subject imports was based in 47.7% of all the cases on the home price or normal value, 16.3% on the export price to a third country, 25% on the constructed value and in 15.1% of the cases the methodology was not reported.[17] Only in 66 cases the imposition of an *ad valorem* duty was reported and, when imposed, it was generally very high. The unweighted average duty is of 53 percent.

[17] According to Mexican legislation, prices of domestic sales in the exporting market are the first option to determine the normal value. If sales in the exporting country market are not made "in the ordinary course of trade" so that normal value cannot be calculated, two other alternatives are provided: the third country normal price which is based on a comparable price of the subject product when exported to an appropriate third country; and the constructed normal value which is based on costs of production, general administrative expenses and profits (www.economia.gob.mx).

IV. Mexican Antidumping Proceedings

Unfair trade practices in Mexico are sanctioned under four legal instruments: the Foreign Commerce Law, the Foreign Commerce Law Regulations, the Agreement on the Application of Article VI of GATT (1994) and the Agreement on Subsidies and Countervailing Measures. This framework "offers to the national industry a timely defence system against dumping or price discrimination practices and subsidies which ensures fair level competition conditions for the performance of the Mexican industry".[18]

In order to claim an AD action, three conditions must be met:

1) Dumping exists (dumping margin).
2) The domestic industry is suffering material injury, is threatened of material injury or its establishment is materially retarded because of imports.
3) There is a causal relationship between the two.

According to Mexican legislation and once these conditions are met, the interested firms can file a petition if *i)* they represent at least 25% of the national production of the subject product, and *ii)* the petition is supported by 50% of the national producers. An organisation or association acting on behalf of the interested industry or firms can also file the petition. Henceforth, the terms firms and industry are indifferently used. The petition is filed within the International Trade Practices Unit (UPCI, in Spanish) who is responsible of the administration of the investigation process. All the decisions or resolutions reached during the investigation are enforced by the Ministry of the Economy, the authority hereafter, and published in the Official Journal.

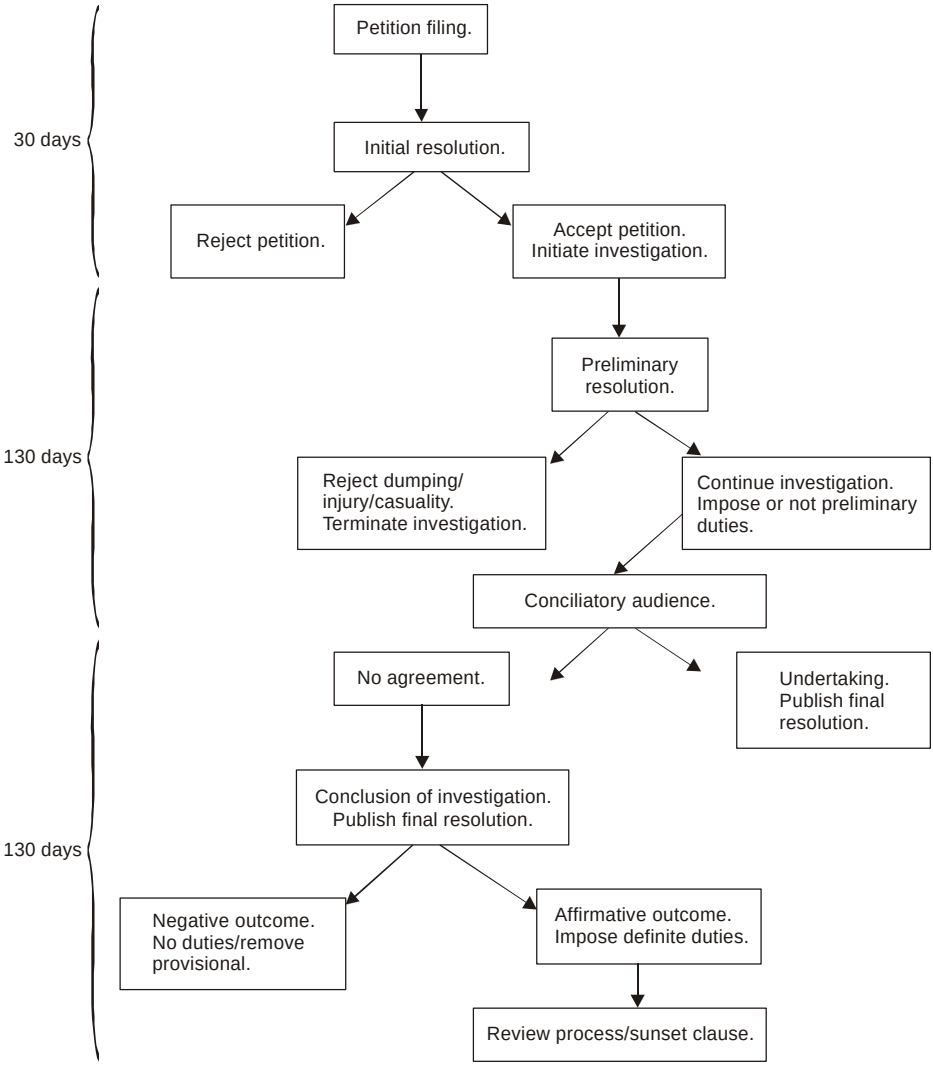
Diagram 1 shows the AD proceedings. Once the petition is filed, the authority will publish within 30 days, as an initial resolution, the acceptance of the petition and initiate the investigation. Otherwise the petition will be rejected.[19]

Within 130 days from the publication of the initial resolution, the authority will publish the preliminary resolution. This will announce

[18] www.economia.gob.mx. Countervailing duties (CVD) are the correspondent remedies for subsidies. However, this paper does not consider these measures mainly because only 18 out of 234 investigations carried out by the authority refer to subsidies (UPCI, 2001). In general, AD studies do not consider CVD.

[19] Within 20 days from the petition filing, the authority may require the petitioner to provide additional information to support the petition filing before the initial resolution is published.

Diagram 1. Mexican AD Proceedings



the continuation of the investigation and the imposition of provisional duties, if it is the case, or terminate the investigation if there is not enough evidence of dumping margin, material injury or threat of material injury and a causal relationship between them.[20] Preliminary

[20] Parties are given a 20 days period from the publication of the preliminary resolution to present any enquiry they should have.

duties, if imposed, will be collected by the Ministry of Treasure who will also accept any guarantee of payment.

At any time before the publication of the final resolution, the foreign government or exporting firms incurring in unfair trade practices may, through a conciliatory audience, voluntarily and before the authority commit to increase their price or stop their exports in order to remove the dumping and injury caused. The agreement, which implies a price undertaking with the approval of the authority, will terminate or suspend the investigation and be published as a final resolution. Note that the undertaking will mimic the duty outcome as it is in the interest of the authority.[21] The authority can request and undertake any verification visit at the physical location of the firms or involved parties to certify any information presented during the investigation. It may also periodically review the price undertakings by petition of the interested party and continue with the investigation in case the agreement is not implemented. Once the investigation is concluded and within 260 days from the publication of the initial resolution, the authority will publish the final resolution. This will announce the definite imposition of duties, remove the provisional duties, or reject the imposition of duties.

Finally, the duration of the definitive duties will be that necessary to repair the injury caused to the industry by the unfair trade practice. They can be reviewed in a yearly basis upon petition of any of the parties or by the authority itself in order to reduce, lift or confirm the duty. After 5 years of duration of the duties, they will be removed unless there has been a petition of review. This is known as the "sunset clause".

V. A Basic Model of Collusion with Antidumping

In this section I develop a basic model of repeated interaction between a duopoly formed by a domestic and a foreign firm that compete in prices in the domestic market, i.e. Mexico. The model, built on Prusa's (1992), shows that amid the price distortions caused by the introduction of antidumping in a free trade state, determined by the standard duopoly Nash-equilibrium, firms achieve tacit collusion using antidumping as the mechanism to sustain it.

[21] See Prusa (1992) for the analysis of the undertaking outcome.

I first set the conditions for the one-shot static game, which represents the free trade equilibrium, this is when no antidumping legislation exists in the domestic country. This is also the benchmark case to compare with once antidumping has been introduced. Once the distortions caused by the introduction of antidumping are shown, I turn to the repeated game where the one-shot game is played infinitely and the collusive outcome achieved.

The model here developed reflects the general framework of Mexican AD policy where, as said before, neither price undertakings nor the withdrawal of the case are likely. Some comments are worth mentioning here.

It is assumed that the n-domestic firms which join to file a petition act as an industry or one firm, as it is a requirement for the initiation of the investigation to represent more than 25% of the national production as well as the support of at least 50% of national producers.[22] Thus, coordination costs are assumed to be zero so that all firms in the industry agree to file the petition. Nevertheless, these costs can be increasing in the number of firms, i.e. the greater the number of firms the more difficult to agree in something, and some firms may not join the filing group (Zanardi, 2000).[23] Filing costs are assumed to be small so that petitions have already been filed. Staiger and Wolak (1994), however, point out that even though investigation effects are likely to exist,[24] many industries face high filing cost, e.g. hiring lawyers, doing market studies, organisation of the filing firms, etc., that limit the number of filed petitions.

Private settlements or price undertakings frequently observed in other countries are rarely observed in Mexico.[25] This is likely due to unclear undertaking rules so that petitioners do not have a good understanding of the process. The authority does not count with the re-

[22] Note that, in cases where the domestic industry is highly concentrated, this requirement may work as an internal condition for the sustainability of a domestic cartel. Acting individually, every firm has an incentive to join the filing group. The existence of domestic cartels is however not considered here.

[23] It may also be the case that the domestic firms coordinate to induce a positive outcome of the investigation, for instance, by reducing profits or prices to increase the likelihood of injury. This can be more difficult the greater the number of firms.

[24] Trade restrictions caused by the only fact that the investigation has been initiated, regardless of the final outcome.

[25] Although under the AD legislation the possibility of price undertakings is present, it will at least mirror the imposition of duties: "[…] exporters of the goods under unfair international trade practice can voluntarily commit before the [authority] to […] modify their prices or cease exports. […] if the [authority] corroborates that the commitment is unexercised, it will resume the investigation of the case and if required, reimpose the provisional duty" (www.economia.gob.mx).

sources to monitor the foreign firm's price commitment, which also makes the undertaking outcome less likely as it results an unsustainable solution for the petitioner.[26] Moreover, private settlements are not allowed at all.[27]

Lastly, for the sake of consistency with previous literature, the construction of the model below assumes a lineal demand for the firms. Although this may be in detriment of the generalisation of the results reached, it is also an useful assumption for the numerical comparison between different equilibria, i.e. free trade and AD.

Now suppose there are two firms, one domestic and one foreign (*) that compete in price in the importing or domestic market. Each firm sells a differentiated good, which is close substitute for each other.[28] Firms face a linear demand for the goods produced and constant and symmetric costs per unit produced. The game played by the firms, that is choosing price strategies, is performed in one period and played only once.[29] The events of the game occur as follows:

1) Each firm maximises profits by choosing price.
2) All equilibrium values are realized.
3) If the petition is filed, the proceedings of the investigation as depicted in Diagram 1 are followed. There is an exogenous and known probability α of an affirmative final resolution with duties of $d = p_F - p^*$ imposed to imports. p_F is the price of the good sold in the foreign firm's own market which is exported to the domestic market at price p^*; p_F is exogenous to the game.
4) With duties imposed, foreign firm collects only p^* and d is the revenue collected by the government.
5) Duties are not imposed with probability $(1 - \alpha)$ and the outcome is the same as in *2)*.
6) Game ends.

[26] These comments were taken from personal conversations with personnel from the UPCI.
[27] Prusa (1992) shows that the possibility of a settlement in the investigation allows firms to revise prices upwards and to get a better outcome relative to the imposition of duties.
[28] Products under AD investigation are usually classified at their 8-digit level of the "Tarifa del Impuesto General de Importación" which is based on the ISIC Code. Although the disaggregation level aims to find substitutability between domestic and imported goods, they are never perfect substitutes.
[29] Generally, the literature on the subject specifies a two period model to introduce AD. In the first period firms choose whether to file the petition and in the second period they choose prices. Here, however, to make matters simple, it is assumed that the filing decision is already taken, as I will focus only on those cases that have been investigated.

V.1. Free Trade Bertrand-Nash Equilibrium

With no AD policy in place, firms make their price decisions simultaneously and the game is played only once. This one-shot static game is the benchmark case to compare with once AD policy is introduced.[30]

Let the respective firm's demand function be:

$$q = a - p + bp^* \tag{1}$$

$$q^* = a - p^* + bp \tag{2}$$

b represents a product differentiation parameter, which for greater values the goods become closer substitutes. p and p^* are the firm's price level and q and q^* the quantities produced, respectively. Each firm's profits are given by:

$$\pi(p,p^*) = (a - p + bp^*)(p - c) \tag{3}$$

$$\pi^*(p,p^*) = (a - p^* + bp)(p^* - c) \tag{4}$$

each firm maximises profits taking the other's price level as given, so that the FOC that imply each firm's best reply function are (BR):

$$a - 2p + bp^* + c = 0 \tag{5}$$

$$a - 2p^* + bp + c = 0 \tag{6}$$

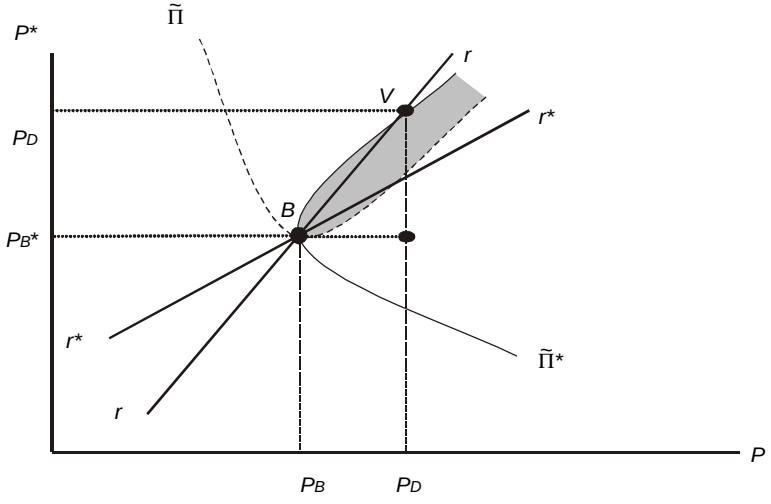
The Bertrand-Nash equilibrium pair of prices (p_B, p_B^*) is obtained by the solution of the system of equations formed by (5) and (6). Thus, the Bertrand-Nash equilibrium prices, quantities and profits are:[31]

$$p_B = p_B^* = \frac{a+c}{2-b}; \qquad q_B = q_B^* = \frac{a+bc-c}{2-b}; \qquad \pi_B = \pi_B^* = \left[\frac{a+bc-c}{2-b}\right]^2.$$

[30] Similar results are reached if competition is considered in quantities instead. The Cournot-Nash equilibrium levels are distorted as AD policy is introduced leaving the foreign firm in a worse off position relative to free trade equilibrium levels (see below). See, for instance, Panagariya and Gupta (1998) and Fischer (1992).

[31] It is assumed that the Bertrand-Nash equilibrium satisfy the sufficient conditions to be stable and unique.

Figure 3. Bertrand-Nash Equilibrium



Point B in Figure 3 represents the equilibrium price level in the domestic market where rr and r^*r^* are the firms' respective best reply functions that attain the maximum isoprofit curve $\widetilde{\Pi}$.

V.2. Bertrand-Nash Equilibrium with Antidumping

Now, AD policy is introduced in the domestic market. Suppose that the domestic industry has chosen to file an AD petition. There is an exogenous probability of the imposition of duties to imports. The free trade Bertrand-Nash equilibrium will prevail with probability $(1 - \alpha)$. With $\alpha = 1$ duties are imposed to the foreign firm exports. The value of the duty is determined by the dumping margin $d = p_F - p_B^*$. Consequently, the foreign firm is forced to raise its price to $p_F = p_D^* = p_B^* + d$.[32] However, the firm will only collect p_B^* and $(q_D^* \cdot d)$ will be collected by the government as the duty revenue.

Considering that the foreign firm passes on to the consumers the whole duty burden so that the market price is $p_D^* = p_B^* + d$, the domes-

[32] GATT/OMC rules recommend that the duty must be the necessary to remove the injury caused to the domestic industry. This implies that although prices in the domestic market are matched, the dumping margin $p_F - p_B^*$ is not necessarily eliminated. However, this will only reduce the size of d without any change in the final outcome.

tic firm's new price facing its rival's price q_D^* is determined by its BR given by (5). Thus, the new equilibrium values when AD policy is introduced are:[33]

$$p_D = \frac{a+c}{2-b} + \frac{bd}{2}; \qquad q_D = \frac{a+bc-c}{2-b} + \frac{bd}{2};$$

$$p_D^* = \frac{a+c}{2-b} + d; \qquad q_D^* = \frac{a+bc-c+bd-2d}{2-b} + \frac{b^2 d}{2};$$

$$\pi_D = \left[\frac{a+bc-c+bd}{2-b} - \frac{b^2 d}{4-2b}\right]^2$$

$$\pi_D^* = \left[\frac{a+bc-c+b^2 d}{2-b} - \frac{b^3 d}{4-2b} - d\right]\left[\frac{a+bc-c}{2-b} + d\right]$$

Proposition 1. *With probability* $\alpha = 1$*, duties are imposed to foreign firm exports.* π_D *is greater than* π_B *and* π_D^* *is smaller than* π_B^**.*

Proof: To see that $\pi_D^* < \pi_B^*$ *note that demand assumptions imply that a higher price results in a reduction of the quantity sold such that* $q_D^* < q_B^*$*; foreign firms collects only* p_B^* *and the government's duty revenue* dq_D^* is *subtracted from the firm's profit. Hence,* π_D^* $(p_{D,}^* p_D) - dq_D^* < \pi_B^*(p_D^*, p_D)$.

To see that $\pi_D > \pi_B$ *it is enough to note that the domestic firm is acting under its best reply function for any price increase by the foreign firm. Hence, a higher price combination than* (p^*_B, p_B) *results in greater profits. Likewise,* $\pi_D > \pi_{D.}^*$ *Q.E.D.*

Proposition 1 implies that the price increase of the domestic firm is smaller than the price increase of the foreign firm as only the former is acting on its best reply function. Consequently, the foreign firm sells less at a higher price. Moreover, the foreign firm never collects $(d \cdot q_D^*)$ the government's revenue. Therefore, AD policy makes the domestic firm better off.

Firm's expected profits when they face AD policy in the domestic market can be expressed by

$$E\Pi(\alpha) = \alpha\Pi_D + (1-\alpha)\Pi_B \tag{7}$$

[33] If the foreign firm passes on to the consumer only a fraction of the duty instead of the whole amount, the price increase would be smaller. However, the final outcome remains the same.

$$E\Pi^*(\alpha) = \alpha\Pi_D^* + (1 - \alpha)\Pi_B^* \tag{8}$$

Corollary 1. *The introduction of AD policy changes the expected profit of the firms. This in turn implies that for every positive value of* α*:*

$$E\Pi_B\left(p_B, p_B^*\right) < E\Pi_D\left(p_D, p_D^*\right);$$
$$E\Pi_B^*\left(p_B, p_B^*\right) > E\Pi_D^*\left(p_D, p_D^*\right);$$
$$E\Pi_D\left(p_D, p_D^*\right) > E\Pi_D^*\left(p_D, p_D^*\right).$$

As a consequence of the price distortion that firms face with the introduction of AD policy, the filing of a petition becomes a dominant strategy for the domestic firm for every $\alpha > 0$. In other words, the expected profits of filing a petition are greater than the Bertrand-Nash equilibrium profits that prevail without AD policy.

Note that the size of the duty imposed depends only on the dumping strategy of the foreign firm, that is the difference between P_F and P_B^*.[34] The foreign firm will try to avoid the imposition of duties or at least to reduce d by setting a higher price relative to the free trade Bertrand-Nash equilibrium price P_B^*.

Proposition 2. *In order to avoid the imposition of duties, the foreign firm will set a higher price in the domestic market relative to the free trade price.*

Proof: p_F *is exogenous with the known probability distribution function* $F(\cdot)$ *on* $[p_B^*, \overline{p}^*]$*, where* $\overline{p}^*$ *is the maximum level of* p_F*, i.e. the monopoly price. Thus, the probability of dumping by the foreign firm is given by* $\rho^d(p^*) = \int_{p^*}^{\overline{p}^*} F'(x)dx$*, where* $\rho_1^d(\cdot) = \dfrac{d\rho^d(\cdot)}{dp^*} < 0$. *Q.E.D.*

Proposition 2 states that due to AD policy firms change their pricing strategy relative to their free trade price strategy. Interestingly, given the possibility of attainable higher profits, at higher prices located within the shaded area depicted in Figure 1, a new game is developed in pursue of extraordinary profits.

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[34] A positive injury determination is one of the conditions for duties to be imposed; however, as the existence of a dumping margin is a necessary condition and without it no AD action would be pursued, for sake of simplicity the injury effect is not considered here. See Prusa (1994) for the modelling of the injury condition.

V.3. The Collusive Outcome

Let's turn back to the price distortions generated by the introduction of AD policy. As a consequence of the imposition of AD duties, consumers in the domestic market face higher prices for both the imported and the domestic good, and the domestic firm enjoys a larger market share and higher profits relative to free trade, i.e. without AD policy. The foreign firm find itself in a worse off position.

As said above, the foreign firm, in an attempt to avoid the imposition of duties, will set a higher price. This price increase will be smaller the smaller the difference between P_F and P_B^*. As the best response to this price increase, domestic firm will charge a higher price too.

Suppose now that firms maximise the discounted sum of future profits. Let δ be the discount factor and t the number of periods firms interact with each other. The range value of δ lays between 0 and 1. The closest to 1 the more patient firms are. In other words, patient firms care about future profits. The present discounted value of per period profits is, respectively, given by:

$$\Pi = \sum_{t=1}^{\infty} \delta^{t-1} \cdot \Pi_t \tag{9}$$

$$\Pi^* = \sum_{t=1}^{\infty} \delta^{t-1} \cdot \Pi_t^* \tag{10}$$

Let Π^{BN} and Π^{*BN} be the profits in the one-shot static free trade equilibrium determined before by π_B and π_B^*, respectively. Let Π^C and Π^{*C} be the collusive profits and Π^d and Π^{*d} the profits of deviation from the collusive agreement. Firms choose the following grim trigger strategy: start by choosing the collusive price P^C, then continue to set P^C until the other firm chooses a lower price P^d. If the other firm sets P^d, then set the free trade price level forever.

Two important conditions must prevail if this strategy is going to be subgame perfect: the first one is that interaction between the industries is foreseen to continue into the future. This is that firms see each other competing in the domestic market for an infinitely number of periods, so that they realise that cooperative gains can outweigh the short-run gains from deviating from the agreement; and the second one is that a credible punishment for any deviation from the cooperative outcome is necessary.

Before establishing the factors that make these conditions exist, it is important to note the following. It is clear now that when the free trade price level is chosen, the Bertrand-Nash equilibrium prices P_B and P_B^*, the domestic firm can file an AD petition. Thus, the domestic firm will consider any deviation by the foreign firm from the monopoly price as a dumping action. This will be the case when P_F is the monopoly price in the foreign firm's home market. If the home market structure were more competitive, P_F would be below the monopoly price and might be closer to P_B^*. P_F can also be interpreted as the foreign firm's average cost, so that AD action against sells bellow cost can be claimed when $P^d \leq P_F$.

To be the grim trigger strategy[35] a subgame perfect equilibrium, it is needed that both the cooperation strategy and the punishment strategy are Nash equilibrium.

Let's consider first the punishment strategy. Either firm's deviation from the cooperative price will make the other firm choose the free trade level price forever. It will not make sense to choose P^C anymore if the other chooses P_B (or P_B^*) at every next period. Thus cooperation is a Nash equilibrium strategy.

Suppose now that the domestic firm sticks to the collusive price. From equation (9), its discounted profits from cooperation are:

$$\Pi^c + \delta\Pi^c + \delta^2\Pi^c + ...+ = \frac{\Pi^c}{1-\delta} \tag{11}$$

If the firm deviates by undercutting its rival at price $p^d \in [p_B, p_F]$, it will get in the current period a greater profit Π^d (because of a larger market share) plus the subsequently non-cooperative profits Π^{NE}. Thus, deviation form the collusive agreement by the domestic firm yields a total payoff of:

$$\Pi^d + \delta\Pi^{BN} + \delta^2\Pi^{BN} + ...+ = \Pi^d + \frac{\delta\Pi^{BN}}{1-\delta} \tag{12}$$

Combining (11) and (12) gives the condition that makes the coordinated outcome sustainable.

$$\frac{\Pi^c}{1-\delta} \geq \Pi^d + \frac{\delta\Pi^{BN}}{1-\delta} \tag{13}$$

[35] It is so called because any deviation from the collusive agreement will make the punishment strategy be played forever.

Because the grim trigger strategy is symmetric, the same result is obtained for the foreign firm. However, note that, from previous sections, incentives for deviation are asymmetric when AD policy exists. Deviation by the foreign firm will trigger the filing of an AD petition. This changes the value of the second term on the right-hand side of condition (13) (for $\alpha = 1$).

Proposition 3. *Under the absence of* AD*, cooperation towards the collusive outcome can be sustained only if (expressed in terms of the domestic firm):*

$$\Pi^{C}\left(P^{C}, P^{*C}\right) \geq (1-\delta)\Pi^{d}\left(P^{d}, P^{*C}\right) + \delta\Pi^{BN}\left(P_{B}, P_{B}^{*}\right) \tag{14}$$

Under AD *policy, cooperation toward the collusive outcome can be sustained only if:*

$$\Pi^{C}\left(P^{C}, P^{*C}\right) \geq (1-\delta)\Pi^{d}\left(P^{d}, P^{C}\right) + \delta\Pi_{D}\left(BR(P_{F}), P_{F}\right) \tag{15}$$

$$\Pi^{*C}\left(P^{C}, P^{*C}\right) \geq (1-\delta)\Pi^{*d}\left(P^{*d}, P^{C}\right) + \delta\Pi_{D}^{*}\left(BR(P_{F}), P_{F}\right) \tag{16}$$

Proposition 3 states that any collusive agreement sustained under the existence of AD policy require the firms to make a different appraisal of future profits relative to that under free trade. This is straightforward by comparing condition (14) with (15) and (16). The second term on the right-hand side of condition (15) is greater relative to the second term on the right-hand side of condition (14) when $a = 1$. This means that the possibility of greater profits for the domestic firm when duties are imposed increases its incentive to deviate; henceforth a higher value of δ is required. On the other hand, the second term on the right-hand side of condition (16) is smaller relative to the second term on the right-hand side of both (15) and (14). This means that in order to be collusion sustainable the foreign firm requires a smaller value of δ relative to both free trade and the domestic firm (see annex for a numerical example).

The model here presented suggests that AD policy changes firms' appraisal of future profits determined by the value of the discount factor δ, relative to free trade. A simple numerical example of the changes in the discount factor induced by the introduction of AD policy is presented in the Annex.

VI. Concluding Comments

In this paper, I have first intended to show through the revision of previous literature on the topic that there are widely recognised incentives for the use of AD measures which outcomes differ from the original aim of the policy. I focus in one of this alternative outcome: tacit collusion. Using a game theoretical framework, I presented a model which in the first part builds on standard results of models with antidumping and in the second suggests a collusive mechanism where firms attain cooperative gains.

When a domestic firm and a foreign firm that compete in prices in the domestic market face the imposition of duties to imports, the domestic firm's strategic response to the price increase of the foreign firm is a higher price s*et al*ong its best reply function. The resulting Nash equilibrium of this one-shot static game is higher prices in the domestic firm with larger profits for the domestic firm and smaller for the foreign firm, relative to the free trade Nash-equilibrium. Because the filing of a petition is a dominant strategy for the domestic firm, by increasing its price, the foreign firm will try to avoid the imposition or reduce the level of duties.

The second part of the model suggests that the price increase induced by the introduction of AD policy aids firms to target monopoly prices in pursue of the anticompetitive outcome. Engaging in a grim trigger mechanism, with the filing of a petition used as the punishment strategy to restore cooperation, firms achieve the collusive outcome when the one-shot static game is repeated infinitely. The effect of AD policy in this cooperative strategy is that the threshold value of the discount factors that sustain the collusive conditions are altered, relative to its free trade values. This is, the discount factor that makes the domestic firm sustain the collusive agreement becomes smaller whereas foreign firm's discount factor becomes greater. In other words, AD policy delays domestic firm's propensity to collude while prompting foreign firm's.

Some comments are made regarding the robustness of these results. First, it is well known that high industry concentration and product homogeneity are factors that facilitate collusion, among others. Despite the need of further analysis to characterise the market structure of specific Mexican AD cases, this paper draws attention on whether competition authorities should turn their eyes to a number of AD cases, as welfare losses might be larger than those supposed to

be corrected by the use of AD policy. Moreover, empirical evidence of Mexican AD cases show that domestic industry-specific factors, such as market power, market share and concentration, are relevant for the filing of AD petitions (Niels, 2002; Esquivel and Solis, 2002). Evidence of international cartels formed by firms from both developed and developing countries has also been proved welfare costly for importing developing countries (Levenstein *et al*., 2003).[36] Nevertheless, further empirical research is necessary to investigate whether AD measures are an instrument cartels resort to as a systematic support of the collusive agreement.

Second, further extensions to the basic model of collusion here presented (e.g. cost asymmetry, endogenisation of P_F) are necessary to determine the conditions in which collusion may be facilitated under AD policy within this framework.

Third, although the model attempts to highlight the proceedings of Mexican AD policy, it is, however, developed within WTO's AD recommendations, which implies that the results reached are consistent globally.

Abolition of AD rules has come up as a solution to the problem of AD among country members within integration initiatives such as the EU and the Australian-New Zealand trade agreement. If tangible results from the debate on the reform of AD to efficiently address the costs of trade liberalisation are yet to come, special attention should be paid to active AD user industries such as chemicals, pharmaceutics, cement or steel, where collusive behaviours have been recently brought into concern.

Annex

The first row of the Table A.1 shows the free trade expected payoffs each firm obtains at the respective strategy they choose in the repeated game. Remember that the grim trigger strategy they engage in to achieve collusion is symmetric, so the payoffs structure is the same for the two firms. Column three shows the Bertrand-Nash equilib-

[36] A Mexican firm participated as a member of the Tampico Fiber Cartel formed also by the US and the Netherlands during January 1990-April 1995. Another Mexican firm was also a member of the Lysine Cartel investigated by the US Department of Justice. Although not a member of the Graphite Electrodes Cartel, a main Mexican producer was also related in the cartel's activities (Levenstein *et al*., 2003).

Table A.1. Strategies and Payoffs

	Cooperation	*Deviation*	*B-N equilibrium*
Free trade	5	6	3
AD Domestic firm	5	6	4
AD Foreign firm	5	6	1

rium payoff from the one-shot static game, which in the collusive mechanism is the punishment strategy. Similarly, the next two rows show the domestic and foreign firm's payoffs under AD policy, respectively. Here, expected payoffs of the punishment strategy are altered because of the possibility of the imposition of duties to imports. This is reflected in the second term on the right-hand side of conditions (15) and (16).

Now, by substituting the payoffs of Table A.1 into conditions (14), (15) and (16) for every value of δ throughout its range, Table A.2 shows the threshold value of δ that makes collusion sustainable according to the grim trigger mechanism. It can be observed that under free trade, condition (14) holds for a δ value of 0.4. Once AD policy is introduced, the value of δ required to sustain the collusive outcome given by (15) increases to 0.5. Contrarily, a smaller value of δ is required for the foreing firm to satisfy condition (16), bringing it down to 0.2 in this numerical example.

Table A.2. Collusive Mechanism. Profits and Value of δ

	Free trade		*AD policy*			
			Domestic firm's profits		*Foreign firm's profits*	
δ	*(14)*		*(15)*		*(16)*	
0	5.00	6.00	5.00	6.00	5.00	6.00
0.1	5.56	6.33	5.56	6.44	5.56	6.11
0.2	6.25	6.75	6.25	7.00	*6.25*	*6.25*
0.3	7.14	7.29	7.14	7.71	*7.14*	*6.43*
0.4	*8.33*	*8.00*	8.33	8.67	*8.33*	*6.67*
0.5	*10.00*	*9.00*	*10.00*	*10.00*	*10.00*	*7.00*
0.6	*12.50*	*10.50*	*12.50*	*12.00*	*12.50*	*7.50*
0.7	*16.67*	*13.00*	*16.67*	*15.33*	*16.67*	*8.33*
0.8	*25.00*	*18.00*	*25.00*	*22.00*	*25.00*	*10.00*
0.9	*50.00*	*33.00*	*50.00*	*42.00*	*50.00*	*15.00*
1	0.00	6.00	0.00	6.00	0.00	6.00

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