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Trade Liberalization and the Adoption of Antidumping Laws in Developing Countries*

José Daniel Reyes**

Abstract

I propose a theoretical model to explain the heterogeneity observed in the adoption of antidumping laws by small developing countries in an environment of multilateral tariff reduction. The analysis is based on a three-stage game of trade policy determination with imperfect competition in differentiated products where the potential lobby for protection is reflected in the government's objective function and where tariffs may be bound due to multilateral trade agreements. This framework implies that the implementation of this administrative protection device is the government's best response when multilateral bound tariffs reach a sufficiently low threshold. The heterogeneity in the adoption decision is explained by the relative size of the domestic market, the degree of product differentiation and political economy motives. Relatively large economies, highly competitive domestic markets, and countries with high domestic lobbying pressure for protection enact antidumping legislation sooner.

Keywords

Optimal trade policy, intra-industry trade, product differentiation

JEL Classification

F12, F13, L13

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La liberalización comercial y adopción de leyes *antidumping* en países en vía de desarrollo

Resumen

Se propone un modelo teórico para explicar la heterogeneidad observada en la adopción de leyes *antidumping* por pequeños países en vía de desarrollo en un contexto de reducción arancelaria multilateral. El análisis se basa en un juego de tres etapas de determinación de política comercial con competencia imperfecta en productos diferenciados, donde la posible presión para la protección se refleja en la función objetivo del gobierno y donde los aranceles se pueden consolidar como resultado de acuerdos comerciales multilaterales. Este marco implica que la aplicación de este dispositivo de protección administrativa es la mejor respuesta del gobierno cuando los aranceles consolidados multilaterales alcanzan un umbral los suficientemente bajo. La heterogeneidad en la decisión de adopción se explica por el tamaño relativo del mercado nacional, el grado de diferenciación de los productos y los motivos de economía política. Las relativamente grandes economías, los mercados nacionales altamente competitivos y los países con una alta presión interna para la protección promulgan leyes *antidumping* mucho más rápido.

Palabras clave

Política comercial óptima, comercio intraindustrial, diferenciación de productos

A liberalização comercial e adoção de leis *antidumping* em países em desenvolvimento

Resumo

Proponhe-se um modelo teórico para explicar a heterogeneidade observada na adoção de leis antidumping por pequenos países em via de desenvolvimento em um contexto de redução tarifária multilateral. A análise baseia-se em um jogo de três etapas de determinação de política comercial com competência imperfeita em produtos diferenciados, onde a possível pressão para a proteção seja refletida na função objetivo do governo e onde as tarifas possam se consolidar como resultado de acordos comerciais multilaterais. Este marco implica que a aplicação deste dispositivo de proteção administrativa é a melhor resposta do governo quando as tarifas consolidadas multilaterais alcançam um limiar suficientemente baixo. A heterogeneidade na decisão de adoção se explica pelo tamanho relativo do mercado nacional, o grau de diferenciação dos produtos, e os motivos de economia política. As relativamente grandes economias, os mercados nacionais altamente competitivos e os países com uma alta pressão interna para a proteção promulgam leis antidumping mais rapidamente.

Palavras chave

Política comercial ótima, comércio intraindustrial, diferenciação de produtos

Introduction

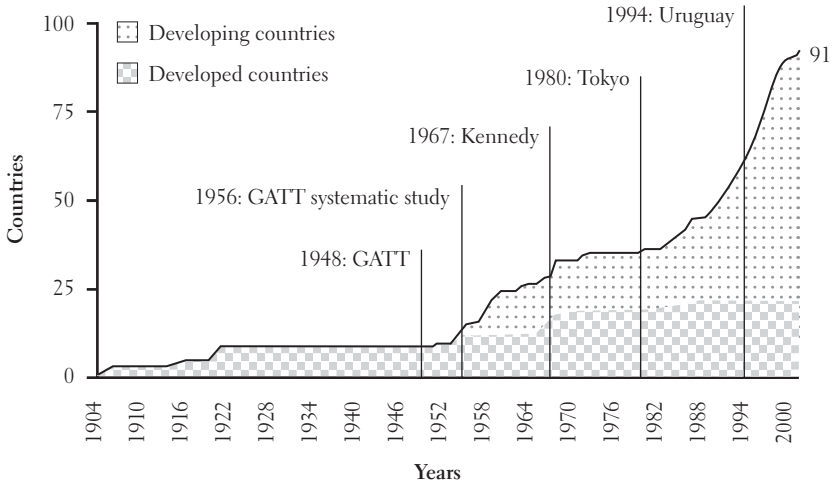
The international trading system established by the General Agreement on Tariffs and Trade (GATT), and its successor, the World Trade Organization (WTO), has resulted in a multilateral tariff reduction around the world. However, concurrently with this trade liberalization episode, Non-Tariff Barriers (NTBs) have arisen as a mechanism to protect domestic industries. Among these NTBs, antidumping (AD) has been the preferred protectionism tool. Originally, it was primarily used by developed countries and later spread out among developing countries (Miranda et al., 1998; Prusa, 2001; Zanardi, 2004). The application of the AD procedure and the subsequent imposition of duties require a national AD legislation that must be aligned with the Uruguay Round AD Agreement that entered into force on January 1st, 1995.

This paper provides the first theoretical framework to understand the underlying motives that lead developing countries to adopt an AD legislation. The main purpose is to explain the heterogeneity observed in the adoption decision among developing countries in an environment of multilateral trade liberalization. One of the most important insights of the AD literature is that the mere presence of AD legislation can affect the behavior of firms, even if no AD duty is ever imposed (Blonigen & Prusa, 2001), and thus this model is not about the determinants of the use of AD protection—a murky issue in reality—but is instead about the underlying motives that influence a country's decision to adopt an AD law in the first place.AD is an exception to the GATT/WTO principle of non-discrimination. Provided that there is dumping, which is generally defined as exporting below "normal value",[1] and that it causes or threatens material injury to domestic industry, a country is entitled to levy discriminatory duties on imports. Even though this legal apparatus was intended to deter predatory pricing in international trade, there is a consensus in AD literature that it has degraded to a quick and easy way to grant protection from import competition without violating WTO rules. Hence, dumping and injury determination has little connection with the intended economic motives to stop "unfair" trade. As Blonigen and Prusa (2003) argue, AD duties are simply the modern form of protection.

1 Article VI of the GATT defines normal value as an export price lower than the price charged by the exporter in its own market or as pricing below production cost plus selling, general, and administrative expenses, and profits.

While the developed world has had AD legislation in place for a long time, the past three decades have witnessed an increase in the adoption of AD laws in developing countries. In fact, by the end of the negotiations in the Tokyo Round in 1980, almost all developed countries had enacted AD legislation,[2] whereas only 15 developing countries had done so. Figure 1 illustrates the heterogeneity between developing countries in terms of the adoption decision after 1980 and highlights the multilateral trade rounds. Vandenbussche and Zanardi (2008) analyze the determinants of this proliferation of trade protection laws and the observed heterogeneity of the time of the adoption by using these data. They employ a duration analysis to find that retaliatory motive, past trade liberalization, and the size of the chemicals sector and the extent of steel imports are positively correlated with the probability of adopting AD legislation.

Figure 1. Multilateral Trade Rounds and Countries with AD Legislation



Source: Own elaboration.

This paper links the optimal tariff literature with the optimal AD policy literature under the possibility of exogenous multilateral binding tariffs. The analysis is based on a three-stage game of trade policy determination in a small developing economy with imperfect competition in differentiated products. The government chooses whether or not to adopt an AD legislation and sets the domestic tariff,

2 Spain and Iceland enacted AD legislations in 1982 and 1987, respectively.

which may be exogenously bound due to multilateral trade agreements, in the first and the second stage, respectively. In the third stage, duopoly competition occurs in a Cournot fashion between the domestic firm and the foreign firm. When setting tariffs, the government takes into account the lobbying pressure for protection that domestic firm can bring to bear.

This simple theoretical framework explains three key elements in the adoption decision in developing countries. First, dumping is a natural strategy of the foreign firm in the sense that it always takes place due to three features of the model (proposition 1): cross-country differences in size, the degree of product differentiation, and the extent of tariff protection. Second, progressive multilateral tariff reduction entails the existence of a threshold tariff where the government decides to adopt AD legislation in order to protect domestic industry from import competition (proposition 2). Third, the heterogeneity observed in the adoption decision is explained by three idiosyncratic factors (proposition 3): political economy motives, the relative size of domestic economy, and the degree of product differentiation. Countries with high lobbying pressure, relatively large economies and highly competitive domestic markets enact AD legislation sooner.

Theoretical AD literature has converged mainly around the determinants of dumping and the process of imposition of AD duties in developed countries.[3] As data on AD duties in developing countries have become available,[4] there is a rising interest in empirically studying these topics in developing countries. Moraga-González and Viaene (2004) address at the theoretical level the incentives of foreign firms to undertake dumping in developing and transition economies. The authors use a two-country model where trade occurs among oligopolistic firms, which differ in terms of efficiency, in a single quality-differentiated product and countries differ in the distribution of consumer preferences. In this context, dumping always arises and governments have incentives to levy tariff on high-quality imports. They argue that since the implications of this policy—namely the impact on the pricing behavior of exporting firms and the ineffectiveness of the arbitrage of goods—do not stop dumping by the foreign firm, governments must adopt AD laws to counteract the effect of their trade policy. Although this paper provides a complete characterization of the occurrence of dumping in developing countries, the argument for the adoption decision is not the result of comparing

3 Blonigen and Prusa (2001) provide a review on the relevant AD literature.

4 Bown (2007) and Zanardi (2004) provide data on the use of AD duties and on the year of adoption on AD legislation among developing countries, respectively.

the economic gains and losses of market participants of enacting the law but it is just a conjecture from the analytical model. Lastly, the model does not take into account the role of trade liberalization in the adoption decision.

Moore and Suranovic (1994) examine the welfare effects of using AD duties in a trade-liberalizing country. They propose a general equilibrium model with one import and one export sector, where tariffs are reduced and an AD duty is simultaneously introduced. The welfare impact depends on the size of the tariff liberalization, the probability that the industry gets AD protection, the size of the AD duty, and the resource cost filling and adjudicating the AD petition. Using a numerical simulation, they generate liberalization scenarios that result in national welfare losses. This article does not address the existence of dumping and assumes that AD protection is triggered by the harm that trade liberalization causes on the domestic firm. There is no explanation of the theoretical motives of enacting AD legislation in the first place.

Anderson et al. (1995) provide a theoretical explanation about the underlying motives to adopt AD legislation in developed countries. The authors employ a differentiated products oligopoly model to characterize firm rivalry in a two-stage model where governments choose whether or not to impose antidumping laws in the first stage. They assume that markets are separated by a barrier to trade of the same size in each direction, which can be either a transport cost or a tariff. They find that the non-cooperative equilibrium is to not enact AD legislation if governments unilaterally maximize domestic welfare. However, welfare may improve if laws are enacted when the barrier to trade involves a transport cost, but not if the barrier is a tariff. Their analysis differs from my model in at least two dimensions: First, they consider the bilateral decision of adopting trade protection laws in developed countries, whereas I focus on the unilateral decision of a developing country. Second, they do not consider the role of trade liberalization in the adoption decision.

This paper is organized as follows: first a formal overview of the model is presented; then, I analyze trade protection under segmented markets and integrated markets, followed by the equilibrium choice with homogeneous goods and the role of trade liberalization. Finally, I explore the determinants of the time pattern of adoption, previous to the concluding remarks.

The Model

Consider a two-country, two-good model with two identical firms producing a differentiated good. Markets are segmented. Firm 1 is located in the home country, whereas firm 2 is located in the foreign country. Countries differ in their market size. The developing country (home) has a market of size α, whereas the developed country (foreign) has a market size of α^*, ($\alpha \leq \alpha^*$). Foreign firm is a monopolist in its local market, but competes with a domestic firm in the home country's market.[5] Let *xi* be the quantity of the product manufactured by firm *i*, $i = \{1, 2\}$, to be sold in the home country. Likewise, x_2^* is the quantity of the product manufactured by firm 2 to be sold in the foreign country. Home (foreign) representative consumer's utility is a quadratic function of the available products in the market xi, $i = \{1, 2\}$, (x_2^*) and linear in a numeraire good *m* (m^*).

$$u(x_1, x_2) = a(x_1 + x_2) - \frac{1}{2}(x_1^2 + x_2^2 + 2cx_1x_2) + m \tag{1}$$

$$u(x_2^*) = a^* x_2^* - \frac{1}{2}x^{*2} + m^* \tag{2}$$

Therefore, there are no income effects on the monopolistic sector, and I can perform partial equilibrium analysis. The degree of product differentiation is given by the parameter *c*, where $0 \leq c \leq 1$. The maximum degree of product differentiation corresponds to $c = 0$ (independent goods) while the minimum degree of product differentiation corresponds to $c = 1$ (homogeneous goods). These utility functions generate the following linear inverse demand function for product *i*:

$$p_i = a - x_i - cx_j \; ; \; i, j = \{1, 2\} \; ; \; i \neq j \tag{3}$$

$$p_2^* = a^* - x_2^* \tag{4}$$

5 Shutting down exports in the developing country greatly simplifies the analysis. A model with bilateral trade would require a large difference in market sizes, a high degree of product differentiation, and a binding antidumping legislation in the developed country.

Given that the slope coefficients of the two inverse demand equations are identical, I use the intercept to designate differences in market sizes.[6]

I consider the subgame perfect Nash equilibrium of a three-stage game. The status-quo of the game is segmented markets (i.e. no AD law in place). In the first stage the domestic government (DG) decides whether or not to adopt an antidumping legislation. An antidumping law is modeled as an extra constraint imposed on the foreign firm preventing it from discriminating between markets. If the government decides to enact such a law, firm 2 chooses $\{x_2, x_2^*\}$subject to constraint $p_2 - \tau \geq p_2^*$, and firm 2's markets will be integrated. If there is not an antidumping law, firm 2 chooses $\{x_2, x_2^*\}$ without restriction, and firm 2 will be said to segment its markets.

In the second stage, the government sets a domestic tariff ($\tau \geq 0$), which may be exogenously bound ($\overline{\tau}$) by multilateral trade rounds. It is assumed that government maximizes social welfare, composed of the consumer surplus, the profits of the domestic firm, and the tariff revenue. The domestic profits are weighted by a factor $\lambda < 1$, which represents the lobbying pressure that domestic firm can bring to bear.

$$G = cs + \lambda\pi_1 + \tau x_2 \tag{5}$$

In this context, consumers do not lobby due to the diffuse nature of their losses.[7] This *politically realistic government objective function* may be derived either from a standard lobbying pressure group model (Baldwin, 1987) or from the median voter model of Mayer (1984) (as cited in Feenstra & Lewis, 1991). Variable λ measures the DG's valuation of a dollar of domestic firm's profits relative to its valuation of a dollar of consumer welfare (the sum of consumer surplus and the tariff revenue).[8]

In the last stage, the domestic firm (DF) and the foreign firm (FF) compete in the domestic market in a Cournot fashion, taking the government trade policy

6 Even though there are other ways to represent differences in market sizes, I prefer this over others (e.g. constant price elasticity) because it implies that, for a given quantity, the larger market will have a higher price.

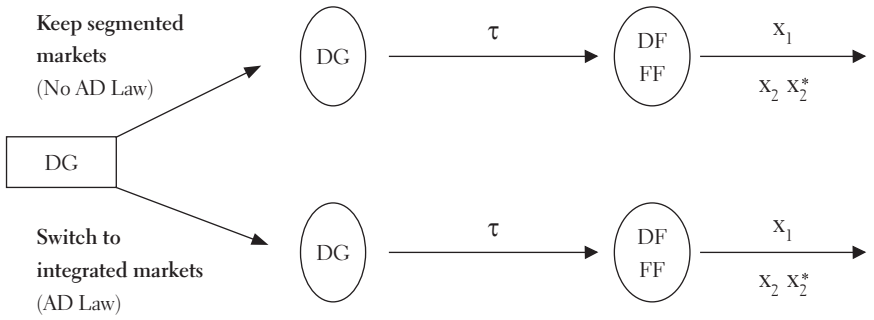
7 For a model where consumers lobby in a similar framework, see Rosendorff (1996).

8 In autarky, it is assumed that $\lambda = 1$ since firms would not lobby for protection.

as given.[9] Before the foreign firm makes output decisions, it chooses whether to stay or to exit the home market. Firms are identical and have constant marginal production costs, which, for simplicity, are assumed to be zero.

This model sketches a broad, but tractable picture of the effects of AD legislation which is consistent with most AD cases. First, AD law is considered as an anti-discriminatory device decreasing inter-firm rivalry to the benefit of domestic firm. Second, even though AD duties are not observed in this model, it is well known that a significant share of investigations ends up with price or quantity undertakings and no duties.[10] Third, with an AD law in effect, firms respect the constraint due to the threat of an investigation and being hit by a duty. Anderson et al. (1995) and Anderson and Schmitt (2003) use a similar model to analyze the effect of AD legislation in developed countries. The three-stage game is depicted in Figure 2.

Figure 2. The Three-Stage Game of Trade Policy Determination



Source: Own elaboration.

Protection under Segmented and Integrated Markets

The domestic government's equilibrium is obtained by solving this game through backward induction. In this section, I solve the last two stages of the game without AD law and with AD law.

9 A duopoly model with differentiated goods and linear demands was firstly introduced by Dixit (1979). Singh and Vives (1984), Bian and Gaudet (1997), Bernhofen (2001), Zanchettin (2006), among others, employ it to study the role of product differentiation on market outcomes.

10 See Prusa (1992) and, for the Latin American case, Finger and Nogués (2006).

Segmented Markets

When markets are segmented, equilibrium prices can be determined separately for each market. The foreign firm maximizes its profits in the two markets independently, i.e., third-degree price discrimination.

Superscript *S* denotes equilibrium variables with no AD law.

Third Stage: Competition between the Domestic and Foreign Firm

The profit of firm 1 in the domestic market is $\pi_1 = (a - x_1 - cx_2)x_1$, whereas the profit of firm 2 in both markets can be written as $\pi_2 = (a - x_2 - cx_1)(x_2 - \tau) + (a^* - x_2^*)x_2^*$.[11] Solving for the Nash equilibrium quantities, I obtain:

$$x_1^S = \frac{a}{2+c} + \frac{c\tau}{(2-c)(2+c)}; \quad x_2^S = \frac{a}{2+c} - \frac{2\tau}{(2-c)(2+c)}; \quad x_2^{*S} = \frac{a^*}{2} \quad (6)$$

The degree of product differentiation in the industry is inversely related to the intensity of competition among firms.[12] Consequently, a higher degree of product differentiation (i.e. a lower value of c) increases the market power of each firm. In the polar case of maximum product differentiation ($c = 0$), both firms are monopolists in the domestic market ($x_1^S = \frac{a}{2}$ and $x_2^S = \frac{a-\tau}{2}$). Note that the restriction $\tau < \widehat{\tau^S} = \frac{a(2-c)}{2}$ is required for there to be intraindustry trade. If $\tau \geq \widehat{\tau^S}$, there is a monopoly in the domestic firm's market with foreign firm excluded by too high export cost.

According to WTO law, if a firm exports a product at a price lower than the price it normally charges on its own home market, it is said to be dumping the product. Using this standard definition, this model predicts dumping by the foreign firm into the domestic market. That is, firm 2 uses third-degree international price discrimination.

Proposition 1. Segmented markets produce unilateral dumping since $p_2 - \tau \leq p_2^*$.

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11 Note that the solution of this problem would be the same as the solution of the maximization of the two markets separately.

12 See Bernhofen (2001) for a detailed explanation on the effect of the degree of product differentiation on the volume of trade and on the composition of the gains from trade under imperfect competition.

Proof. Define the dumping margin as $\gamma = p_2^* - (p_2 - \tau)$. Replacing equation (6) into equations (3) and (4) I obtain:

$$\gamma^S = \frac{a^* - a}{2 + c} + \frac{a^* c}{2(2 + c)} + \frac{2\tau}{(2 + c)(2 - c)} \tag{7}$$

Since $a \leq a^*$, $0 \leq c \leq 1$, and $\tau \geq 0$, then $\gamma^S \geq 0$ ■

The first term in the dumping margin is the "market size difference effect", which is non-negative because the foreign market is at least as large as the domestic market. The second effect is the "product differentiation effect", which is non-negative because goods are strategic complements. The third term is the standard "Brander-Krugman effect", which is non-negative because government values producer surplus at least as much as consumer surplus, so it never assigns import subsidies.[13]

Second Stage: Domestic Tariff Determination

In this stage, domestic government chooses the politically optimal tariff given its previous choice of not enacting an AD law. Evaluating equation (5) at its optimal levels with segmented markets and computing the optimal tariff I obtain:

$$\tau^S = \frac{a(2 - c)[c(2\lambda - 1) + 2]}{12 - c^2(2\lambda + 1)} \tag{8}$$

The optimal tariff is increasing in the government's relative valuation of domestic profits (λ). This parameter is determined by the lobbying activities of the domestic industry seeking protection from import competition. Therefore, more lobbying pressure implies that the government is willing to sacrifice consumer welfare in exchange for larger domestic profits and sets a higher tariff.[14]

The optimal equilibrium tariff is decreasing in the degree of product differentiation. The closer substitutes the goods are, the more negative the impact of

13 See Brander and Krugman (1983).

14 Formally, $\frac{\partial \tau^S}{\partial \lambda} = \frac{4ac(2-c)[6+c(1-c)]}{(c^2-12+2\lambda c^2)^2} \geq 0$.

import competition on domestic firm profits. Hence, for a given value of λ, the government sets a higher tariff the more similar the goods are.[15]

Integrated Markets

When markets are integrated, the foreign firm's prices are tied in such a way that the dumping margin is eliminated. Hence, the domestic government sets a binding constraint on the foreign firm's maximization problem that requires the elimination of the difference between FOB prices across markets ($\gamma = 0$). Superscript *I* denotes equilibrium variables with AD law.

Third Stage: Competition between the Domestic and Foreign Firm

The profit function of firm 1 is the same as with segmented markets. The maximization problem of Firm 2 is now subject to the constraint $p_2 - \tau \leq p_2^*$ or $\alpha - x_2 - cx_1 - \tau \geq \alpha^* - x_2^*$. The concavity of the profit function ensures that this restriction will hold with equality. Since an AD law entails the equalization of net prices across markets, firm 2 may either still serve the domestic market without dumping or else withdraw from its export market.

Solving the case where the foreign firm still serves the domestic market with an AD law, I obtain the following equilibrium quantities:

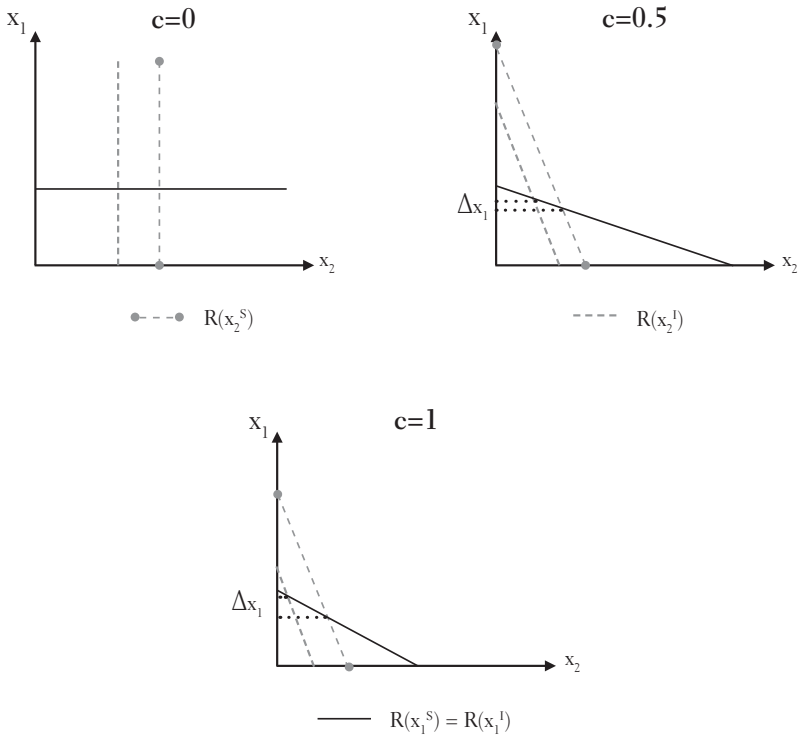
$$x_1^I = \frac{a(4-3c)+ca^*+3c\tau}{8-3c^2}; \quad x_2^I = \frac{3a(2-c)-2a^*-6\tau}{8-3c^2};$$
$$x_2^{*I} = \frac{2a^*(3-c^2)-a(2-c)+2\tau}{8-3c^2} \tag{9}$$

An AD law reduces the foreign firm's equilibrium output in the domestic market and increases it in the foreign market. Domestic firm output increases in the domestic country as long as $c > 0$. The more homogeneous the goods are, the larger the increase in domestic output is. Figure 4 compares the equilibrium solutions between segmented markets and integrated markets under different degrees of product differentiation. Not surprisingly, AD legislation raises domestic prices

15 Formally, $\frac{\partial \tau^S}{\partial c} = \frac{4a(\lambda-1)(c^2(1+2\lambda)+12-8c)}{(c^2(1+2\lambda)-12)^2} \geq 0$.

and decreases foreign prices, whereas firm 1's profits increase and firm 2's profits decrease. The prohibitive tariff with integrated markets is $\widehat{\tau^I} = \frac{a(2-c)}{2} - \frac{a^*}{3}$ (note that $\widehat{\tau^I} = \widehat{\tau^S} - \frac{a^*}{3}$).

Figure 4. Degree of Product Differentiation and Response Functions with Integrated and Segmented Markets



Source: Own elaboration.

If constraint to tie markets, foreign firm may wish to give up entirely on the export market in order to raise its domestic price. I assume the decision to enter or exit the home market is made prior to output decisions. Thus, if the foreign firm exits the home market, both firms become monopolists in their respective local markets.

An equilibrium with two firms in the domestic market requires that the foreign firm has no incentive to deviate from this situation. This implies that firm 2's profits under integrated markets and trade must be at least as large as firm 2's profits when

it is a monopolist in its own market. Given that $\pi_2^I = 2\left[\frac{a^*(2-c^2)+a(2-c)-2\tau}{8-3c^2}\right]^2$ and $\pi_2^m = \frac{a^{*2}}{4}$ the condition for exit can be written as:

$$\tau > \tau^{ex} = \frac{a(2-c)}{2} - a^*\left[\sqrt{2}-1-\frac{c^2}{8}(3\sqrt{2}-4)\right] \tag{10}$$

If domestic tariff is too high $\tau > \tau^{ex}$, firm 2 would prefer to exit the market in the presence of antidumping legislation. Note that τ^{ex} is decreasing in a^*, the market size of the foreign country, and increasing in a, the market size of the domestic country. That is, firm 2 is more likely to exit the home market, the smaller that market is relative to the foreign market. In order to ensure that there exists some non-negative domestic tariff ($\tau^{ex} \leq 0$) that entails an equilibrium with two firms in the domestic market, I restrict the relative size of the foreign economy as follows.

$$1 \leq \frac{a^*}{a} \leq \frac{4(2-c)}{8(\sqrt{2}-1)-c^2(3\sqrt{2}-4)} \tag{11}$$

If the relative foreign market size is greater than this upper bound, firm 2 quits the domestic market for any tariff. Hence, an AD legislation necessarily involves a monopoly in the domestic country. Note that the binding tariff for the foreign firm to stop selling in the domestic market is the exit tariff (τ^{ex}), not the prohibitive tariff ($\hat{\tau}^I$).

Lemma 1. Under integrated markets and both firms serving the domestic market, $\tau^{ex} < \hat{\tau}^I$

Proof. Suppose $\tau^{ex} \geq \hat{\tau}^I$. Thus $\frac{a(2-c)}{2} - a^*\left[\sqrt{2}-1-\frac{c^2}{8}(3\sqrt{2}-4)\right] \geq \frac{a(2-c)}{2} - \frac{a^*}{3}$.

Solving for *c*:

$c \geq \left[\frac{8}{3\sqrt{2}-4}(\sqrt{2}-1-\frac{1}{3})\right]^{\frac{1}{2}} = 1.633$, which is a contradiction because $0 \leq c \leq 1$.

Thus, $\tau^{e\hat{x}} < \tau^I$ ■

The exit tariff is increasing in the degree of product differentiation. If products are very similar, the foreign firm faces more competition in the domestic market

thus it would make lower profits and be willing to give up the domestic market at a lower tariff than when products are more differentiated.[16]

Second Stage: Domestic Tariff Determination

The politically optimal tariff (τ^I) in the case of AD law and both firms in the domestic market is given by equation 12. Let $\tilde{\tau}^I$ be the optimal tariff resulting from the maximization of equation 5 at its optimal levels with integrated markets.[17]

$$\tau^I = \min[\tau^{ex}, \tilde{\tau}^I] \tag{12}$$

where

$$\tilde{\tau}^I = \frac{(a^* - 3a)}{3} + \frac{4(a^* - 3a)(2 - \lambda c^2) + 2ca(3 - 4\lambda)}{3c^2(1 + 2\lambda) - 20}$$

For homogeneous goods it is easy to show that $\tau^I = \tau^{ex}$. An increase in the degree of product differentiation involves an opposite impact on the relevant tariffs in equation 12. On the one hand, it raises τ^{ex} because a reduction in the intensity of competition among firms boosts foreign firm's profits in the domestic market. On the other hand, it decreases $\tilde{\tau}^I$ because the government chooses a lower optimal tariff since domestic firm is less affected by import competition. Therefore, the degree of product differentiation determines the solution of equation 12.

The government has no incentives to exclude foreign firm from the domestic market by setting a tariff higher than τ^I. Because domestic firms do not lobby for protection in autarky ($\lambda = 1$), consumer losses -the sum of consumer surplus and tariff revenue- offset the domestic firms benefits of shutting down foreign trade.

AD legislation has a different effect on domestic producers and consumers. Domestic firm is better off since it obtains more profits, provided that $c > 0$. Consumers, on the other hand, are worse off because domestic prices increase. Finally, tariff revenue decreases since, for a given value of the domestic tariff, the foreign firm exports less. The combined impact of these three effects on the government's objective function, in conjunction with the existence of an exogenous

16 1 $\frac{\partial \tau^{ex}}{\partial c} = \frac{a^* c}{4}(3\sqrt{2} - 4) - \frac{a}{2} < 0$.

17 Note that I allow for firm 2 to exit the domestic market but I required that there must exist a non-negative tariff ($\tau^{ex} \geq 0$) for which it prefers to serve the domestic market with integrated markets.

bound to multilateral tariffs determines the decision of whether to enact an AD legislation or not.

Trade Liberalization and the Adoption of AD Laws

Consider, now, the first stage in this three-stage game of trade protection. Here, the domestic government decides whether to switch to an AD law or not. The decision, of course, depends on which regime can deliver the highest government payoff in an environment where tariffs may be exogenously bound by multilateral trade rounds. This section presents the solution of the game for homogeneous goods.

The government faces a trade-off between the domestic firm's profits and the consumer welfare in the first stage. Firm 1 is better off with an AD law because it sells more at higher prices while consumers are worse off because they confront higher prices. The government collects less tariff revenue because imports decrease. If the government can freely choose any tariff, it will not switch to an AD regime because the negative consumer welfare effect outweighs the positive firm's profits effect.[18]

Whenever tariffs are bound ($\overline{\tau}$) at a lower level than the politically optimal tariff in segmented markets (i.e. tariffs are effectively bound), domestic profits decrease because of fiercer foreign competition and consumer surplus increases due to the reduction in prices. The effect on tariff revenue is undetermined, on the one hand it increases due to higher import volumes, but on the other hand, it decreases due to the reduction in multilateral tariffs.

As a consequence of the progressive reduction of multilateral tariffs implied by different trade rounds, it is optimal for a government to switch to an AD law for a sufficiently low bound tariff (τ'). At this point the positive firm's profits effect just match the negative consumer's welfare effect of enacting an AD law. The optimal AD policy in small developing countries is characterized by proposition 2.

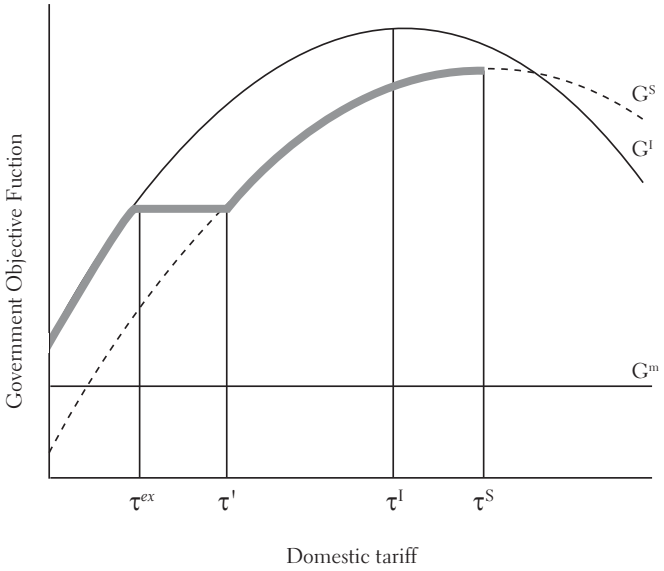
Proposition 2:

1. *AD legislation will never be enacted if* $\overline{\tau} > \tau'$, where τ' *satisfies* $G^S(\tau') = G^I(\tau^{ex})$
2. *When* $\overline{\tau} \leq \tau'$, *the government adopts an AD law.*

Proof. See Appendix ■

18 Since the status-quo regime is no AD legislation, the government's valuation of domestic profits (λ) must be restricted. See the Appendix for details.

Figure 5. The Choice of Policy Regimes



Source: Own elaboration.

Figure 5 shows the optimal antidumping policy with trade liberalization. When tariffs are not effectively bound, the government chooses no AD law and sets the optimal tariff in segmented markets ($\tau = \tau^S$). When $\tau' < \bar{\tau} \leq \tau'$, the best policy is to keep the segmented markets situation and to set $\tau = \bar{\tau}$. When $\tau^{ex} \leq \bar{\tau} \leq \tau'$ the government finds it optimal to enact an AD legislation and sets $\tau = \tau^{ex}$; hence the applied tariff is lower than the bound tariff.[19] Finally if $\bar{\tau} < \tau^{ex}$ the government sets $\tau = \bar{\tau}$. The gray line in the Figure 5 shows the welfare corresponding to the optimal antidumping policy.

Heterogeneity in the Timing of AD Law Adoption

The theoretical model explains the adoption decision as a result of the trade liberalization process. Now, the observed heterogeneity in the adoption decision in developing countries is explained by three features: Political economy motives,

19 The government does not set the $\tau = \bar{\tau}$ in this interval to avoid foreign firm exit and face a monopoly situation in the domestic market.

"The observed heterogeneity in the adoption decision in developing countries is explained by three features: Political economy motives, the relative domestic market size, and the degree of product differentiation".

the relative domestic market size, and the degree of product differentiation. Proposition 3 presents the relationship between the threshold for adoption (τ') and the relative government's valuation of domestic profits (λ), the inverse of the relative size of the domestic market $\left(\frac{a^*}{a}\right)$, and the degree of product differentiation (c).

Proposition 3:
1. τ' *is increasing in* λ.
2. τ' *is decreasing in* $\frac{a^*}{a}$.
3. τ' *is increasing in* c.
Proof. See Appendix ■

A higher government valuation of domestic profits, which reveals more lobbying pressure from the domestic industry, implies a sooner adoption of the AD law. When facing a trade liberalization episode, governments with better organized lobbies care more about domestic firm's losses than consumers' welfare gains. Thus, the threshold for adoption of an AD law is increasing in λ. The first panel of Figure 6 shows the graphical solution for an increase in λ.

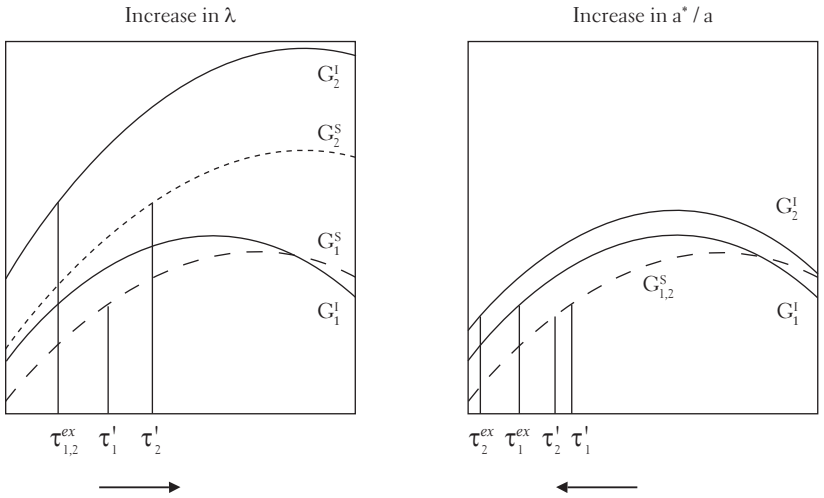
"When facing a trade liberalization episode, governments with better organized lobbies care more about domestic firm's losses than consumers' welfare gains".

When obligated to tie markets, the foreign firm exits the domestic country sooner for relatively smaller countries. In the segmented markets case, the foreign firm's profits from the foreign market are at least as large as the profits for the domestic market.[20] Consequently, a decrease (an increase) in the relative size of the domestic market implies a decrease (an increase) in foreign firm's profits from the domestic market. Thus, if the foreign firm must

20 The reason for this is twofold: On the one hand, the foreign market is at least as large as the domestic market, thus -for the same degree of product differentiation in both markets- the foreign equilibrium price and quantities are at least as large as the domestic equilibrium values. On the other hand, due to our assumption of no competition in the foreign market, the foreign firm behaves as a monopolist in fully differentiated goods in its country regardless of the degree of product differentiation in the domestic country.

integrate its markets in a relatively smaller country, it finds it optimal to exit at a lower tariff since it would have to tie its own market price to an even lower domestic price. When facing a trade liberalization episode, domestic government delays its adoption of an AD law to prevent exit because this hurts domestic consumers. Thus, the threshold for adoption is decreasing in the relative size of the foreign market (second panel of Figure 6).

Figure 6. Valuation of Domestic Profits, Relative Market Size, and the Timing of the Adoption Decision*



* The exercise assumes an initial situation (labeled with subscript 1) with the following parameter values: $\frac{a^*}{a} = 1.1$, $\lambda = 1.1$, $c + 1$. The government objective function with segmented markets is represented with dashes lines. The first panel represents an increase in λ to 1.3, whereas the second panel corresponds to an increase in $\frac{a^*}{a}$ to 1.25. The arrow at the bottom of each graph shows the direction of change in the threshold tariff for adoption of AD legislation.

Source: Own elaboration.

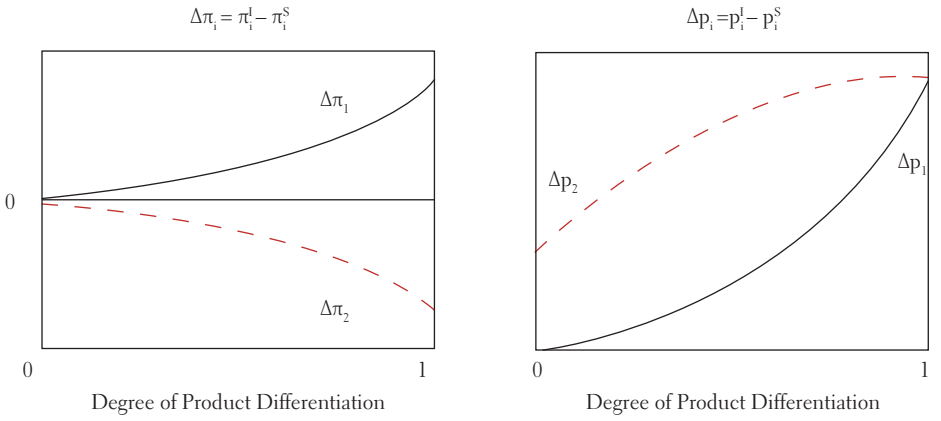
Since the degree of product differentiation is inversely related to the intensity of competition, foreign firm's profits in the small country with segmented markets are decreasing in c.[21] The foreign firm's profits in the foreign market are indepen-

21 Recall that c goes from maximum product differentiation ($c = 0$) to minimum product differentiation ($c = 1$). Thus, an increase in c is a reduction of the degree of product differentiation whereas a decrease in c is an increase of the degree of product differentiation.

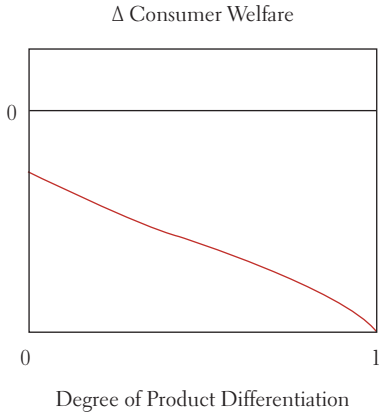
dent of the degree of product differentiation since there is no competition in the foreign market. When the foreign firm is obligated to equate the net domestic price —which is a function of the degree of product differentiation— with the foreign price —that is always set at the fully differentiation level due to the absence of competition—, the negative net effect on its profits $(\pi_2^I - \pi_2^S)$ is smaller, the more differentiated the goods are.[22] The first panel of Figure 7 shows the relation of net profits for both firms with product differentiation.

Antidumping legislation implies an increase in domestic prices. When products are perfectly homogeneous, the home price of the domestic output increases at the same level as the home price of imports. On the other hand, when goods are fully differentiated, the home price of the domestic product is not affected by AD legislation (second panel, Figure 7). For any degree of product differentiation, consumers are worse off with the adoption of the law, since the net change in domestic prices $(p_1^I - p_1^S$ and $p_2^I - p_2^S)$ is positive. Tariff revenue always decreases with an AD law since foreign firm reduces exports to the domestic market. Thus, consumer welfare (consumer surplus plus tariff revenue) is more negatively affected when goods are more alike. The last panel of Figure 7 shows this relationship.

Figure 7. Effect of AD Legislation on Profits, Domestic Prices and Consumer Welfare



22 The conversely is true for the domestic firm, the positive net effect on its profits is smaller the more differentiated the good are.

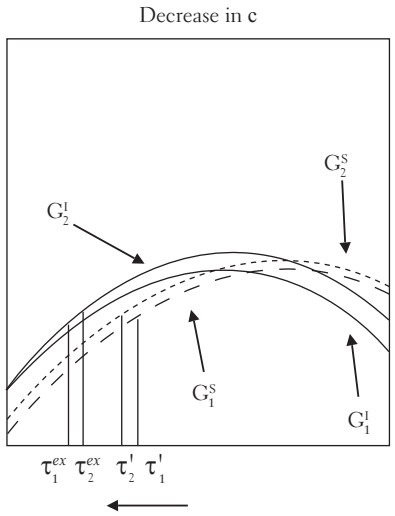


Source: Own elaboration.

Having explained the solution of the model with homogeneous goods, we should analyze the effect of a progressive movement towards product differentiation and its impact on the timing of adoption. Consider a situation where the bound tariff is equal to the threshold tariff for adoption with homogeneous goods (called $\tau'_{c=1}$), and compare this result with the first-stage solution (same bound tariff) with some degree of product differentiation.[23] Recall that the government decides to enact AD legislation at the point where the positive domestic profits' effect just match the negative consumer welfare's effect of switching to integrated markets. When goods share some degree of product differentiation, a change to integrated markets entails a smaller increase of domestic profits and a lower consumer welfare losses compare to the homogeneous goods situation (Figure 7). The reduction in net domestic profits is larger than the reduction in consumer welfare losses, and thus each marginal increase in product differentiation (reduction in c) signifies that consumer welfare losses outweigh the domestic firm's gains. This implies that, at $\bar{\tau} = \tau'_{c=1}$, the government chooses not to switch to an AD regime. Consequently, the optimal threshold for adoption is decreasing in the degree of product differentiation (Figure 8).

23 I assume that the change in c is marginal in such a way that $\tau^I = \tau^{ex}$ still holds.

Figure 8. Degree of Product Differentiation and the Timing of the Adoption*



* The exercise assumes the same initial values as in Figure 6. The change in c corresponds to a decrease of product differentiation to 0.9.

Source: Own elaboration.

Concluding Remarks

The reduction in tariffs that the world has witnessed in the last 40 years has led governments to resort to other mechanisms to constrain trade. Antidumping legislation, originally a privilege of the developed countries, is now the most widely used policy device worldwide. This paper proposes a theoretical framework to explain the observed heterogeneity in the time of adoption of antidumping laws in developing countries. The analysis is based on a three-stage game of trade policy determination with imperfect competition in differentiated goods, where tariffs are exogenously bound due to multilateral trade rounds.

Trade policy is the result of the government analysis to resolve trade-offs between surpluses of domestic market participants. On one hand, the boost in import competition created by tariff reductions decreases producer surplus, while increasing consumer surplus. On the other hand, an adoption of AD legislation decreases inter-firm rivalry to the benefit of the domestic firm and to the disfavor of the consumer welfare. In a trade liberalization episode where the potential lobby for protection is reflected in the government's objective function, it is shown

that the implementation of AD legislation is the government's best response when multilateral bound tariffs reach a sufficiently low threshold.

This threshold for adoption among developing countries depends on three idiosyncratic factors. Countries with high lobbying pressure for protection enact AD legislation sooner because the government cares more about the negative impact that trade liberalization bears for domestic producers. A government in a relatively small domestic market delays the enactment of AD legislation to prevent exit from the foreign firm due to the requirement of integrated markets. Finally, since the degree of product differentiation is inversely related to the intensity of competition in the domestic market and, thus, to the level of domestic profits, AD laws are approved sooner when trade is performed in more homogeneous goods.

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Appendix

Proof of Proposition 2

1. Primitive assumptions of the model.
   $\lambda > 1$, $a > 0$, $a^* > 0$, and $1 \leq \frac{a^*}{a} \leq 1.3025$. The upper bound of the relative foreign market size is given by equation 11.

2. $G^I(\tau^{ex}) > G^S(\tau^{ex})$: The government objective function evaluated at the exit tariff is greater with integrated markets than with segmented markets.

   Let $\Delta G = G^I(\tau^{ex}) - G^S(\tau^{ex})$. By means of contradiction I will show that $\Delta G > 0$

$$\Delta G = \frac{a^*(2-\sqrt{2})}{144}\left[a^*\left[23\sqrt{2} - 16 - \lambda(14\sqrt{2}-16)\right] - 12a(3-2\lambda)\right]$$

   Suppose $\Delta G \leq 0$. Thus, the following condition must hold:

$$\frac{a^*}{a} \leq \frac{12(3-2\lambda)}{23\sqrt{2}-16-\lambda(14\sqrt{2}-16)}$$

   Since $\leq \frac{a^*}{a}$, then $1 < \frac{12(3-2\lambda)}{23\sqrt{2}-16-\lambda(14\sqrt{2}-16)}$

   Solving this inequality, $\lambda \leq \frac{52-3\sqrt{2}}{40-14\sqrt{2}} \approx 0.9640$, which is a contradiction because $\lambda > 1$. Thus $\Delta G > 0$.

3. $G^S(\tau^S) > G^I(\tau^{ex})$: The government prefers segmented markets and the optimal tariff rather than integrated markets and the exit tariff.

   Let $\Delta G = G^S(\tau^S) - G^I(\tau^{ex})$.

$$\Delta G = \frac{a^2}{2}\left[\frac{(\lambda - \frac{3}{2})^2}{11-2\lambda}\right] + \left[\frac{a^*}{8}\right]^2\left[75 - 52\sqrt{2} - \lambda(34-24\sqrt{2})\right]$$

$$+ \frac{aa^*}{16}\left[\lambda(6\sqrt{2}-8) - 9\sqrt{2} + 12\right]$$

Since $a > 0$, I can divide ΔG by a^2 without changing the sign of this expression. Below each component of the next equation is the condition for it to be positive.

$$\frac{\Delta G}{a^2} = \underbrace{\left[\frac{(\lambda - \frac{3}{2})^2}{2(11-2\lambda)}\right]}_{\lambda < \frac{11}{2} = 5.5} + \left[\frac{a^*}{8a}\right]^2 \underbrace{\left[75 - 52\sqrt{2} - \lambda(34 - 24\sqrt{2})\right]}_{\lambda < \frac{75-52\sqrt{2}}{32-24\sqrt{2}} = 24.8} + \frac{a^*}{16a} \underbrace{\left[\lambda(6\sqrt{2} - 8) - 9\sqrt{2} + 12\right]}_{\lambda > \frac{9\sqrt{2}-12}{6\sqrt{2}-8} = 1.5}$$

It is easy to see that in interval $1 < \lambda \leq 1.5$, the second term outweighs the third term. Thus, the first term determines the sign of the equation; therefore, I need the restriction $1 < \lambda < 5.5$ for $\Delta G > 0$.[24]

4. $G^S(\tau)$ is strictly concave and $\tau^{ex} < \tau^S$: Since the exit tariff is to the left of the optimal tariff in segmented markets, $G^S(\tau)$ is increasing between τ^{ex} and τ^S.

   $\frac{\partial^2 G^S(\tau)}{\partial^2 \tau} = \frac{2}{9}\lambda - \frac{11}{9} < 0$ because, by step 3, $1 < \lambda < 5.5$.

   $\tau^S = \frac{a(2\lambda+1)}{11-2\lambda}$ and $\tau^{ex} = \frac{a}{2} - \frac{a^*(5\sqrt{2}-4)}{8}$. By means of contradiction suppose that $\tau^{ex} \geq \tau^S$, thus:

$$\frac{a^*}{a} \leq \frac{4}{5\sqrt{2}-1} - \frac{8(2\lambda+1)}{(5\sqrt{2}-4)(11-2\lambda)}$$

   Since $1 \leq \frac{a^*}{a}$

$$1 \leq \frac{4}{5\sqrt{2}-1} - \frac{8(2\lambda+1)}{(5\sqrt{2}-4)(11-2\lambda)}$$

24 Conceptually, it means that government's valuation of local profits cannot be so high to begin with so it prefers to set an AD legislation when tariffs are not constrained by any trade agreement. Recall that the status-quo regime is no AD legislation.

Solving this inequality, $\lambda \leq 0.12$, which is a contradiction because $\lambda < 1$. Thus $\tau^{ex} < \tau^{S}$.

5. By steps 2 and 3, $G^{S}(\tau^{ex}) < G^{I}(\tau^{ex}) < G^{S}(\tau^{S})$. By step 4, $G^{S}(\tau)$ is increasing in the interval $[\tau^{ex}, \tau^{S}]$. Then, by the intermediate value theorem, there exists $\tau' \in (\tau^{ex}, \tau^{S})$ such that $G^{S}(\tau') = G'(\tau^{ex})$. For the proof of the intermediate value theorem see Rudin (1976), Theorem 4.23, p; 93.

QED

Proof of proposition 3

1. *τ' is increasing in λ.*
   Since λ shifts both segmented markets and integrated markets government functions by the same proportion, and since τ^{ex} does not depend on λ, a necessary and sufficient condition for τ' be increased in λ is to show that $\Delta G(\tau^{ex}) = G^{I}(\tau^{ex}) - G^{S}(\tau^{ex})$ is increasing in λ. Since $G^{S}(\tau)$ is increasing between $[\tau^{ex}, \tau^{S}]$, then τ' must be increasing in λ (see Figure 6).

$$\Delta G = \frac{a^*(2-\sqrt{2})}{144}\left[a^*\left[23\sqrt{2} - 16 - \lambda(14\sqrt{2}-16)\right] - 12a(3-2\lambda)\right]$$

$$\frac{\partial \Delta}{\partial \lambda} = \frac{a^*(2-\sqrt{2})}{144}\left[24a - (14\sqrt{2}-16)a^*\right]$$

I show that this expression is positive by a contradiction. Divide this equation by α and suppose it is non-positive, thus,

$$\left[24 - (14\sqrt{2}-16)\frac{a^*}{a}\right] \leq 0$$

$$6.32 = \frac{24}{14\sqrt{2}-16} \leq \frac{a^*}{a}$$

Which is a contradiction since $1 \leq \frac{a^*}{a} \leq 1.3025$.
Therefore, $\Delta G(\tau^{ex}) \leq 0$ and τ' is increasing in λ.

QED

2. τ' *is increasing in* $\frac{a^*}{a}$.
Suppose that a is a constant and a^* changes. Thus I need to show that τ' is decreasing in a^*.
$G^S(\tau)$ does not depend on a^*. Thus, a sufficient and necessary condition for τ' be decreased in a^* is that τ^{ex} is decreasing in a^*(see Figure 6).

$$\tau^{ex} = \frac{a(2-c)}{2} - a^* \left[\sqrt{2} - 1 - \frac{c^2}{8}(3\sqrt{2} - 4)\right]$$

$$\frac{\partial \tau^{ex}}{\partial a^*} = -\left[\sqrt{2} - 1 - \frac{c^2}{8}(3\sqrt{2} - 4)\right]$$

This expression is negative for any degree of product differentiation. Suppose it is not, then $\sqrt{2} - 1 - \frac{c^2}{8}(3\sqrt{2} - 4) \leq 0$, which implies $3.69 = \left[\frac{8(\sqrt{2}-1)}{3\sqrt{2}-4}\right]^{\frac{1}{2}} \leq c$; which is a contradiction because $0 \leq c \leq 1$. Therefore, τ' is decreasing in a^*.
Suppose that a^* is a constant and a changes. Thus I need to show that τ' is increasing in a.
Again this implies that τ^{ex} must be increasing in a

$$\tau^{ex} = \frac{a(2-c)}{2} - a^* \left[\sqrt{2} - 1 - \frac{c^2}{8}(3\sqrt{2} - 4)\right]$$

$$\frac{\partial \tau^{ex}}{\partial a} = \frac{(2-c)}{2} > 0$$

Which is positive for $0 \leq c \leq 1$.

QED

3. τ' *is increasing in* c.
A change in c shifts both government objective functions and the exit tariff. A necessary and sufficient condition for τ' be increased in c is to show that τ^{ex} and $\Delta G(\tau^{ex}) = G^I(\tau^{ex}) - G^S(\tau^{ex})$ are decreasing in c. Since $G^S(\tau)$ is increasing between $[\tau^{ex}, \tau^S]$ then τ' must be increasing in c (see Figure 8).

Recall that the relative size of the foreign market must the following condition $1 \leq \frac{a^*}{a} \leq \frac{4(2-c)}{8(\sqrt{2}-1)-c^2(3\sqrt{2}-4)}$. This implies $1.3025 \leq \frac{a^*}{a} \leq 2.4142$. Furthermore, assume a small deviation from $c = 1$ such that $\tau^I = \tau^{ex}$ still holds.[25]

- τ^{ex} is decreasing in c

$$\tau^{ex} = \frac{a(2-c)}{2} - a^* \left[\sqrt{2} - 1 - \frac{c^2}{8}(3\sqrt{2} - 4)\right]$$

$$\frac{\partial \tau^{ex}}{\partial c} = -\frac{a}{2} + \frac{ca^*}{4}\left[3\sqrt{2} - 4\right]$$

$\frac{\partial \tau^{ex}}{\partial c} < 0$ implies $\frac{a^*}{a} < \frac{2}{c(3\sqrt{2}-4)}$. Since $1 \leq \frac{a^*}{a}$, then $1 < \frac{2}{c(3\sqrt{2}-4)}$ $= 8.2426$. Given that $0 \leq c \leq 1$, this condition holds.

- $G(\tau^{ex})$ is decreasing in c
  $G(\tau^{ex})$ can be written as $G(\tau^{ex}) = AB$, where

$$A = \frac{1}{16}\left[c^4 a^*\left[3\sqrt{2} - 4 + 2\lambda\left(4\sqrt{2} - 3\right)\right] + 4c^3 a\left(2\lambda + 1\right) + 2c^2 a^*\left[2 - \sqrt{2} + 2\lambda\left(5\sqrt{2} - 6\right)\right] + 16ca\left(1 + 2\lambda\right) + 8a^*\left(3\sqrt{2} - 2\right) + 64a\right] > 0$$

$$B = -a^*\left[2 - \sqrt{2}\right]\left[\frac{c+2}{c-2}\right]^2 < 0$$

$$\frac{\partial A}{\partial c} = \frac{1}{16}\left[4c^3 a^*\left[3\sqrt{2} - 4 + 2\lambda\left(4\sqrt{2} - 3\right)\right] + 12c^2 a\left(2\lambda + 1\right) + 4ca^*\left[2 - \sqrt{2} + 2\lambda\left(5\sqrt{2} - 6\right)\right] + 16a\left(1 + 2\lambda\right)\right] > 0$$

25 Comparing equations 10 and 12 it is possible to find a threshold $\bar{c}$ such that $\tau^{ex} \leq \overline{\tau^I}$. This condition is quiet cumbersome to be written here but it is available for the interested reader.

$$\frac{\partial B}{\partial c} = 2a^* \left[2 - \sqrt{2}\right] \left[\frac{c+2}{c-2}\right] \left[\frac{4}{(c-2)^2}\right] < 0$$

Then

$$\frac{\partial G(\tau^{ex})}{\partial c} = A\frac{\partial B}{\partial c} + B\frac{\partial A}{\partial c} < 0$$

QED