# Do we need Antidumping Rules?

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**Abstract**

We show that antidumping (AD) and countervailing subsidy (CVD) regulations can increase the range of feasible preferential trade agreements (PTA), given governments that are sensitive to pressure groups defending import competing industries. AD and CVD regulations serve as an "escape valve" for pressure groups affected by the PTA in some states of the world. If the preferences of government do not differ by much from those of a welfare maximizing planner, there are PTAs with escape clauses that provide more welfare than PTAs without escape.

AD and CVD differ from safeguards in not requiring compensation to exporting countries, so a feasible agreement requires testing for injury caused by imports. Cheating on trade agreements is likely unless the level of pressure for protection is verifiable, and this is the role of the World Trade Organization (WTO) injury tests. If the injury tests are weakened, and the level of political pressure is less observable than expected, agreements become less valuable or may collapse.

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# 1 Introduction

An unanswered question in the theory international trade is the prevalence of antidumping (AD) and anti-subsidy (CVD) regulations embedded in most multi- and bilateral preferential trade agreements (PTA).[1] Since it is well known that AD regulations serve a protectionist purpose, why should trade agreements —specifically designed to reduce restrictions to trade— include them? When asked, trade negotiators state that without AD and other escape clauses, the treaty would not be signed.[2] This raises the obvious question of why this portmanteau protection is required in order to sign agreements. The answer we provide is that governments are sensitive to pressure groups à la Helpman (1997). When adverse sectoral shocks in the import-competing sector occur, the associated pressure groups may lobby hard enough to break trade agreements if their wishes are not satisfied. If there were a way of "escaping" some obligations while staying within the agreement, the stability of the agreement would increase with this targeted protection.

Hence, we argue that there is a wider and more inclusive class of agreements that can be signed when AD regulations are in place. In fact, we show that governments that are not too sensitive to import-competing pressure groups may achieve agreements that are better for social welfare than those without the possibility of escape. We do not claim that these agreements are preferable to PTAs without escape clauses signed by a welfare maximizing government which is oblivious of pressure groups. Rather, we show that since governments usually do not maximize social welfare, it is possible to sign PTAs with escape clauses that achieve higher welfare than those that can be signed without these clauses.

We also show that procedural rules similar to those incorporated in the AD code of the WTO are essential in order to provide the observability required by a stable agreement. Moreover, we show that if the rules of AD procedure are subverted, preferential trade agreements become less stable and if they survive, provide fewer benefits.

Our argument follows the one in a recent paper by Rosendorff and Milner (2001). These authors have shown that safeguard protection and other rules which allow agreements to be "escaped" while compensating the other party, can be rationalized as means of increasing the range of cooperative trade agreements. According to this argument, preferential trade agreements are vulnerable to political pressures from sectors that are adversely affected by trade. Under certain conditions these sectors might pressure successfully to break the agreement. By allowing these

[1] For example, Hoekman (1998) writes

> "It is well known that many PTAs have not eliminated the reach of trade policy —governments often exempt certain sectors and retain the right to impose antidumping, countervailing duty and "emergency" protection."

There are a few agreements without AD clauses: Canada-Chile, European Economic Area, Australia-New Zealand, among others. Nevertheless even these agreements normally include some escape clauses. See Hoekman (1998). We will write Preferential Trade Agreement for convenience, even though most of the paper deals with a world of two countries (in the working paper version at `http://www.dii.uchile.cl/~cea` we extend most of the results to a world of many countries).

[2] Countries may forsake agreements that introduce constraints on their use of AD rules, as shown by the US refusal to accept an international procedure to adjudicate AD cases in the US-Canada FTA (see Hoekman (1998)).

sectors to escape their obligations, the pressures are reduced and hence the agreements are stabler. The compensations to the other party that are embodied in safeguards are essential, since otherwise it could be costless to impose safeguards and the agreement might founder in a round of mutual safeguard actions. The usual compensations for safeguards involve increased access in other sectors or the possibility that the trade partner imposes its own retaliatory restrictions. It is important to note that by hurting interests within its own country, a government that uses safeguard actions is implicitly showing that the political pressures to abandon the agreement were high.

There is an alternative set of escape clauses that does not require compensation by the country that uses them and hence are not covered by the logic of the previous argument: antidumping (AD) and countervailing subsidy (CVD) regulations. In this paper we extend the argument in Rosendorff and Milner (2001) to cover this case, showing that AD and CVD regulations are designed so as to provide escape for politically powerful sectors that are adversely affected by trade shocks, while not requiring compensations. The possibility of escaping the agreement adds flexibility to the agreements, making them more palatable to groups that fear the effects of lower barriers to trade. The problem is that escape without compensation can be dangerous to the agreement. We show that if escape is not limited by enforceable rules, the agreements collapse. In order to avoid this pitfall, the WTO uses an AD code (and the CVD code) to limit the scope for opportunistic use of contingent protection. It does so by establishing a set of quasi-judicial procedures –the *injury tests*– that can be interpreted as showing to the trade partner that the affected sector is in sufficient trouble that unless a means of escaping the treaty obligations is provided, the trade agreement itself is in danger.[3] We show that observability of the effects of the shock –in the sense of a credible injury test– is essential for the trade agreement to survive in the presence of non-compensatory escape clauses. A decline in the credibility of the injury test reduces the scope and the quality of preferential trade agreements. In the remainder of the paper we will speak of antidumping, but most of the remarks also apply to CVD regulations.

Historically, there are two main traditions regarding AD laws. In the first tradition, the intent is protectionist, as in the first AD law introduced by Canada in 1904, and which contained the automatic imposition of a duty equal to the dumping margin[4], without any investigation of whether

[3]For example, note clause b) from the *Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade 1994 (antidumping)*:

> Art.5.2Anapplicationunderparagraph1shall include evidence of (a) dumping, (b) injury within the meaning of Article VI of GATT 1994 as interpreted by this Agreement and (c) a causal link between the dumped imports and the alleged injury. Simple assertion, unsubstantiated by relevant evidence, cannot be considered sufficient to meet the requirements of this paragraph. Art. 6.4 The authorities shall whenever practicable provide timely opportunities for all interested parties to see all information that is relevant to the presentation of their cases, that is not confidential as defined in paragraph 5, and that is used by the authorities in an anti-dumping investigation, and to prepare presentations on the basis of this information.

Moreover, the Agreement defines procedures and terms in an attempt at restricting the scope of the codes to only the most clear-cut cases.

[4]The difference between prices in the domestic market and other international markets, usually the originating

imports had cause injury to the domestic industry. The other strand of AD law is represented by the Revenue Act of 1916, which was "...a form of legislative extraterritorial applications of the Sherman Act's principles ..." (Marceau (1994)), and which sought to penalize international predation. However, by 1921, a new US antidumping law followed the Canadian approach of concentrating on dumping margins, while adding an injury test that was missing from the Canadian version, and the second strand of AD laws disappeared. The 1921 AD Act was the model for GATT Article VI concerning AD regulations. The AD regulations were tightened in the 1967 GATT AD code, in order to restrict the broad definitions of article VI, to introduce procedural requirements and the possibility of remedies with respect to sporadic dumping (large quantities of goods imported in a short period). These AD regulations were further amended in the Tokyo Round of GATT, by lowering the requirements on the "injury test", introducing procedures for exporter's undertakings (promises to raise their export prices in order to avoid paying AD duties) and new dispute resolution procedures. The revised AD code was incorporated into the WTO agreement. What is important, for the purposes of this paper, is that the AD code sets fairly precise rules on how to design national AD legislation. In particular, it defines the main terms, sets up rules of procedure (see footnote 3) and in general establishes rules to make the process as transparent as possible.

Recall that whenever social planners place more value on producer's welfare than consumer's welfare (which can be explained in terms of the lower difficulty in forming lobbying groups) a trade agreement can be interpreted as a cooperative solution to a repeated prisoner's dilemma game, in which there always exists a temptation to deviate by imposing high tariffs on the trade partner(s) while the other country keeps low tariffs for our products.[5] Hence we can rationalize a trade agreement as a cooperative solution to a repeated game with a punishment for deviation equal to abandoning the agreement, i.e. (a trigger or grim strategy), for example by setting the Nash tariffs forever against the trade partner.

Consider then the following explanation for the existence of AD and other escape clauses in trade agreements: in the absence of escape clauses, the agreement is vulnerable to political pressures of import-competing lobbies representing sectors that are adversely affected by shocks. If there is no escape clause, the only possibility of relieving these pressures is by taking actions that violate the rules of the agreement and put the whole agreement at risk, since there is an explicit violation of the convention. An agreement without escape clauses might be more valuable (in the sense that if it were to hold, it would led to more gains from trade) but at the same time it is more vulnerable to adverse shocks. Since the possibility of abrogating an agreement exists, a cooperative agreement without escape clauses has a smaller chance of being signed (or alternatively it might be signed with higher tariffs), in the sense that it requires a lower discount rate of the future.

market.

[5]This political economy argument is the basis of Helpman (1997). Most of the literature on trade deviation focuses on terms of trade gains as a reason for defecting. In our paper we show that the terms of trade argument for defection can be interpreted as a social planner that puts more weight on producer than consumer surplus. See the appendix of the working paper version of this article available at `http://www.dii.uchile.cl/~cea`.

This explains the reason for escape clauses, but it does not explain why they take two basic forms: safeguards, in which the country imposes protection by itself and compensates the trade partner; and AD and countervailing (CVD) measures, which require an investigation and a determination according to specified rules, but do not require compensation. While this is not the topic of this paper, we observe that according to Rosendorff and Milner (2001), the existence of compensations implies that the cost of an "escape" by a trade partner is smaller –since the exporting country receives the compensation–, and also lowers the temptation of the importer to escape, so that only when pressure is very high will safeguards be utilized. In the case of AD and CVD, on the other hand, there is no compensation, so an escape represents a free lunch for the importing country's government. This might be the reason for the higher frequency of use of non-compensatory escape clauses.[6]

However, we argue that the injury investigation that is always included in WTO compliant AD and CVD rules serves a crucial role in limiting the use of this free lunch. The positive determination of injury is a signal to the exporting country of the strength of the political pressures against imports on its trade partner. In order to serve this role, the injury investigations must be fair and open, and this is one of the main aspects of the WTO AD and CVD codes.

There is empirical support for the hypothesis that injury investigation is the only relevant test in AD regulation. For the 859 US AD cases that were initiated in the period 1980-1998, a positive dumping margin determination by the US Department of Commerce was almost a certainty (3.26% rejection rate), whereas the injury determination test at the US International Trade Commission had a combined (preliminary/final) rejection rate of 34%. In fact, in the period 1994-1998, there was not a single rejection by the Department of Commerce of a positive dumping margin. If we consider those cases that *were not withdrawn nor settled*, the rates rise to 4% for a rejection of a positive dumping margin and to 41.7% for the rejection of an injury determination.[7]

When the procedures in the injury investigation do not provide information about the pressures facing the government, escape clauses do not help in signing PTAs. Moreover, we show that when the investigation rules for injury are relaxed after an agreement is signed, some agreements will collapse and others will become less valuable. This is the reason for the elaborate procedural details in the AD and CVD codes incorporated into the WTO: they lead to some degree of confidence that positive determinations of injury effectively represent injury and hence are not violations of the agreement. Note, in this context, the fact that the US Congress has often altered administrative procedures in order to increase the protectionist effect of AD and CVD regulations.[8]

Dixit (Dixit (1987), Dixit (1989b), Dixit (1989a)) has criticized the notion that protection can

[6] In Rosendorff and Milner (2001), non-compensatory escape clauses are described as "poor man's" protection. Appendix E of the working paper version of this article has an alternative explanation of the preference for AD and CVD measures.

[7] These numbers were kindly provided by Thomas Prusa in a personal communication.

[8] For example, the Byrd amendment that assigns the AD duties to the complainant, increases the incentives to file AD complaints and may be in violation of WTO commitments.

be used as a device to provide insurance to trade shocks (for this approach see Eaton and Grossman (1985), Fischer and Prusa (2003)). Since private insurance is an alternative to protection, it is necessary to show that there are market imperfections that preclude insurance. However, Dixit points out that unless the source of market imperfection is examined carefully, laissez faire might be a better option, since protection may exacerbate the market failures. The present case does not fall within Dixit's categories, because we take it as a given that governments are imperfect and respond to lobbies. If there are market imperfections that make insurance more expensive than lobbying, interest groups will prefer to lobby for protection in response to an adverse shock, and a government that maximizes its own utility (rather than social welfare) will respond to these pressures by protecting the sector.

The literature that uses non-cooperative games to model trade agreements is extensive. Jensen and Thursby (1984) showed that free trade is an equilibrium in dynamic non-cooperative trade game. Hungerford (1991) examines a dynamic trade game with imperfect information and NTB's and shows that cooperation is feasible, thought it involves periods of retaliation when no deviation has occurred. The same paper also examines GATT as a system for organizing information previous to punishment of defection, at a cost. In this case, defections will still occur. Bagwell and Staiger (1990) examine a dynamic model of trade with endowment shocks and show that cooperation can be achieved but it involves time varying protection, depending on the extent of the shocks. Moreover, they show that increase protection occurs just when trade volumes are highest. Our paper differs from Bagwell and Staiger (1990) in that we have a constant level of cooperative tariffs, which can be escaped for a length of time if a sectoral shock is too large to accommodate easily within the cooperative agreement.

Along somewhat different lines, Maggi (1999) focuses on other advantages of multilateral agreements in order to enforce cooperation: the ability to gather information and provide it to third parties and facilitating multilateral trade negotiations rather than a web of bilateral negotiations. In this sense, Maggi (1999) is complementary to our work, since we only consider bilateral relationships due to the nature of our strategic game. Similarly, Bagwell and Staiger (1999) show how the rules embedded in GATT and the WTO serve to facilitate bilateral agreements by restricting the scope of future agreements with other parties that may erode the value of the original agreements.

The next section describes the basic political economy underpinnings of the model. Next we show how cooperation (i.e. an agrement to reduce trade barriers) may be established in the context of an infinitely repeated game. The fourth section examines escape clauses and shows that they allow a broader range of agreements. The fifth section shows the government sill increase its welfare by these agreements above that under agreements without the possibility of escape, so there will be an incentive to sign these agreements. Moreover, we show that there is scope for an increase in social welfare as well. The next section examines the case when the shocks that lead to escape are not perfectly observable, and show that the associated erosion in benefits of the agrement may explain the elaborate rules the WTO requires countries to have in order to allows escapes from the agreements. The final section concludes.

## 2 The model

Antidumping and anti-subsidy rules are normally associated to economies with many traded goods.[9] Nevertheless, we will work with a model with two countries which import only a single good, in order to simplify the exposition and because the main principles are plainer in this context[10]. Following Rosendorff and Milner (2001), consider the case of two countries, Home (H) and Foreign (F), that produce two types of goods; $m$ and $x$. The Home country has a comparative advantage in $x$, while F has a comparative advantage in $m$. To keep things simple, we assume that each country consumes only its import good:, i.e., H consumes only $m$, while F consumes only $x$.

Each country can choose its tariff on imports. The local country sets a tariff of $t$ on imports of $m$ while F sets a tariff $\tau$ on imports of $x$. This implies that consumer surplus CS in H (F) is a decreasing function of $t$ ($\tau$). Since firms in H producing $m$ compete with imports, they obtain profits $\Pi_m(t)$, increasing in $t$. On the other hand, firms in H that produce $x$ have profits $\Pi_x(\tau)$ that fall with increases in $\tau$. Government revenue from tariffs is $T(t)$, which is assumed to be increasing in $t$ within the relevant range.

The utility of government in H depends on local consumer surplus, profits of domestic firms and on government revenue from tariffs. Political lobbying can increase the weight of the profits of local import-competing firms on the objective function of government. Let $a > 0$ be the weight the government sets on the profits of import-competing firms. The per-period utility of the domestic government is given by:[11]

$$G(t, \tau, a) = CS(t) + a\Pi_m(t) + \Pi_x(\tau) + T(t) \tag{1}$$

Analogously the utility function of the foreign government is given by

$$G^*(t, \tau, \alpha) = CS^*(\tau) + \alpha\Pi_x^*(\tau) + \Pi_m^*(t) + T^*(\tau) \tag{2}$$

where $\alpha$ is the weight the foreign government sets on the profits of its own import-competing firms, i.e. those producing $x$. We interpret the parameters $a > 1$ and $\alpha > 1$ as political pressure parameters that measure the strength of the protectionist lobby.

The political pressure parameters $a$ and $\alpha$ are random variables, presumably dependent on some external shock. They are i.i.d., with known density function $d\Phi$ over the interval $[1, \hat{a}]$. At the beginning of each period, a government observes the level of internal pressure, but does not know the level of pressure in the trade partner. Unless there is an AD or CVD investigation, neither

[9] Note the important exception of Brander and Krugman (1992).

[10] In the appendix of the working paper version we show that our main result can be extended to a multi-good model.

[11] This is similar to the political economy model in Helpman (1997). In the present form, which includes a stochastic political pressure parameter, it follows Rosendorff and Milner (2001). In the working paper version we show that the response to these shocks is equivalent to the response to negative price shocks to the import competing sector.

country is able to verify ex-post the level of internal political pressure facing the trade partner. Moreover, both governments are equally uninformed about future levels of political pressure.

The political pressure parameter can incorporate a component corresponding to the terms of trade motive for protection, and in fact, we could have considered protection as arising from this reason only.[12]

# 3 International cooperation: The prisoner's dilemma

This setting is analogous to a prisoner's dilemma. Whenever the political pressure parameter is larger than one, each country would like to deviate from a single period free trade agreement (FTA), or from any agreement that would reduce tariffs below the Nash equilibrium values. Clearly, it is Pareto optimal –from a social welfare viewpoint– to have a FTA. Unfortunately, in general the cooperative agreements are not sustainable, so each country can end up in the Nash equilibrium in tariffs. Just as in the prisoner's dilemma, repetition can lead to cooperation, which we will examine in this section.

## 3.1 Nash equilibrium

In this scenario, each country chooses its tariff as a best response to the tariff chosen by the trade partner. At the beginning of the period each country knows it political pressure parameter. Hence the country chooses the tariff that solves

$$t(\tau, a) = arg\ max_t\ G(t, \tau, a) \tag{3}$$

Analogously for the foreign country:

$$\tau(t, \alpha) = arg\ max_\tau\ G^*(t, \tau, \alpha) \tag{4}$$

As is obvious, the optimal strategy of each country depends on its trade partner's choices. Solving both both problems simultaneously we obtain the equilibrium tariffs.[13] Let $t^N(a, \alpha)$ y $\tau^N(a, \alpha)$ be the Nash equilibrium tariffs. The corresponding utilities are:

$$\begin{aligned} N(a, \alpha) &= G(t^N(a, \alpha), \tau^N(a, \alpha), a) \\ N^*(a, \alpha) &= G^*(t^N(a, \alpha), \tau^N(a, \alpha), \alpha) \end{aligned}$$

[12]See appendix B.

[13]We assume the conditions for a unique equilibrium.

### 3.2 Preferential Trade agreements

In this scenario the countries agree to cooperate by lowering their tariffs to agreed levels $t^C$ y $\tau^C$. The corresponding utilities are

$$\begin{aligned} C(a) &= G(t^C, \tau^C, a) \\ \\ C^*(\alpha) &= G^*(t^C, \tau^C, \alpha) \end{aligned}$$

### 3.3 Deviations from the trade agreement

A country will deviate from the trade agreement whenever it sets a tariff different from the cooperative tariffs defined above. Clearly it is optimal in that case to choose those tariffs that maximize the deviant's utility (given that the other country does not deviate). For H, the deviation tariff is given by:

$$t^D(a) = arg\ max_t\ G(t, \tau^C, a) \tag{5}$$

Analogously for F:

$$\tau^D(\alpha) = arg\ max_\tau\ G^*(t^C, \tau, \alpha) \tag{6}$$

If H abandons the agreement, setting tariffs $t^D(a)$, it will obtain utility

$$D(a) = G(t^D(a), \tau^C, a)$$

If, on the other hand, it is the foreign country that deviates form the cooperative agreement, the utility of the home government is:

$$S(a, \alpha) = G(t^C, \tau^D(\alpha), a)$$

For the foreign country, the analogous utilities are:

$$\begin{aligned} D^*(\alpha) &= G^*(t^C, \tau^D(\alpha), \alpha) \\ S^*(a, \alpha) &= G^*(t^D(a), \tau^C, \alpha) \end{aligned}$$

### 3.4 The prisoner's dilemma

Note that our assumptions mean that $D(a) > C(a) > N(a, \alpha) > S(a, \alpha)\ \ \forall\ (a, \alpha)$. Therefore, the tariff setting problem that each government faces each period can be described by a 2x2 matrix of outcomes with the structure of a prisoner's dilemma and which is parameterized by the cooperative tariffs, $(t^C, \tau^C)$. We denote this reduced static game by $\mathcal{G}(t^C, \tau^C)$. We will assume that there exists an optimal cooperative agreement $(t^{*C}, \tau^{*C})$, but the PTA may not achieve this level of tariffs $(t^C, \tau^C) \geq (t^{*C}, \tau^{*C})$.

| | | Country B: C | Country B: D |
|---|---|---|---|
| Country A | C | $C(a), C^*(\alpha)$ | $S(a,\alpha), D^*(\alpha)$ |
| | D | $D(a), S^*(a,\alpha)$ | $N(a,\alpha), N^*(a,\alpha)$ |

Game 1: The Game $\mathcal{G}(t^C, \tau^C)$ of Cooperation or Defection

Sustainable preferential trade agreements are only possible in this setup with an infinite time horizon. We will assume that punishments take the form of "grim strategies", where the punishment for deviations lasts forever. The difference between this problem and the standard repeated prisoner's dilemma is that future realizations of the political pressure parameters are random, and hence the value of future deviations and of cooperation are also random. Moreover, each period, the H government knows only the distribution of the political pressure in its trade partner.

In order to proceed, we need some definitions of variables associated to the game $\mathcal{G}(t^C, \tau^C)$.

**Definition 1** *We define:*

$$N(a) \equiv \int_\alpha N(a,\alpha) d\Phi, \quad \textit{and} \quad S(a) \equiv \int_\alpha S(a,\alpha) d\Phi$$

*to be the expected value of the utilities $N(a,\alpha)$ and $S(a,\alpha)$, respectively, for a given parameter a in the local country. For any variable $I(a) = D(a),\ C(a),\ N(a),\ S(a)$, we denote its expected value over a by*

$$I \equiv \int_a I(a) d\Phi.$$

**Definition 2** *We define the auxiliary variables:*

$$B(a) \equiv D(a) - C(a), \quad A(a) \equiv N(a) - S(a), \quad p(a) \equiv \int_1^a d\Phi \quad \textit{and} \quad \hat{a} \equiv \max a$$

Note that $B(a)$ represents the gains from defecting from a cooperative agreement while $A(a)$ represents the difference between welfare under simultaneous defection and welfare when cooperating while the trade partner defects. To simplify the analysis, we assume that both governments have a common discount factor of the future $\delta$.[14]

**Definition 3** *A pure cooperative preferential trade agreement strategy (CP) for the Home country is a grim strategy where it plays C if $D^*$ has not been played in the past and D if $D^*$ has been played in the past.*

[14]This is only necessary to simplify the analysis and avoid introducing excessive notation.

**Proposition 1** *A pair of CP strategies is a subgame perfect equilibrium for the repeated game $\mathcal{G}(t^C, \tau^C)$ if*

$$\delta \geq Max \left\{ \frac{Max_a \; B(a)}{C - N + Max_a \; B(a)}; \frac{Max_\alpha \; B^*(\alpha)}{C^* - N^* + Max_\alpha \; B^*(\alpha)} \right\}.$$

**Proof:** In order to support a cooperative agreement it must be that each period, the benefit from following the agreement is higher than the benefits from deviating, considering that deviation leads to Nash equilibrium utility forever.

$$C(a) + \sum_{i=1}^{\infty} C \, \delta^i \geq D(a) + \sum_{i=1}^{\infty} N \, \delta^i \tag{7}$$

$$\Longrightarrow \quad \frac{\delta}{1-\delta}(C - N) \geq B(a) \tag{8}$$

This condition must hold for all $a$ if we want the trade agreement to be sustainable in all states of the world. In particular, it must hold for the $a$ such that $B(a)$ achieves its highest value. Therefore the condition for a sustainable cooperative equilibrium becomes:

$$\delta \geq \frac{Max_a \; B(a)}{C - N + Max_a \; B(a)}$$

Similarly, we obtain the analogous condition that must be satisfied for the foreign country to follow the cooperative agreement. Finally, the condition on the common discount factor that allows cooperation is

$$\delta \geq Max \left\{ \frac{Max_a \; B(a)}{C - N + Max_a \; B(a)}; \frac{Max_\alpha \; B^*(\alpha)}{C^* - N^* + Max_\alpha \; B^*(\alpha)} \right\}.$$

∎

This equation determines the lowest discount rate that is compatible with cooperation using CP strategies in $\mathcal{G}(t^C, \tau^C)$ and is independent of the size of the shock $a$. Note that this agreement is robust to all possible shocks $a$.[15]

**Definition 4** *We define $\delta^{CP}$ as the value at which the previous condition holds as an equality.*

## 4 Escape clauses: AD and CVD regulations

In this section we show that the AD and CVD escape clauses can increase the range of sustainable cooperative agreements under certain conditions. As we have seen, the problem facing the government is that the political pressures facing the government (i.e., the $a$ and $\alpha$ parameters) can

[15]This might appear as a stringent condition. It is easy to relax it so that the agreement is resistant up to a severity of shocks. Suppose that $\hat{a}'$ with $p(\hat{a}') < 1$ is the maximum shock the agreement is designed to survive. Then the only change in the conditions is that proposition 1 must be modified by first, using $\delta' = \delta p(\hat{a}')$ and by taking the expected value conditional on $a \leq \hat{a}'$.

become so large that the countries have to abandon the agreement. Since the political parameters are random, the fact that they take a high value in some period does not imply that they will remain there forever, so if the sector can be protected during such extreme situations, the pressure to abandon the agreement will be smaller and the agreement will be able to survive larger shocks than without contingent protection.[16] The point of AD and CVD is that they allow governments to impose protection in response to high levels of political pressure caused by adverse, temporary shocks, without abandoning the agreement forever.

Suppose that, besides the two pure strategies of defection and cooperation, we consider a type of mixed strategies for the single period game which we denote by *escape* strategies. An escape strategy $E(\bar{a})$ is a mixed strategy in $\mathcal{G}(t^C, \tau^C)$ defined by $\bar{a} \in [1, \hat{a}]$ (resp. $\bar{\alpha} \in [1, \hat{\alpha}]$), such that if $a < \bar{a}$, the country chooses C, with cooperative tariff $t^C$ and if $a \geq \bar{a}$, the country chooses D with the corresponding defection tariff. This implies that the country stays within the agreement if the pressures for protection are not excessive, but escapes if they surpass a predetermined level $\bar{a}$. In this interpretation, the pressure parameter $a$ is related to the injury suffered by the import-competing sector and $\bar{a}$ represents a threshold level of pressure beyond which the country can defect from the agreement for a single period. Observe that strategies E and D are observationally equivalent for $a \geq \bar{a}$. The difference in the repeated game is that E will only be used in response to large shock while D will be used as a response to any shock. We can use escape strategies to define trigger strategies for the repeated game:

**Definition 5** *A contingent protection (AD) strategy for the H country in the repeated game $\mathcal{G}(t^C, \tau^C)$ is one in which it plays $E(a)$ if the other player has played $E^*(\alpha)$ in the past, and D if $D^*$ has been played in the past (i.e., if the trade partner has defected with $a < \bar{a}$).*

By definition 2, we have that $p(\bar{a})$ is the probability that the country does not escape its obligations in a period (given no previous defections), i.e., that it does not use contingent protection in that period in response to the shock. Observe that under this interpretation, a CP strategy is a AD strategy with $\bar{a} = \hat{a}$, since $p(\hat{a}) = 1$.

Hence, under the AD strategy, we will observe that tariffs are low for a number of periods, and then jump up for a period in response to a large shock, before falling to the earlier level once again.

Note the importance of being able to verify the value of the political pressure parameter $a$ in the definition of the AD strategy. Since $E(a)$ and D are observationally equivalent for $a > \bar{a}$, and can only be distinguished for smaller shocks, an inability to verify whether $a > \bar{a}$ means that AD and D are indistinguishable. We will analyze the issue of observability in more detail later.

[16] As mentioned in the introduction, Dixit (1987), Dixit (1989b), Dixit (1989a) argue that in terms of social welfare, it is necessary to determine the source of the market imperfection that precludes the use of insurance contracts, rather than propose protection as a type of "administrative insurance". However, the argument in this paper is not normative, but rather positive, explaining why contingent protection helps to create sustainable trade agreements. Moreover, if lobbying is cheaper for the firms than an insurance scheme, and if the government is responsive to political pressures, then these policies are more effective than insurance contracts.

**Proposition 2** *A pair of AD strategies is a subgame perfect equilibrium for the repeated game $\mathcal{G}(t^C, \tau^C)$ if*

$$\delta \geq Max\left\{\frac{[p(\bar{a})B(\bar{a})+(1-p(\bar{a}))A(\bar{a})]}{p(\bar{a})(D-N-(p(\bar{a})B+(1-p(\bar{a}))A))+[p(\bar{a})B(\bar{a})+(1-p(\bar{a}))A(\bar{a})]};\right. \tag{9}$$

$$\left.\frac{[p(\bar{\alpha})B^*(\bar{\alpha})+(1-p(\bar{\alpha}))A^*(\bar{\alpha})]}{p(\bar{\alpha})(D^*-N^*-(p(\bar{\alpha})B^*+(1-p(\bar{\alpha}))A^*))+[p(\bar{\alpha})B^*(\bar{\alpha})+(1-p(\bar{\alpha}))A^*(\bar{\alpha})]}\right\}$$

**Proof:** In order for the strategy AD to be a best response to strategy AD of the trade partner, the expected value of deviation must be lower than the expected value of keeping to an agreement that incorporates contingent protection. Since the level of internal political pressure is observable at the beginning of the period, the expected value of keeping the agreement is (we write $p \equiv p(\bar{a})$ to simplify the notation):

$$\Pi_{keep} = \begin{cases} pC(a)+(1-p)S(a)+\sum_{i=1}^{\infty}[p^2C+p(1-p)(D+S)+(1-p)^2N]\delta^i & \text{if } a<\bar{a} \\ pD(a)+(1-p)N(a)+\sum_{i=1}^{\infty}[p^2C+p(1-p)(D+S)+(1-p)^2N]\delta^i & \text{if } a\geq\bar{a} \end{cases}$$

In turn, the expected value of deviation is:

$$\Pi_{deviation} = pD(a)+(1-p)N(a)+\sum_{i=1}^{\infty}N\,\delta^i \quad \forall\, a$$

Note that the option of deviation is relevant only when $a < \bar{a}$. Therefore, comparing the expected value of keeping the agreement to deviation and punishments forever, the following condition must be satisfied in order for the H country to prefer to abide by the agreement:

$$\delta \geq \frac{pB(a)+(1-p)A(a)}{p(D-N-(pB+(1-p)A))+(pB(a)+(1-p)A(a))}, \quad \forall a<\bar{a}$$

This condition must hold for all $a \leq \bar{a}$; in particular, for the $a \leq \bar{a}$ that maximizes the term $(pB(a)+(1-p)A(a))$ that appears in the numerator and the denominator. It is possible to demonstrate that this value correspond to $\bar{a}$.[17] Analogously, we obtain the condition for the foreign country to sustain the agreement. Finally, since we want to have a stable agreement, the discount factor must be great enough to satisfy the last two conditions and hence, we get the condition (9).[18]

∎

Equation (9) determines the lowest discount rate that is compatible with an equilibrium in

[17] See the proof of lemma 1 in the Appendix.

[18] In the working paper version we show that this result, which is fundamental to this paper, extends to the case of a multisectoral trade model.

AD strategies for game $\mathcal{G}(t^C, \tau^C)$, given the maximum value of the shock that does not trigger an escape, $\bar{a}$. We will be interested in the relationship between this discount rate and the rate that allows CP agreements for $\mathcal{G}(t^C, \tau^C)$.

**Definition 6** *We define $\delta^{AD}(\bar{a})$ as the value at which equation (9) holds with an equality. In order to proceed, we define an auxiliary function which will be useful in the proofs:*

$$\delta^{Aux}(\bar{a}) = \max_a \frac{[p(\bar{a})B(a) + (1 - p(\bar{a}))A(a)]}{p(\bar{a})(D - N - (p(\bar{a})B + (1 - p(\bar{a}))A)) + [p(\bar{a})B(a) + (1 - p(\bar{a}))A(a)]}$$

The auxiliary function has the property of always lying above the function $\delta^{AD}(\bar{a})$ and intersecting it only at $\bar{a} = 1$, $\hat{a}$.[19] The advantage of the auxiliary function is that it is easier to compare analytically to $\delta^{CP}$. Thus, if we prove that under certain conditions, $\delta^{Aux}(\bar{a}) < \delta^{CP}$, we also have that under these conditions $\delta^{AD}(\bar{a}) < \delta^{CP}$. We use this strategy in the next result.

**Proposition 3** *An equilibrium in AD strategies for $\mathcal{G}(t^C, \tau^C)$ can be sustained with a lower discount rate than the CP equilibrium if the following four conditions hold:*[20]

$$\begin{aligned} \bullet\, B &> A \\ \bullet\, p(\bar{a}) &\geq \frac{A(\hat{a})(C - N)}{B(\hat{a})(B - A)} \\ \bullet\, B^* &> A^* \\ \bullet\, p^*(\bar{\alpha}) &\geq \frac{A^*(\hat{\alpha})(C^* - N^*)}{B^*(\hat{\alpha})(B^* - A^*)} \end{aligned} \tag{10}$$

**Proof:** The proof is a simple matter of comparing terms in $\delta^{Aux}(\bar{a})$ and $\delta^{CP}$, simplifying and then using the fact that $\delta^{Aux}(\bar{a})$ lies above $\delta^{AD}(\bar{a})$.[21] See the appendix. ∎

The conditions of proposition 3 imply restrictions on the structure of payoffs in the game: for each country, the difference between the expected value of the gain from escaping for one period from the cooperative tariffs (B) and the expected loss from letting the other country escape for one period from its obligations (A) should be positive. The other two conditions are harder to interpret. Nevertheless, it is clear that when $\bar{a}$ is small, i.e., when there is a high probability of escape ($p(\bar{a})$ is small), the future benefits of complying with the agreement are not very valuable,

[19]We prove these results in lemma 1 and lemma 2 in the Appendix

[20]The conditions of proposition 3 can be easily weakened at the cost of complexity. The weakest sufficient conditions for the home country (similarly for F) are obtained directly from $\delta^{AD}(\alpha)$:

$$p(\bar{a})\left[B(\hat{a})\frac{B - A}{C - N} + \frac{B(\hat{a}) - B(\bar{a})}{1 - p(\bar{a})}\right] \geq A(\bar{a}).$$

[21]For a detailed proof, see the working paper version.

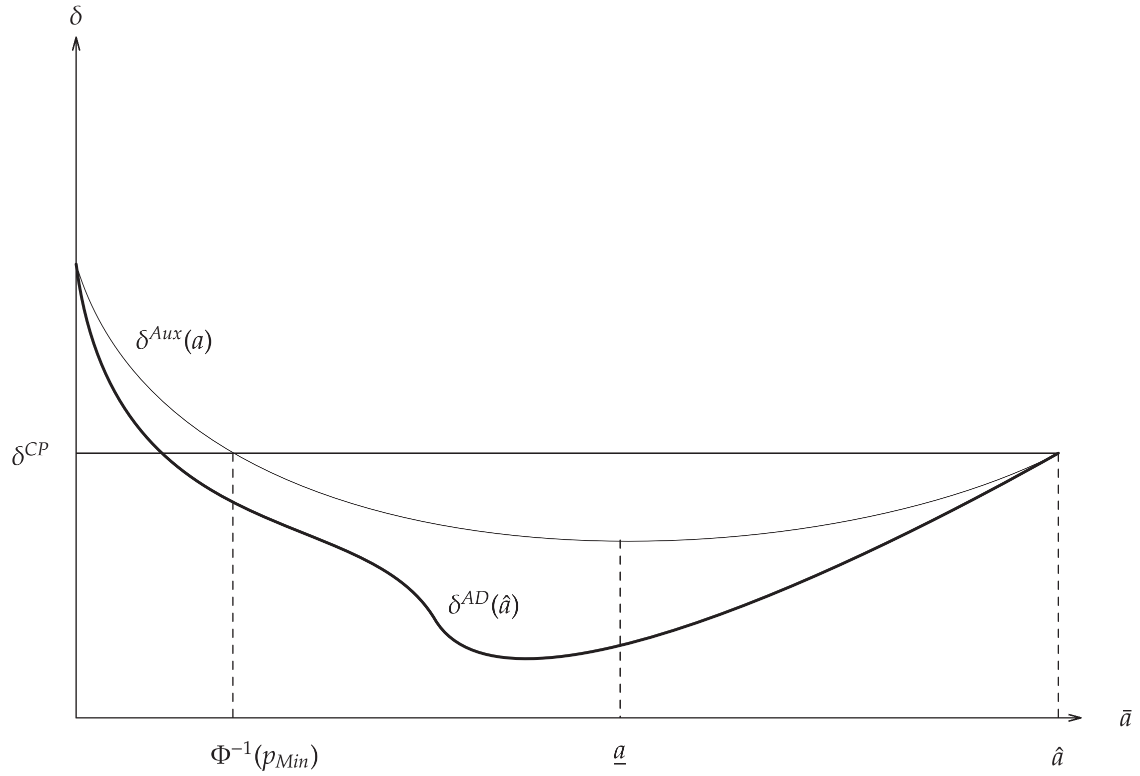



Figure 1: Minimum discount rates that allow sustainable CP and AD agreements

hence a low rate of time preference is needed for the agreement to survive. The conditions (10) will be essential in the analysis that follows.

**Definition 7** *Let*

$$p_{Min} \equiv \frac{A(\hat{a})(C-N)}{B(\hat{a})(B-A)}$$

The probability $p_{Min}$ corresponds to the minimum probability at which $\delta^{Aux}(\bar{a}) \leq \delta^{CP}$ when $B > A$, and will helpful in interpreting figure 1. Consider figure 1, where $\delta^{Aux}$ and $\delta^{CD}$ are graphed against $\bar{a}$. The function $\delta^{Aux}$ crosses $\delta^{CD}$ at a point $\Phi^{-1}(p_{Min})$ to the left of $\hat{a}$, and lies below $\delta^{CP}$ until it is equal to $\delta^{CP}$ at $\hat{a}$. Hence $\delta^{AD}$ will cross $\delta^{CP}$ to the left of $\Phi^{-1}(p_{Min})$, will lie below $\delta^{CP}$ for $\bar{a} \in (\Phi^{-1}(p_{Min}), \hat{a})$ and will equal $\delta^{CP}$ at $\hat{a}$.

Note that for any level of political pressure that leads to an escape (i.e., any given $\bar{a}$, or equivalently $p(\bar{a})$), there is an associated minimum level of the discount factor that allows equilibria. For any given $\bar{a}$ and its associated minimum discount rate $\delta^{AD}(\bar{a})$ that supports an AD agreement, there is a range of higher values of both the trigger pressure level and the discount rate that can be supported in an agreement.

We would like the function $\delta^{AD}(\bar{a})$ to also have a unique minimum. However, in the absence of additional assumptions, this is not true. However, we have the following sufficiency result:

**Lemma 3** *Assume conditions (10) and that $\partial^2 p/\partial \bar{a}^2 > 0$. Then $\delta^{AD}(\bar{a})$ has a unique minimum at $\bar{a}_{min\delta}$.*

**Proof:** For a detailed proof, see the working paper version, available at `http://www.dii.uchile.cl/~cea`. ∎

## 5 AD agreements and government utility

The following result shows why governments prefer to sign agreements incorporating escape clauses to agreements without these clauses when both types of agreements are viable. Since, in addition, there is a range of preferential trade agreements that can only be signed if escape clauses are included, we have an explanation of the observation that trade agreements without escape clauses are rare.

**Proposition 4** *Consider a repeated game $\mathcal{G}(t^C, \tau^C)$ and assume that conditions (10) hold. Assume also that the discount rate is high enough that both a CP and an AD agreement are viable. Then there always exists an AD agreement that is at least as good for government as the CP agreement.*

**Proof:** See appendix

∎

The intuition for the proof is fairly simple using figure 2. First, it is easy to show that the expected utility for the government under AD is a concave function $V^{AD}(\bar{a})$. Moreover, at $\bar{a} = \hat{a}$ we have $V^{AD}(\hat{a}) = V^{CP}$, because the AD agreement with $\bar{a} = \hat{a}$ allows escapes with probability zero, i.e., it is a CP agreement in practice. The maximum of $V^{AD}$ is interior to the interval if $D + S \geq 2C$. In that case, since we know that $V^{AD}(\hat{a}) = V^{CP}$, there is a range of $\bar{a}$ such that $V^{AD}(\bar{a}) > V^{CP}$, as can be seen in figure 2a. When $D + S < 2C$, the maximum value occurs at $V^{AD}(\hat{a}) = V^{CP}$, as seen in figure 2b. Observe that we have not only shown that an AD agreement is as good as a CP agreement, but more strongly, that if $D + S > 2C$, there exists an AD agreement is strictly better than any CP agreement.

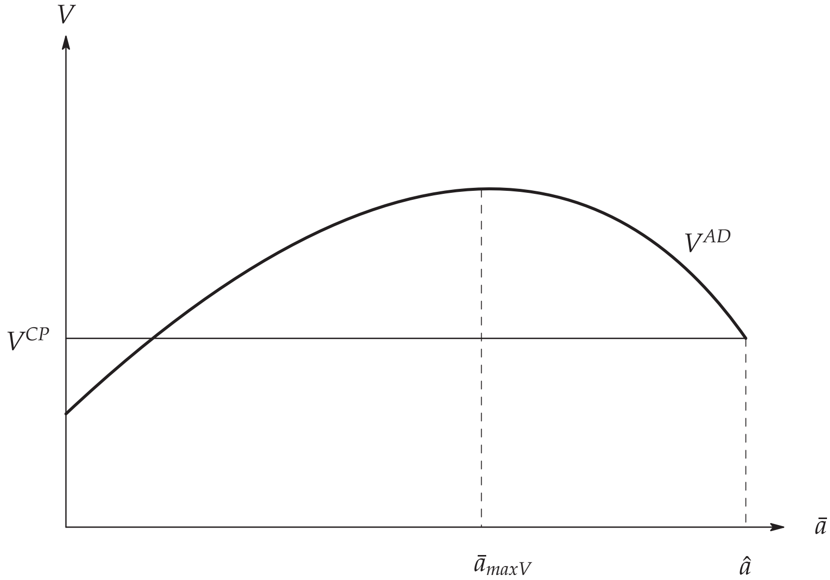
**Definition 8** *We define $\bar{a}_{maxV}$ as the parameter $\bar{a}$ where the value of an AD agreement reaches its maximum value.*

Under the conditions of lemma 3, the value of $\bar{a}$ corresponding to the minimum discount factor that allows agreement is lower than the value of $\bar{a}$ that maximizes welfare under an agreement (i.e., $\bar{a}_{min\delta} < \bar{a}_{maxV}$), see figure 3.[22]

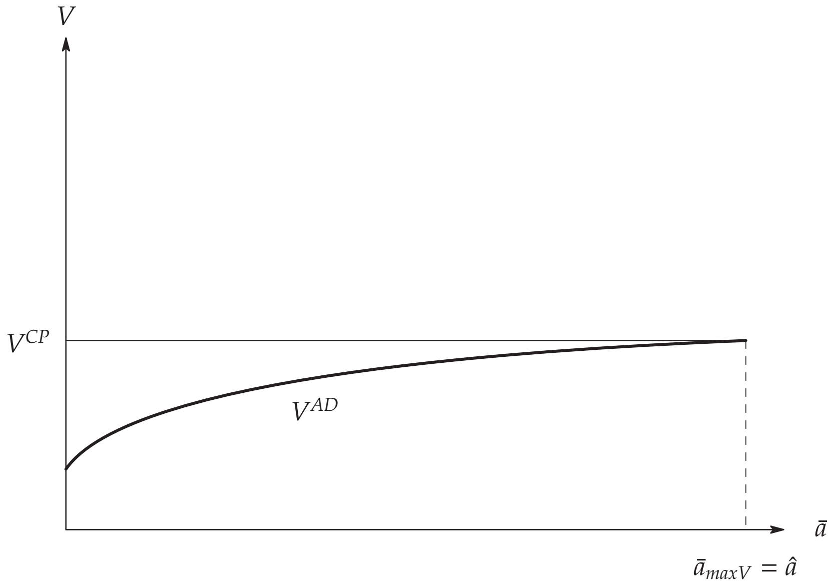
This result has important consequences, since this means that when AD agreements have interior solutions (i.e., when $D + S > 2C$, see proposition 4), we can describe the best choice of the government.[23] Using figure 3, when the discount rate of the government is larger than $\delta^{AD}(\bar{a}_{maxV})$,

[22] The proof appears in lemma 4 of the working paper version.

[23] In the case of non-interior solutions, the best choice is to reproduce the CP agreement, if this is feasible given $\delta$.




(a) Interior solution ($D + S \geq 2C$)




(b) Extreme solution ($D + S \leq 2C$)

Figure 2: Government utility under AD and CP agreements

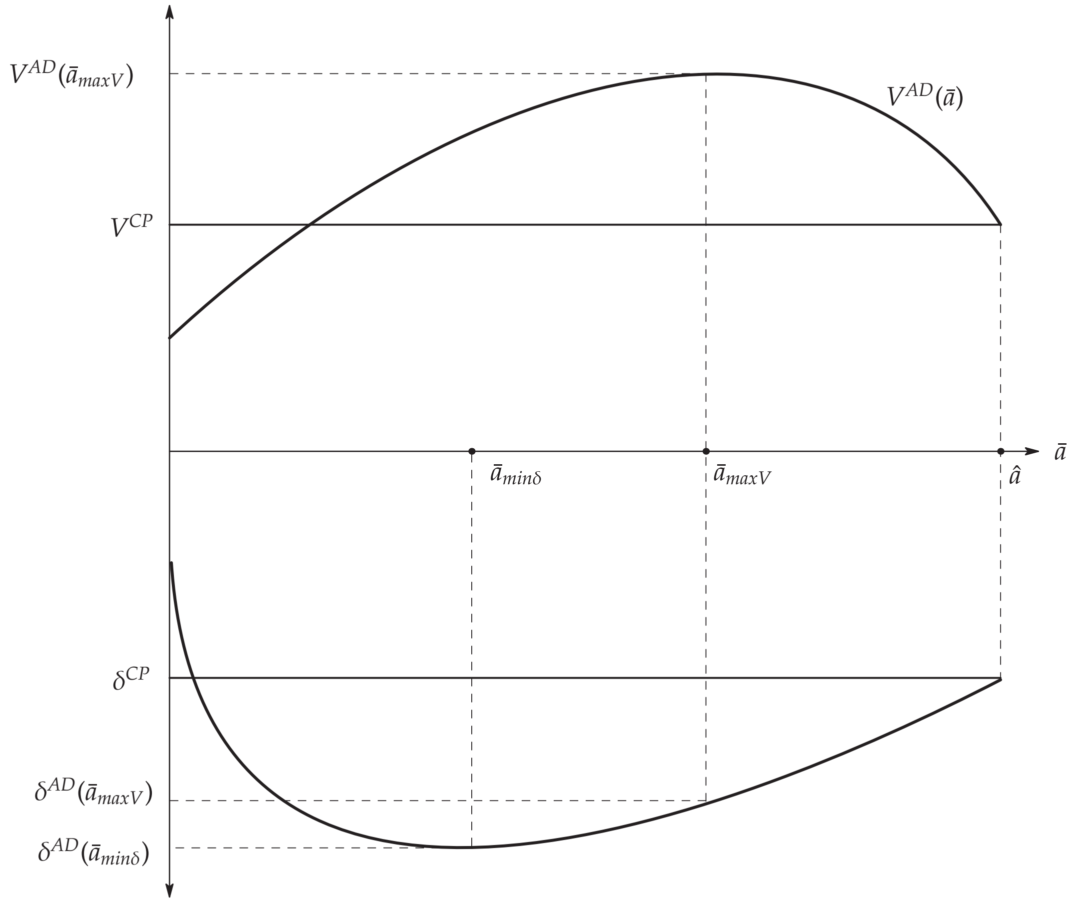



Figure 3: The governments optimal $\bar{a}$.

the government maximizes its welfare by setting $\bar{a} = \bar{a}_{maxV}$. When, on the other hand, the discount rate $\delta$ is lower than $\delta^{AD}(\bar{a}_{maxV})$, but still above $\delta^{AD}(\bar{a}_{min\delta})$, the government should set the largest value of $\bar{a}$ such that $\delta^{AD}(\bar{a}) = \delta$. Thus, we have characterized optimal agreements for all discount rates that allow an AD agreement.

Next, we show that for any discount rate that allows a CP treaty to be signed, it is possible to structure an AD treaty with *lower values* of the cooperative tariffs $t^C$. We show this in the following result.

**Proposition 5** *Assume conditions (10). Consider two identical countries and a game $\mathcal{G}(t^C, \tau^C)$, with $t^C > t^{*C}$ and $\tau^C > \tau^{*C}$. If a CP agreement can be signed, there exists an AD agreement with lower tariffs.*

**Proof:** See the appendix. ∎

The intuition for the proof is straightforward. Since AD agreements are viable with lower discount rates than CP agreements, it is possible to "exchange" lower tariffs for the higher discount rate that allows a viable CP agreement. This result is interesting, but is still not enough to allow us to make social welfare comparisons, since the benefits of lower tariffs under AD agreements may be counterbalanced by the negative effect of protection in the cases when the shock leads to an escape.

Proposition 4 shows that governments prefer AD to CP agreements, but this does not imply that AD agreements lead to higher social welfare. There are games $\mathcal{G}(t^C, \tau^C)$ when AD agreements are clearly better, namely, when no agreement would have been signed in the absence of AD, because the discount rates of the governments are too low for sustainable CP agreements. If the agreement can only be signed with AD, this is clearly better than the Nash equilibrium forever. In other cases, the welfare comparison under an AD and a CP agrement requires us to examine the tradeoff between the lower tariffs under the AD agreement with the case in which the trade partner defects or when both countries go back to the single period Nash equilibrium in response to large shocks. The next proposition shows that if the preferences of government are not too different from the preferences of society, it is possible to structure AD agreements that provide higher welfare than CP agreements. This is an important result, because it shows that AD agreements are not only easier to sign than CP agreements, but they have the potential to lead to higher welfare than agreements without the possibility of escape.[24]

**Proposition 6** *Assume condition (10) and a game $\mathcal{G}(t^C, \tau^C)$. If the objectives of the government do not differ by much from those of society ($\hat{a} \approx 1$), it is possible to structure AD agreements that provide at least as much social welfare as a CP agreement.*

[24]As we have mentioned before, this does not mean that agreements with no escape are not preferable in a world of social-welfare maximizing governments, but rather that since real governments do not maximize social welfare, a second best result is achieved via preferential trade agreements with escape.

**Proof:** Recall that the welfare function of society is the welfare function of government when $a \equiv 1$. Thus:

$$W = (p(\bar{a})^2 C + p(\bar{a})(1 - p(\bar{a}))(D + S) + (1 - p(\bar{a}))^2 N)|_{a=1} \tag{11}$$

First, consider the case when the country cannot sign a CP agreement but an AD agreement is viable. The question is whether the agreement provides more welfare than not signing an agreement and staying at the Nash equilibrium forever. We can rewrite the condition as

$$W \geq N|_{a=1} \Leftrightarrow [-p(B - A) + (D - N - A)]|_{a=1} \geq 0 \tag{12}$$

Given that social welfare is higher under a trade agreement than using the Nash equilibrium tariffs, $C|_{\hat{a}=1} \geq N|_{\hat{a}=1}$, we have

$$[-p(B - A) + (D - N - A)]|_{a=1} > (1 - p)(B - A)|_{a=1}$$

so welfare increases under an AD agreement, for all values of $p$, if $(B - A)|_{a=1} \geq 0$. Recalling the definition of $B$ and $A$, and using the mean value theorem,

$$0 < B - A = (B(\tilde{a}) - A(\tilde{a}))$$

for $\tilde{a} \in [1, \hat{a}]$. Letting $\hat{a} \to 1$ implies $(B - A)|_{a=1} > 0$. Thus a country that cannot sign an CP agreement but can sign an AD agreement is better off if the interests of the government do not diverge too much from those of society or if the probability of no escape ($p$) is high enough.

Consider now the case when the country can sign an AD as well as a CP agreement. There are two cases to be examined. The first case occurs when $(D + S - 2C \leq 0)|_{a=1}$. This occurs with two symmetric countries and therefore $D + S^* = D^* + S = D + S$. In this case, total social welfare under cooperation ($2C|_{a=1}$) is greater than the total social welfare under defection ($(D + S)|_{a=1}$) because cooperation is Pareto optimal. Thus, if the objective function of the government does not differ by much from that of society (i.e., $\hat{a} \approx 1$) we have that $(D + S - 2C \leq 0)$. Therefore the government maximizes welfare with an AD agreement with a zero probability of escape (see the proof of proposition 4). This is equivalent to a CP agreement and therefore achieves the same level of social welfare. This proves the result in this case.[25]

[25] If the objective function of the government differs sufficiently from that of society it is possible that $(D + S - 2C) > 0$ even though $(D + S - 2C)|_{a=1} \leq 0$, then from the proposition 4 government will sign an AD agreement with $p < 1$. In this case, it may be possible that an AD agreement provides strictly higher social welfare than a CP agreement. This occurs if the benefits obtained by the lower tariffs under an AD agreement (as shown in proposition 5) are high enough. In fact, the difference between the social welfare under a CP and an AD agreement is given by:

$$W(t^{*C}) - C(t^C) = (1 - p)[p(B(t^{*C}) - A(t^{*C})) - (C(t^{*C}) - N)]|_{a=1} + [C(t^{*C}) - C(t^C)]|_{a=1}$$

where $t^C > t^{*C}$. The fist term is negative for any value of $p$ when $(D + S - 2C)|_{a=1} \leq 0$. The second term, which represents the increased welfare obtained by the lower tariff under an AD agreement, is positive, so the possibility of welfare improvement exists, though it is not guaranteed. An alternative formulation for this possibility uses equation (13).

Consider now the alternative $(D + S - 2C)|_{a=1} > 0$. This can occur if one country is much larger than the other country, and thus the loss induced by a deviation of the small country is unimportant. In this case, $(D + S - 2C) > 0$ because the welfare expression is increasing in $a$[26], and therefore, from the proof of proposition 4, the government prefers an AD agreement with a nonzero probability of escape. Consider the change in social welfare as the probability of cooperation (no escape) $p$ is lowered from $p = 1$.

We use equation 11 to examine the effect of the change in $p$, considering the maximum reduction in tariffs that is compatible with the AD agreement, using the results of proposition 4. Differentiating the function $W$ and evaluating at $p = 1$, we obtain:

$$\frac{dW}{dp} = [2C - (D + S)]|_{a=1} + \left.\frac{dC|_{a=1}}{dt^C}\frac{dt^C}{dp}\right|_{p=1} \tag{13}$$

Since social welfare declines as tariffs increase, $dC|_{a=1}/dt^C < 0$, and since proposition 5 implies that $dt^C/dp|_{p=1} > 0$ (see proof in the appendix), the second term in the RHS of (13) is negative. Since in this case the first term is also negative, expression (13) is negative, so an AD agreement with an active escape clause (i.e., $p < 1$) improves welfare. Note that in this case there is no need for the condition that the objectives of the government be close to those of society.

∎

# 6 Verifiability Problems

Up to now we have implicitly assumed that each country can ex-post verify the level of political pressure in its trade partner. In this section we examine the case in which this is not necessarily the case and show how the equilibrium agreements change as the degree of verifiability changes.

Assume first that it is impossible to verify the level of political pressure ex-post. In that case, under AD, each country will always announce a high level of political pressure and escape the agreement. Since neither country can verify whether the other country has abandoned the agreement, there can be no punishments (because each period we get the Nash equilibrium in any case), so we will observe the Nash outcome forever. Hence, cooperative AD equilibria are non-viable for any value of the discount rate. However CP equilibria are still potentially viable. We have shown that

**Proposition 7** *If there is no way to verify the level of political pressure in the trade partner, AD equilibria are worse than CP equilibria.*

[26]The proof of this fact is similar to the proof of Lemma 1 in the Appendix. Examples where $(D + S - 2C)|_{a=1} > 0$ are easily constructed using linear demand.

### 6.1 Partial observability

The previous section examined the case in which it is impossible to verify the level of political pressure facing the trade partner. The more interesting case occurs when even though a country is able to observe the level of political pressure in the trade partner, it cannot *verify* (in the sense of being able to switch to the punishment strategy) the observed value of the political pressure parameter. We shall denote by partial observability the case when the value of the political pressure parameter that the government can verify in order to apply the punishment strategy is lower than the observed value. Assume then, that we can verify a value which is a convex combination of the value observed by H and the value announced by F (analogously for F). For country H we have:

$$a_V = \lambda a_A + (1 - \lambda)a \tag{14}$$

where $a_V$ is the verifiable level of $a$, $a_A$ is the value of $a$ announced by H and $\lambda$ is the verifiability parameter, which indicates the degree of verifiability by F of the true value of $a$. Hence $\lambda = 0$ corresponds to the case of perfect verifiability of the political pressure parameter $a$, while $\lambda = 1$ corresponds to the case of no verifiability studied in the previous section. As we saw in the previous section, each country will always prefer to escape its obligation by announcing the highest possible value of $a_A$. In effect,

$$a_V = \lambda \hat{a} + (1 - \lambda)a \tag{15}$$

where $\hat{a}$ is the highest value of $a$ among the feasible set of values. Note that if $\lambda$ is such that $\lambda\hat{a} > \bar{a}$, any previous agreement collapses always, independent of the shock $a$, since both countries will defect all periods. In this case, only agreements with no escape are viable.

Figure 4 shows the effects of the lack of observability. The function $\delta^{AD}(\hat{a})$ shifts to the right, and covers the same range on the smaller domain.

**Proposition 8** *Assume conditions (10) and that $\partial^2 p/\partial\bar{a}^2 > 0$. If after signing the trade agreement partial observability problems appear, some agreements will not survive. Those that survive will be less valuable.*

**Proof:** First, consider the simple case where $\lambda\hat{a} > \bar{a}$. In this case, $a_V > \bar{a}$, $\forall a$, so there is escape whenever $p(\bar{a}) < 1$. The only AD agreements that survive are those with $p(\hat{a}) = 1$, that is, those that reproduce the CP agreements.

Consider now the alternative, $\lambda\hat{a} < \bar{a}$. There will be no escape following a shock $a$ if the following condition is satisfied:

$$a < \frac{\bar{a} - \lambda\hat{a}}{1 - \lambda} \tag{16}$$

Let $\bar{a}(\lambda)$be the maximum shock under which there is no escape when the observability parameter is $\lambda$. Let $q(\lambda)$ be the probability associated to $\bar{a}(\lambda)$, that is, the probability of no escape if the observability problem appears. Notice first that

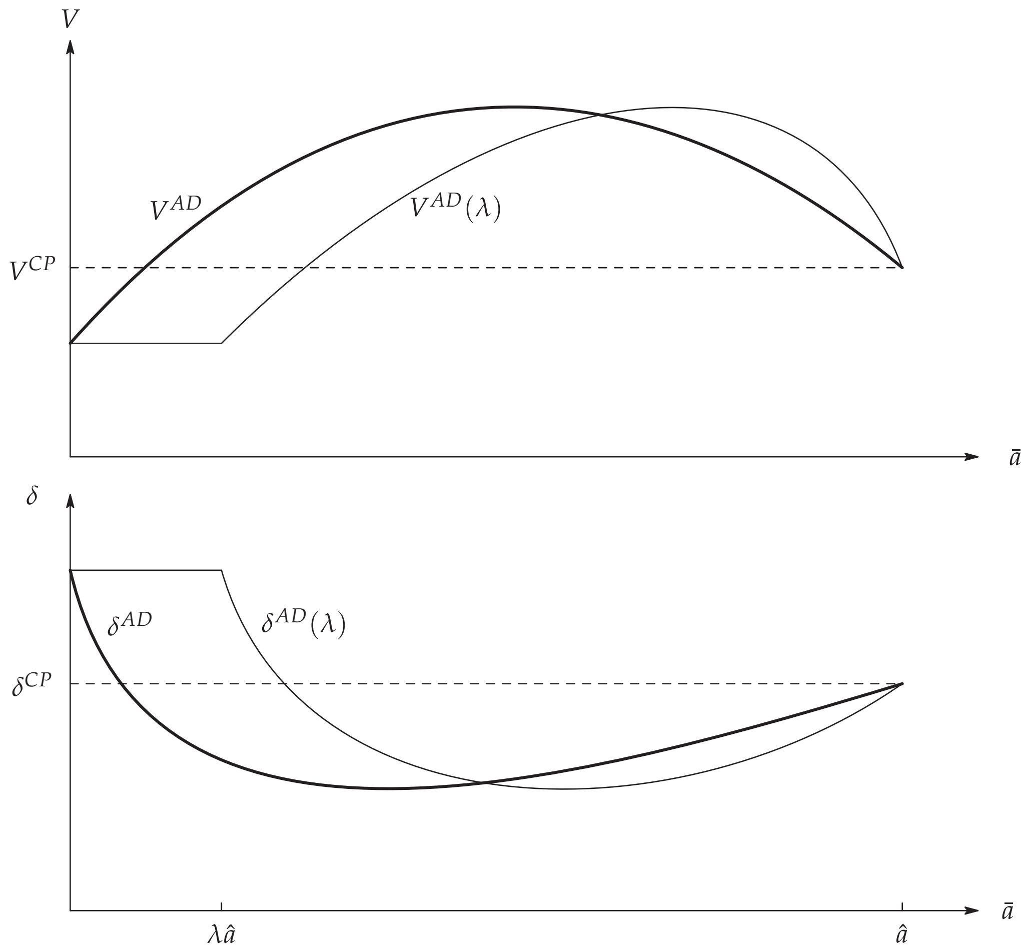



Figure 4: Effects of observability problems

$$q(\lambda) = \int_1^{\bar{a}(\lambda)} d\Phi = p - \int_{\frac{\bar{a}-\lambda\hat{a}}{1-\lambda}}^{\bar{a}} d\Phi < p, \quad \forall\, \lambda \tag{17}$$

In the same way that we proceeded in the case of perfect observability, proposition 2, we can define the minimum discount rate that allows cooperation after observability problems:

$$\delta^{AD}(\bar{a}(\lambda)) \geq \frac{[q(\lambda)B(\bar{a}(\lambda)) + (1-q(\lambda))A(\bar{a}(\lambda))]}{q(\lambda)(D - N - (q(\lambda)B + (1-q(\lambda))A)) + q(\lambda)B(\bar{a}(\lambda)) + (1-q(\lambda))A(\bar{a}(\lambda))}$$

which is valid for $a < (\bar{a} - \lambda\hat{a})/(1-\lambda)$, or for the equivalent range of $p(a)$. This is a transformation of the function $\delta^{AD}(\bar{a})$, that compresses the domain of the function but leaves it otherwise unchanged, with the same minimum, as shown in figure 4. The associated utility of an AD agreement for the government changes as shown in the figure. Now consider the optimal agreements signed without expecting observability problems.

If the AD agreement has an $\bar{a}$ that lies in the region to the left of the intersection of $\delta^{AD}(\bar{a})$ and $\delta^{AD}(\bar{a}(\lambda))$ (see figure 4), the agreement collapses, because the discount rate of the original agreement is smaller than the one required by a sustainable agreement under lack of observability, since $\delta^{AD}(\bar{a})$ lies below $\delta^{AD}(\bar{a}(\lambda))$.

If the AD agreement has an $\bar{a}$ that lies to the right of the intersection the agreement survives. However, it is less valuable. To see this, recall that all optimal AD agreements have $\bar{a} \in [\bar{a}_{min\delta}, \bar{a}_{maxV}]$ and government utility in the range $[V^{AD}(\bar{a}_{min\delta}), V^{AD}(\bar{a}_{min\delta})]$. Since in that range, $V^{AD}(\bar{a}(\lambda)) < V^{AD}(\bar{a})$ (see figure 4), we have shown that the agreements that survive produce lower welfare for the government. ∎

**Corollary 1** *Assume condition (10) and $\partial^2 p/\partial\bar{a}^2 > 0$. The number of agreements that will fail if partial observability problems appear is increasing in the lack of observability parameter $\lambda$. Similarly, the loss of utility in those agreements that survive is increasing in the value of $\lambda$.*

**Proof:** Easy, using the previous arguments. ∎

# 7 Conclusions

While escape clauses such as AD and CVD are protectionist and reduce social welfare (as we all know), in an environment in which governments are responsive to pressure groups, they help sign trade agreements or alternatively, they lead to agreements with lower barriers to trade. Moreover, we show that if the government's objective function does no differ too much from the objective function of a benevolent social planner, social welfare improves with anti-dumping.

In our model, the injury determination is the crucial element in the sustainability of PTAs. Thus we have a rationale for the observation that the US AD rules almost always determine positive dumping margins, whereas there is a substantial probability that the more relevant (according to our interpretation) injury determination is negative. The true damage to the agreements does not come from the certain determination of a positive dumping margin but rather when there are violations of the AD and CVD procedural rules determining injury, or when these rules are eased. When this happens, the agreements can collapse or, when they survive, the results will be worse than expected when the agreement was signed.

Finally, it is worthwhile to speculate on the need for two different approaches to escape clauses. Rosendorff and Milner (2001) have advanced the explanation that AD and CVD are "poor man's" escape clause. Safeguards require an explicit offer of compensations (such as increased access to domestic markets), which may be difficult to obtain, since it may require coordination across different industries. Under this interpretation, safeguards have higher transaction costs than AD or CVD measures, which may explain why they are not used more often.[27]

An interesting extension of this model would be to model the effects of an increase in uncertainty (modelled as an increase in the variance of $\Phi$) on the relative merits of AD and CP agreements.

[27] An alternative explanation for the preference for AD and CVD over safeguards is sketched in appendix D of the working paper version. The appendix shows that AD and CVD agreements are sustainable with lower discount factors than safeguards and are thus easier to establish.

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# A Appendix

**Lemma 1** *The function $\delta^{Aux}(\bar{a})$ satisfies the following property:*

$$\delta^{Aux}(\bar{a}) > \delta^{AD}(\bar{a}),\ \forall \bar{a} \in (1, \hat{a}).$$

**Proof:** From the definition of home government utility (and using the envelope theorem):

$$\begin{aligned}
\frac{dN(a)}{da} &= \Pi_m(t^N) \\
\frac{dC(a)}{da} &= \Pi_m(t^C) \\
\frac{dD(a)}{da} &= \Pi_m(t^D) \\
\frac{dS(a)}{da} &= \Pi_m(t^C)
\end{aligned}$$

Therefore:

$$\begin{aligned}
\frac{dB(a)}{da} &= \Pi_m(t^D) - \Pi_m(t^C) > 0 \\
\frac{dA(a)}{da} &= \Pi_m(t^N) - \Pi_m(t^C) > 0 \\
\Longrightarrow & \qquad \frac{d[p(\bar{a})B(a) + (1 - p(\bar{a}))A(a)]}{da} > 0
\end{aligned}$$

Note that $B(a)$ and $A(a)$ are increasing in $a$, so $(p(\bar{a})B(a) + (1 - p(\bar{a}))A(a))$ also increases in $a$. Recalling the definition of $\delta^{Aux}(\bar{a})$ and $\delta^{AD}(\bar{a})$:

$$\delta^{AD}(\bar{a}) = \frac{[p(\bar{a})B(\bar{a}) + (1 - p(\bar{a}))A(\bar{a})]}{p(\bar{a})(D - N - (p(\bar{a})B + (1 - p(\bar{a}))A)) + p(\bar{a})B(\bar{a}) + (1 - p(\bar{a}))A(\bar{a})]}$$

$$\delta^{Aux}(\bar{a}) = \max_a \frac{[p(\bar{a})B(a) + (1 - p(\bar{a}))A(a)]}{p(\bar{a})(D - N - (p(\bar{a})B + (1 - p(\bar{a}))A)) + [p(\bar{a})B(a) + (1 - p(\bar{a}))A(a)]}$$

(and similar expressions for the foreign country), we have that $\delta^{Aux}(\bar{a}) > \delta^{AD}(\bar{a})$. ∎

**Lemma 2** *Assume that $B > A$. Then*

1. *$\delta^{Aux}(\bar{a}) < \delta^{CP}$ if*

$$p(\bar{a}) \geq p_{Min} = \frac{A(\hat{a})(C - N)}{B(\hat{a})(B - A)}$$

2. $\delta^{AD}(\hat{a}) = \delta^{Aux}(\hat{a}) = \delta^{CP}$.

3. $\delta^{AD}(1) = \delta^{Aux}(1) = 1$.

4. *Suppose (10), then* $\delta^{Aux}(\bar{a})$ *attains its minimum value at*

$$\underline{a} = \Phi^{-1}\left(\frac{A(\hat{a})\sqrt{\frac{B(\hat{a})(D-N-A)-A(\hat{a})(C-N)}{A(\hat{a})(B-A)}} - A(\hat{a})}{B(\hat{a}) - A(\hat{a})}\right)$$

**Proof:** See working paper version. ∎

**Proposition 3** *An equilibrium in AD strategies for the repeated game* $\mathcal{G}(t^C, \tau^C)$ *can be sustained with a lower discount rate than the CP equilibrium if the following four conditions hold:*

$$\begin{aligned} \bullet\, B &> A \\ \bullet\, p(\hat{a}) &\geq \frac{A(\hat{a})(C-N)}{B(\hat{a})(B-A)} \\ \bullet\, B^* &> A^* \\ \bullet\, p^*(\hat{\alpha})* &\geq \frac{A^*(\hat{\alpha})(C^*-N^*)}{B^*(\hat{\alpha})(B^*-A^*)} \end{aligned}$$

**Proof:** Consider the home country first. Comparing the discount rates $\delta^{CP}$ and $\delta^{Aux}(\bar{a})$:

$$\begin{aligned} \delta^{CP} - \delta^{Aux}(\bar{a}) &= \frac{Max_a\ B(a)}{C-N+Max_a\ B(a)} \\ &\quad - \frac{p(\bar{a})Max_a B(a) + (1-p(\bar{a}))Max_a A(a)}{p(\bar{a})(D-N-(p(\bar{a})B+(1-p(\bar{a}))A)) + p(\bar{a})Max_a B(a) + (1-p(\bar{a}))Max_a A(a)} \\ &= \frac{B(\hat{a})}{C-N+B(\hat{a})} - \frac{p(\bar{a})B(\hat{a}) + (1-p(\bar{a}))A(\hat{a})]}{p(\bar{a})(D-N-(p(\bar{a})B+(1-p(\bar{a}))A)) + p(\bar{a})B(\hat{a}) + (1-p(\bar{a}))A(\hat{a})]} \\ &= \frac{B(\hat{a})[p(\bar{a})B - p(\bar{a})^2 B - p(\bar{a})A + p(\bar{a})^2 A] \ - \ (1-p(\bar{a}))A(\hat{a})(C-N)}{[C-N+B(\hat{a})][p(\bar{a})(D-N-(p(\bar{a})B+(1-p(\bar{a}))A)) + p(\bar{a})B(\hat{a}) + (1-p(\bar{a}))A(\hat{a})]} \\ &= \frac{p(\bar{a})(1-p(\bar{a}))B(\hat{a})(B-A) \ - \ (1-p(\bar{a}))A(\hat{a})(C-N)}{Z(\hat{a}, p(\bar{a}))} \end{aligned}$$

where

$$Z(\hat{a}, p(\bar{a})) \equiv [C-N+B(\hat{a})][p(\bar{a})(D-N-(p(\bar{a})B+(1-p(\bar{a}))A)) + p(\bar{a})B(\hat{a}) + (1-p(\bar{a}))A(\hat{a})] \ > \ 0,$$

Thus:

$$\delta^{CP} \geq \delta^{Aux}(\bar{a}) \quad \Leftrightarrow \quad p(\bar{a})B(\hat{a})(B-A) \geq A(\hat{a})(C-N) \tag{18}$$

A shock probability $p(\bar{a})$ satisfies equation (18) if the following conditions are satisfied:

$$\begin{aligned} B &> A \qquad (19) \\ p(\hat{a}) &\geq \frac{A(\hat{a})(C-N)}{B(\hat{a})(B-A)} \qquad (20) \end{aligned}$$

Analogously, we obtain the desired conditions for the foreign country. The, using lemma 1, the desired inequality holds for $\delta^{AD}(\bar{a})$. ∎

**Lemma 3** *Assume conditions (10) and that* $\partial^2 p/\partial \bar{a}^2 > 0$. *Then* $\delta^{AD}(\bar{a})$ *is convex and has a unique minimum at* $\bar{a}_{min\delta}$.

**Proof:** See working paper version. ∎

**Proposition 4** *Consider a repeated game* $\mathcal{G}(t^C, \tau^C)$ *and assume that conditions (10) hold. Assume also that the discount rate is high enough that both a CP and an AD agreement are viable. Then there always exists an AD agreement that is at least as good for government as the CP agreement.*

**Proof:** Given and AD agreement with $\bar{a}$ and associated $p(\bar{a})$, the expected values of CP and AD agreement are respectively (we write $p = p(\bar{a})$):

$$\begin{aligned} V^{CP} &= C \\ V^{AD} &= p^2 C + p(1-p)(D+S) + (1-p)^2 N \end{aligned}$$

The expected value of the AD agreement is a function of $p$ that satisfies:

$$\begin{aligned} \frac{dV^{AD}}{dp} &= 2pC + (1-2p)(D+S) - 2(1-p)N \\ &= 2p(A-B) + D - N - A \\ \frac{d^2V^{AD}}{dp^2} &= 2(A-B) < 0 \end{aligned}$$

Hence the expected value of an AD agreement is a concave function of $p$. Let $p_{maxV}$ be the value of $p$ that maximizes the value of the AD agreement:

$$\frac{dV^{AD}}{dp} = 2p(A-B) + D - N - A = 0.$$

At an interior equilibrium

$$\Rightarrow p_{maxV} \equiv \frac{D-N-A}{2(B-A)} \qquad (21)$$

Recall that $p_{Min}$ is the minimum $p$ that satisfies condition (10). We examine the conditions for $p_{maxV} \in [p_{Min}, 1]$.

$$\begin{aligned} 1 - p_{maxV} &= 1 - \frac{D - N - A}{2(B - A)} \\ &= \frac{D + S - 2C}{2(B - A)} \end{aligned}$$

Therefore we have that:

$$\begin{aligned} \text{if } D + S \geq 2C &\Rightarrow p_{maxV} \leq 1 \\ \text{if } D + S < 2C &\Rightarrow p_{maxV} > 1 \end{aligned}$$

Moreover,

$$\begin{aligned} p_{maxV} - p_{Min} &= \frac{D - N - A}{2(B - A)} - \frac{A(\hat{a})(C - N)}{B(\hat{a})(B - A)} \\ &= \frac{B(\hat{a})(D + S - 2N) - 2A(\hat{a})(C - N)}{2B(\hat{a})(B - A)} \\ &> \frac{A(\hat{a})(D + S - 2C)}{2B(\hat{a})(B - A)} \end{aligned}$$

which means that if:

$$D + S \geq 2C \Rightarrow p_{maxV} > p_{Min}$$

Therefore, if $D + S \geq 2C$, the probability $p_{maxV}$ is an interior solution and it is an extremum otherwise. Consider first

• Case $D + S < 2C$

By concavity of $V^{AD}$ with respect to $p$, we have that $\frac{dV^{AD}}{dp} > 0$, $\forall\ p \leq 1$ satisfying (10). Then the maximum value of $V^{AD}$ is attained when $p = 1$. Since $p = 1 > p_{Min}$, if both agreements can be signed, we have

$$V^{AD} - V^{CP} = (p^2 C + p(1 - p)(D + S) + (1 - p)^2 N)|_{p=1} - C = C - C = 0$$

In conclusion, in the case $D + S < 2C$, the value of a CP agreement for the government is no higher than the value of an AD agreement. Consider now the alternative

• Case $D + S \geq 2C$

Consider an AD agreement with $p = p_{maxV}$. Then

$$\begin{aligned} V^{AD} - V^{CP} &= (p^2 C + p(1-p)(D+S) + (1-p)^2 N)|_{p_{maxV}} - C \\ &= (p^2(A-B) + p(D-N-A) + N)|_{p_{maxV}} - C \\ &= \frac{(D-2N+S)^2 + 4(D-C-N+S)(N-C)}{4(B-A)} \\ &= \frac{D^2 + S^2 + 4C^2 + 2DS - 4CD - 4CS}{4(B-A)} \\ &= \frac{(D+S-2C)^2}{4(B-A)} \geq 0 \end{aligned}$$

Hence when $D + S \geq 2C$, we can find a value of $\bar{a} \equiv \Phi^{-1}(p_{maxV})$ such that an AD agreement provides more utility than a CP agreement. See Figure 2. Hence the government chooses the AD agreement to a CP agreement. ∎

**Lemma 4** *Assume condition (10) and $\partial^2 p/\partial\bar{a}^2 > 0$. Let $\bar{a}_{min\delta}$ be the value of $\bar{a}$ where $\delta^{AD}(\bar{a})$ achieves its minimum value, so that with lower discount rates no AD agreement is feasible. Let $\bar{a}_{maxV}$ be the value of $\bar{a}$ where the value of an AD agreement reaches its maximum value. Then $\bar{a}_{min\delta} < \bar{a}_{maxV}$.*

**Proof:** See working paper version. ∎

**Proposition 5** *Assume conditions (10). Consider two identical countries and a game $\mathcal{G}(t^C, \tau^C)$, with $t^C > t^{*C}$ and $\tau^C > \tau^{*C}$. If a CP agreement can be signed, there exists an AD agreement with lower tariffs.*

**Proof:** ¿From proposition 1, the condition for stability of a CP agreement is that

$$\frac{\delta}{1-\delta}(C - N) \geq B(\hat{a}) \tag{22}$$

¿From this condition we obtain the minimum discount factor that allows cooperative CP equilibria for a given set of CP tariffs:

$$\delta^{CP} = \frac{B(\hat{a})}{C - N + B(\hat{a})} \tag{23}$$

Let $t^C$ denote the cooperation tariff associated to $\delta^{CP}$. Any lower tariff would be too tempting to sustain the CP agreement for that discount rate. Hence, totaly differentiating the equation (22) with respect to $t^C$, we get:

$$\frac{\delta^{CP}}{1-\delta^{CP}} \frac{\partial(C-N)}{\partial t^C} - \frac{\partial B(\hat{a})}{\partial t^C} > 0$$

Using $\delta^{CP}$ defined in the equation (23) and reorganizing we obtain:

$$\frac{\partial C}{\partial t^C} - \frac{C-N}{B(\hat{a})}\left(\frac{\partial B(\hat{a})}{\partial t^C}\right) > 0 \tag{24}$$

Similarly, from the proof of proposition 2, the minimum discount factor that allows a sustainable agreement under AD is given by:

$$\frac{\delta}{1-\delta}[p^2(A-B) + p(D-N-A))] = [pB(\bar{a}) + (1-p)A(\bar{a})] \tag{25}$$

Consider the effect of a small change in $p$, the probability of cooperation, while changing the cooperative tariff $t^C$ appropriately in order to maintain the agreement and evaluating in the neighborhood of $p=1$ (where AD agreement is equivalent to a CP agreement):

$$\begin{aligned} 2C - D - S + \left(\frac{\partial C}{\partial t^C}\right)\left.\frac{dt^C}{dp}\right|_{p=1} &= \frac{1-\delta}{\delta}\left[B(\hat{a}) - A(\hat{a}) + \left(\left.\frac{\partial B(\bar{a})}{\partial t^C}\right|_{\bar{a}=\hat{a}}\right)\left.\frac{dt^C}{dp}\right|_{p=1}\right. \\ &\quad \left. + \left(\left.\frac{\partial B(\bar{a})}{\partial \bar{a}}\right|_{\bar{a}=\hat{a}}\right)\left.\frac{d\bar{a}}{dp}\right|_{p=1}\right] \end{aligned}$$

In order to compare both agreements, the discount factor must be such that both types of agreements are stable. Looking at figure 1 we observe that in the neighborhood of $p=1$, CP agreements require a higher minimum discount rate in order to be sustainable. Using $\delta^{CP}$ defined by equation (23), the condition (24), the fact that $B(a)$ is increasing in $a$[28], the condition (10) and reorganizing, we obtain:

$$\left.\frac{dt^C}{dp}\right|_{p=1} = \frac{B(\hat{a})(B-A) + (C-N)\left\{\left(\left.\frac{\partial B(\bar{a})}{\partial \bar{a}}\right|_{\bar{a}=\hat{a}}\right)d\Phi^{-1}(1) - A(\hat{a})\right\}}{B(\hat{a})\frac{\partial C}{\partial t^C} - (C-N)\left(\frac{\partial B(\hat{a})}{\partial t^C}\right)} > 0 \tag{26}$$

Thus, in the neighborhood of a CP agreement ($p=1$), a small reduction in the probability of cooperation allows a reduction in the cooperative tariff while maintaining a stable AD agrement.

∎

# B The terms of trade motive for protection

Consider a multiproduct model similar to Helpman (1997), with $i = 1, \ldots n$ domestically produced goods that compete with imports and $j = 1, \ldots l$ export goods. Let $t_i$ be the tariff on imported good $i$ and $\tau_j$ the foreign tariffs on good $j$. Let $p_i^{Wm}$ be the international price of the imported good and $p_i^m = (1+t_i)p_i^{Wm}$ be the domestic price of the good. Similarly, let $p_j^{Wx}$ be the domestic price of

[28] See proof of lemma 1

export good $j$ and $p_j^x = (1+\tau_j)p_j^{Wx}$ the foreign market price of the same good. We assume that prices can be altered by changes in demand or supply.

The utility function of the government can be written as

$$G = \sum_{i=1}^{n} S_i(p_i^m) + \sum_{i=1}^{n} b_i \Pi_i^m(p_i^m) + \sum_{j=1}^{l} \Pi_j^x(p_j^x) + \sum_{i=1}^{n}(p_i^m - p_i^{Wm})M_i(p_i^m) \tag{27}$$

where the first term on the RHS corresponds to consumer surplus, the second term corresponds to the profits of import competing firms, weighed by a factor $b_i \geq 1$ representing the bias towards protection in the government. The third term represents profits in the export markets and the last term corresponds to tariff revenues. We can use this function to find the optimal import tariffs:

$$\frac{dG}{dt_i} = \frac{\partial G}{\partial p_i^m}\frac{dp_i^m}{dt_i} + \frac{\partial G}{\partial p_i^{Wm}}\frac{dp_i^{Wm}}{dt_i} = 0 \tag{28}$$

Using the expression for (27) in (28) and noting that production of the import competing firm is $X_i^m = \Pi_i^{m\prime}$, that imports are $M_i = D_i^m - X_i^m$ and that domestic demand for imports is $D_i^m = -S_i'$ we get:

$$\frac{dG}{dt_i} = \left\{(b_i - 1)X_i^m(p_i^m) + (t_i p_i^{Wm})M_i'(p_i^m)\right\}\frac{dp_i^m}{dt_i} + \{-M_i(p_i^m)\}\frac{dp_i^{Wm}}{dt_i} = 0 \tag{29}$$

As mentioned in Bagwell and Staiger (1999), equation (28) makes it clear that there are two effects that come into play after changing tariffs. The first term corresponds to the impact caused by the change in domestic prices. As can be seen from equation (29), this term has two components, a *political economy* effect and an *efficiency* effect. The political economy effect refers to the capacity of commercial policy to later domestic prices and redistribute the surplus between domestic producers, consumers and tariff revenue, while keeping imports constant. The efficiency effect arises because the change in domestic prices impacts on import volumes and therefore affects social welfare.

The second effect of the change in tariffs is associated to the impact on world prices. By means of this *terms of trade* effect, the country can appropriate some of the surplus away from its commercial partners.

Finally, the optimal tariff for good $i$ can be written as:

$$t_i^* = \left(b_i - \frac{\frac{dp_i^{Wm}}{dt_i}}{\frac{dp_i^m}{dt_i}}\frac{M(p_i^{Wm})}{X(p_i^{Wm})} - 1\right)\frac{X_i(p_i^{Wm})}{p_i^{Wm}\cdot\left(-M_i'(p_i^{Wm})\right)} \tag{30}$$

When there is no protectionist bias ($b = 1$), equation (30) shows that positive tariffs can only be due to terms of trade reasons. In turn, if the country is small and its tariffs do not affect international prices ($\frac{dp_i^{Wm}}{dt_i} = 0$), tariffs are only due to political economy reasons.

We can now redefine the variable $a_i$ in the expression the utility of the government (a generalization to many goods of (1)) as:

$$a_i = b_i - \frac{\frac{dp_i^{Wm}}{dt_i}}{\frac{dp_i^{m}}{dt_i}} \frac{M(p_i^{Wm})}{X(p_i^{Wm})} \tag{31}$$

Thus, it is possible to embed into the variable $a_i$ that we used in the body of the paper both political economy and terms of trade motives for protection. Moreover, it is easy to show that a random shock to the political pressure parameter $a_i$ is equivalent to a random shock to the terms of trade.[29]

[29] See working paper version.