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Free-Trade Areas and Special Protection

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Abstract

This paper investigates the impact of regional free-trade-area (FTA) agreements on the ability of countries to multilaterally cooperate within an economic environment characterized by trade-flow volatility. We show that the parallel formation of different FTAs leads to a gradual but permanent easing of multilateral trade tensions. In particular, we demonstrate that the emergence of the FTAs will be accompanied by a decline in global "special"-protection activity, such as safeguard or anti-dumping initiations, but will have less significant implications for most-favored-nation tariffs, or "normal" trade protection. (JEL: F13, F15)

1 Introduction

In this paper, we investigate the impact of free-trade-area (FTA) formation on multilateral trade cooperation within an economic environment characterized by trade-volume volatility. More specifically, we examine how the establishment of FTAs affects the ability of countries to multilaterally cooperate in the use of most-favored-nation (MFN) tariffs, or "normal" protection, as well as "special" protection, such as safeguards or anti-dumping duties. Our main contribution is that we extend the previous theoretical work on regionalism (e.g., Bagwell and Staiger, 1997a, b; Krishna, 1998; Bond et al., 2001; Aghion et al., 2007; Tabakis, 2010) by exploring the ramifications of FTA agreements also for "special" protection.[1] This is an important question given that both FTA agreements and "special" protection play a prominent role in modern commercial policy. For instance, as of October 2013, the number of active regional trade agreements (RTAs) notified to the General Agreement on Tariffs and Trade/World Trade Organization (WTO) stands at 250, of which 90% are FTA and partial scope agreements.[2] At the same time, according to the WTO, 4,230 anti-dumping, 255 safeguard, and 302 countervailing investigations have been initiated since its establishment in 1995.[3]

The model we present is built on three main assumptions. First, we assume that countries are limited to cooperative multilateral trade agreements that are self-enforcing, i.e., agreements balancing the onetime gains from defection against the expected discounted cost of a future breakdown in multilateral cooperation. This assumption is common in the literature, and reflects the lack of a strong mechanism within the WTO for enforcing the trade policies agreed upon under its auspices.[4] Second, we adopt the view of Bagwell and Staiger (1990) that "special" protection is a useful safety valve allowing countries to maintain multilateral cooperation amid volatile trade swings, and introduce trade-flow volatility into our framework in a very simple way: Countries are assumed to be hit every period by a common exogenous trade shock. Third, following Bagwell and Staiger (1997a), the

[1] In Tabakis (2010), we focus instead on customs unions, and address a related question. In particular, we examine the implications of customs-union formation for both "normal" and "special" trade protection. As we briefly discuss in the concluding section, the predictions we obtain there are qualitatively very different.

[2] See http://www.wto.org/english/tratop_e/region_e/region_e.htm.

[3] See http://www.wto.org/english/tratop_e/adp_e/AD_InitiationsByRepMem.pdf, http://www.wto.org/english/tratop_e/safeg_e/SG-Initiations_By_Reporting_Member.pdf, and http://www.wto.org/english/tratop_e/scm_e/CV_InitiationsByRepMem.pdf, respectively.

[4] See, for example, Dixit (1987) and Bagwell and Staiger (2002) for further elaboration on this point.

countries' trading relationship is assumed to pass through three phases: an initial or pre-FTA-negotiations phase, a transition or FTA-negotiations phase where different FTA talks are concurrently in progress, and a final phase in which the world is divided into symmetric FTAs. In practice, the establishment of an FTA entails a lengthy period over which an FTA agreement is firstly negotiated, subsequently ratified by all the member states, and finally gradually implemented. In the earlier stages of this process, the changes member and nonmember countries face are primarily with respect to expected future trading patterns rather than current ones, implying that the impact of FTAs on multilateral trade cooperation is nonstationary. Our three-phase framework here enables us to highlight and better analyze this nonstationarity.

We demonstrate that relatively to the pre-FTA world, more liberal multilateral trade policies can be sustained as soon as the FTAs are established. Intuitively, this stems from the trade-diversion effect of FTA formation. In particular, once the FTA agreements are implemented, the volume of trade between FTA partners and nonpartner countries decreases. This has a dampening effect on countries' static incentive to defect from the cooperative course, allowing for a less protectionist international trading environment to come forth. Most importantly, we find that FTA formation has an impact primarily on "special" rather than "normal" protection (since for "normal" import volumes, the incentive to defect is rather weak throughout the game). More specifically, in comparison with the pre-FTA world, countries employ "special"-protection instruments in the post-FTA world both less frequently and when so, more moderately. At the same time, "normal" protection remains low, largely unchanged from the pre-FTA era.

Moreover, we show that more restrictive multilateral trade policies are required in the initial than in the transition phase of our game. To understand this finding, note that as countries enter into FTA talks, the final phase with the fairly liberal equilibrium trade policies draws closer. This raises the expected discounted value of future cooperation, while leaving the static incentive to cheat unaffected. Thereby, a more liberal trading environment is now feasible, especially with regard to the employment of "special" protection.

These results extend in two important (and testable) ways previous findings in the literature showing that FTAs might induce member countries to lower their external tariffs (e.g., Richardson, 1993; Bagwell and Staiger, 1999; Bond et al., 2004; Ornelas, 2005). First, FTA agreements are shown here to induce member states to also limit their use of "special"-protection instruments against nonmember countries, with this effect being more significant relative to their impact on MFN tariffs. Second, the beneficial effect of FTA formation on multilateral trade cooperation is shown to (i) be gradual but permanent; and (ii) start materializing as soon as the FTA negotiations get underway. Observe that our latter conclusions contrast sharply with those of Bagwell and Staiger (1997a), who find that multilateral trade tensions are heightened as countries pass from the pre-FTA-negotiations to the FTA-negotiations phase, and only subside once the final phase is reached. This difference in the findings is mainly driven by the fact that the dampening effect of FTAs on countries' static incentive to cheat emerges as a more pivotal factor in our analysis, suggesting at a more general level that for countries that are not overly patient, our predictions are likely to be empirically a better fit than theirs.

Finally, it is important to note that our results seem to be in line with the experiences with NAFTA. In particular, according to our model, the establishment of NAFTA in 1994 should have resulted in a decrease in the "special"-protection activity of the US, Canada, and Mexico against the rest of the world (ROW). Focusing on anti-dumping, which is the most heavily employed instrument of "special" protection worldwide, we calculate now the average annual anti-dumping initiations of the NAFTA partners against the ROW over the periods 1989–1993 (i.e., prior to NAFTA) and 1994–1998 (i.e., post NAFTA), where the data is taken from Bown (2012). Our calculations reveal that during the period 1994–1998, average annual anti-dumping initiations in the US, Canada, and Mexico against the ROW were approximately 48%, 61%, and 75%, respectively, lower than over the period 1989–1993. Thus, although it is true that only econometric analysis can shed definitive light on the empirical validity of our model, our predictions do seem broadly consistent with the experiences with the most prominent FTA.[5]

The remainder of the paper is organized as follows. The next section sets out the basics. Sections 3, 4, and 5 characterize the equilibrium multilateral trade policies for the final phase, the transition phase, and the initial phase, respectively. Finally, Section 6 discusses the generality of our results and concludes. All the proofs are relegated to Appendix B.

2 The Model

We assume the world consists of four countries, X, Y, W, and Z, that trade four goods, X, Y, W, and Z. In any given period, the output of product i equals $1 + 3e$ in country i and $1 - e$ in country $j \neq i$, where e is independently drawn over time from the uniform distribution on $[0, 1]$ and $i, j \in \{X, Y, W, Z\}$. On the consumption side, demand functions are symmetric across countries and goods, and the demand for any good i is assumed independent of the prices of other goods $j \neq i$. More specifically, the demand for product

[5] In our model, the equilibrium level of "special" protection for any given period is both phase- and trade-shock-dependent. One could then argue that the striking decrease in anti-dumping initiations of the NAFTA partners against the ROW during 1994–1998 might have been due not to NAFTA but to the lower import activity faced by the three countries over that period. The data though seems not to support the latter explanation as average annual aggregate imports into the US, Canada, and Mexico were approximately 54%, 46.5%, and 120%, respectively, *higher* during 1994–1998 than over 1989–1993 (where the data is taken from UN Comtrade via WITS). On a different note, Blonigen (2006) documents a positive trend in the US anti-dumping duties over the period 1980–2000, which might seem inconsistent with our predictions. This inconsistency is only superficial, however, for two reasons. First, this positive trend was substantially *less* pronounced in the second half of the 1990s (i.e., in the post-NAFTA era). Second, during the course of such a long time period, the distribution of the trade shocks might have actually changed (unlike in our framework), heightening on average the equilibrium level of US "special" protection.

i in country j is given by $C\left(P_i^j\right) = \alpha - \beta P_i^j$, where $\alpha > 1$ and $\beta > 0$ are constants, and P_i^j is the price of good i in country j. Given our setup, country j has three natural import goods, goods $i \neq j$, and one natural export good, good j. In particular, country j's import demand for good $i \neq j$ equals $C\left(P_i^j\right) - 1 + e$, while its export supply of good j equals $1 + 3e - C\left(P_j^j\right)$. Thereby, the countries encounter a common exogenous trade shock every period that is a function of parameter e, with a rise in e increasing the volume of trade between countries at the expense of the import-competing producers, who experience a drop in their output and their domestic market share. Moreover, we assume the countries simultaneously select each period nonprohibitive specific tariffs so as to maximize their individual national welfare. The tariffs are picked after the current-period value of e is observed and with perfect information as to all past tariff choices.

As we mentioned above, following Bagwell and Staiger (1997a), we assume the multilateral trading environment passes through three phases. In phase I, the countries trade normally with each other, but are at the same time aware that it might eventually become politically feasible for countries X and Y on the one hand, and countries W and Z on the other hand, to commence bilateral FTA talks. Phase II is a transition period, during which the countries are engaged in their respective bilateral FTA negotiations while they still trade as usual with each other. Finally, in phase III, two discrete symmetric FTAs are in place: one composed of countries X and Y, and another of W and Z. To avoid additional nonstationarities, we assume that once the FTAs are formed, they endure into the infinite future. Furthermore, in order to keep our analysis as straightforward as possible, the FTA agreements are assumed to involve zero protection only for the natural export goods of their respective member countries, with nondiscriminatory trade barriers remaining in place for the rest of the goods (meaning that once, for example, countries X and Y form an FTA, intrabloc trade barriers are removed only for goods X and Y). This assumption simply precludes the possibility that because of differences in consumer prices due to differences in external tariffs, a country will start exporting to its FTA partner some of its natural import goods. In any case, allowing for this possibility would only reinforce our results (see, e.g., Richardson, 1993, 1995).

We do not rigorously examine either the domestic political process or the FTA negotiations. Instead, we simply assume that in any period of the game, if FTA discussions have not yet started, there is probability $\rho \in (0, 1)$ that both bilateral FTA talks will begin in the following period. Thus, if the countries are in phase I at date t, then the probability of being in phase II at date $t + 1$ is ρ. Similarly, if in any period the FTA negotiations are already underway, there is probability $\lambda \in (0, 1)$ that both FTAs will be finalized and fully implemented by the beginning of the next period. Therefore, if the countries are in phase II at date t, then λ is the probability of being in phase III at date $t + 1$. Observe that the probabilities ρ and λ are time-invariant and history-independent (i.e., the transition process is characterized by constant hazard rates).

For this symmetric nonstationary dynamic game, we restrict our attention to symmetric cooperative subgame-perfect equilibria, in which (a) along the equilibrium path, at any date t, a single (nonnegative) import tariff is selected by all countries; and (b) if at any point in the game a deviation occurs from the common equilibrium cooperative tariff for the corresponding period, then all countries revert from the following period onwards to noncooperative Nash play. An equilibrium of this type will comprise three cooperative tariff *functions*, one per phase, indicating the equilibrium protection level in the different phases for any given trade shock. Let these functions be denoted by $\tau_1^c(e)$, $\tau_2^c(e)$, and $\tau_3^c(e)$.[6] Of course, multiple such equilibria exist, but our interest lies only in the most cooperative

[6]Note that our constant-hazard-rate assumption allows us to look for a single cooperative tariff function for all dates within a phase. Furthermore, as will become evident later in the paper, these tariff functions will consist in essence of a "normal"- and a "special"-protection part.

equilibrium phase-I, phase-II, and phase-III tariff functions, i.e., the ones specifying for any realization of e the lowest level of protection that does not invite cheating in the initial, the transition, and the final phase, correspondingly.[7]

Let, then, $\widehat{\tau_1^c}(e)$, $\widehat{\tau_2^c}(e)$, and $\widehat{\tau_3^c}(e)$ refer to the most cooperative equilibrium tariff functions of the three phases of our game. We solve for them in a recursive fashion. More precisely, we first characterize the no-defect condition for phase III and look for the most cooperative tariff function that is sustainable in this phase given the threat of infinite Nash reversion should a defection ever take place. Having thus obtained $\widehat{\tau_3^c}(e)$, we subsequently turn to phase II, derive the no-defect condition for this phase using $\widehat{\tau_3^c}(e)$, and determine the phase-II most cooperative equilibrium tariff function, $\widehat{\tau_2^c}(e)$. Finally, we specify the no-defect condition for phase I using both $\widehat{\tau_2^c}(e)$ and $\widehat{\tau_3^c}(e)$, and solve for the most cooperative tariff function that satisfies it, $\widehat{\tau_1^c}(e)$. This recursive method does indeed provide us with the most cooperative equilibrium tariff functions, since from the perspective of any given phase (i) the sum of discounted expected future benefits from presently maintaining multilateral cooperation is maximized as future cooperative tariffs are minimized; and (ii) as the former is maximized, lower tariffs can be currently sustained.

Before proceeding further, a couple of features of our setup require some discussion. First, the assumptions that both bilateral FTA negotiations begin unfolding concurrently and that the two FTAs also are established at the same date are of course not meant to be interpreted literally. They are just made for analytical convenience since they ensure that all countries face symmetric situations throughout the game. Second, the intrabloc trade arising in our framework is assumed not to be subject to "special" protection, which can be justified on several grounds. First, there is empirical evidence that the rules of a

[7]The most cooperative equilibrium seems the most natural focal point for our game since (i) it is the only equilibrium of the desired class that is not Pareto dominated; and (ii) nothing precludes preplay communication among the countries.

significant number of RTAs with respect to "special" protection entail discrimination in favor of partner countries. For instance, Prusa and Teh (2011) examine a sample of 74 RTAs, including the economically most important ones, and find that (i) about a sixth of them have totally dispensed with at least one form of "special" protection with regard to intrabloc trade; and (ii) more than half of them have adopted RTA-specific rules that tighten discipline on the employment of "special"-protection instruments against member states. Interestingly, they show that FTAs are the most likely to have adopted such discriminatory rules against nonmember countries. Moreover, on a more theoretical level, an FTA agreement normally deepens the trading relationship between its signatory parties, which is likely to raise the discount factor in their dealings with one another. If so, the FTA partners can clearly support a lower level of "special" protection against each other than against third (nonpartner) countries. In any event, imposing the weaker assumption that a lower level of "special" protection can be enforced within the FTAs than multilaterally would not affect the qualitative nature of our findings (since trade diversion would still take place, albeit to a lesser extent).

This completes the outline of our model. We next formally derive the phase-III, phase-II, and phase-I no-defect conditions, as well as the associated most cooperative equilibrium tariff functions.

3 Phase III

We begin our analysis with phase III. During phase III, the two FTAs are in full effect. Countries X and Y form one FTA, whereas countries W and Z form another one.

3.1 Phase-III Static Game

In this section, we characterize the static Nash equilibrium for phase III. Let $l \in \{X, Y\}$, $m \in \{W, Z\}$, τ_i^j represent the specific import tariff levied by country j on good $i \neq j$ $(i, j \in \{X, Y, W, Z\})$, $\overrightarrow{\tau}_i$ denote the vector of tariffs good i faces internationally, and M_i^j stand for the volume of imports of good i into country $j \neq i$. Moreover, given the symmetric structure of our model, let us focus on country X. Assuming that the market for each product clears, we obtain the following equilibrium domestic prices:

$$P_l^X\left(\overrightarrow{\tau}_l\right) = \frac{\alpha - 1}{\beta} - \frac{1}{4}\sum_m \tau_l^m \text{ and} \tag{1}$$

$$P_m^X\left(\overrightarrow{\tau}_m\right) = \frac{\alpha - 1}{\beta} - \frac{1}{4}\tau_m^Y + \frac{3}{4}\tau_m^X. \tag{2}$$

The market-clearing import levels, then, equal:

$$M_Y^X\left(e, \overrightarrow{\tau}_Y\right) = C\left(P_Y^X\left(\overrightarrow{\tau}_Y\right)\right) - 1 + e = e + \frac{\beta}{4}\sum_m \tau_Y^m \text{ and} \tag{3}$$

$$M_m^X\left(e, \overrightarrow{\tau}_m\right) = C\left(P_m^X\left(\overrightarrow{\tau}_m\right)\right) - 1 + e = e + \frac{\beta}{4}\left(\tau_m^Y - 3\tau_m^X\right). \tag{4}$$

Therefore, country X's welfare, defined as the sum of consumer surplus, producer surplus, and tariff revenue, is given by:

$$\begin{aligned} W_3^X\left(e, \overrightarrow{\tau}_W, \overrightarrow{\tau}_Z, \overrightarrow{\tau}_X, \overrightarrow{\tau}_Y\right) &= \sum_i \int_{P_i^X\left(\overrightarrow{\tau}_i\right)}^{\frac{\alpha}{\beta}} C\left(P\right) dP \\ &+ \int_0^{P_X^X\left(\overrightarrow{\tau}_X\right)} \left(1 + 3e\right) dP + \sum_{-x} \int_0^{P_{-x}^X\left(\overrightarrow{\tau}_{-x}\right)} \left(1 - e\right) dP + \sum_m \tau_m^X M_m^X\left(e, \overrightarrow{\tau}_m\right), \end{aligned} \tag{5}$$

where $-x \in -X \equiv \{X, Y, W, Z\} \setminus \{X\} = \{Y, W, Z\}$.

With equation (5) in place, we may now derive the best-response tariffs for country X, $\tau_m^{X^R}$. The first-order derivative of its welfare function with respect to τ_m^X is:

$$\frac{\partial W_3^X(\cdot)}{\partial \tau_m^X} = \frac{e}{4} + \frac{\beta}{16}\left(\tau_m^Y - 15\tau_m^X\right), \tag{6}$$

implying $W_3^X(\cdot)$ is strictly concave in τ_m^X. Setting then $\frac{\partial W_3^X(\cdot)}{\partial \tau_m^X} = 0$, we obtain:

$$\tau_m^{X^R}\left(e, \tau_m^Y\right) = \frac{4e}{15\beta} + \frac{1}{15}\tau_m^Y. \tag{7}$$

Equation (7) reveals that $\tau_m^{X^R}$ is strictly increasing in τ_m^Y, which reflects our "competing"-importers structure: As country Y raises τ_m^Y, more units of good m are shipped to country X, which thereby has an incentive to increase its own tariff on good m so that it collects even more tariff revenue.

Using finally (7) and exploiting symmetry, it is direct to verify that the phase-III static Nash tariff equals:

$$\tau_3^N(e) = \frac{2e}{7\beta}. \tag{8}$$

Note that for any country j, $\frac{\partial W_3^j(e,\tau,\ldots,\tau)}{\partial \tau} = -\beta\tau$, implying that the above (unique) equilibrium is inefficient and that all countries would be monotonically made better off with any degree of symmetric trade liberalization. Thus, the static game features a Prisoner's Dilemma property.

3.2 Phase-III Dynamic Game

We now allow for repeated interaction among the four countries. The dynamic game we consider is just the static one we already examined infinitely repeated. More precisely, at the beginning of any period, the countries become informed of the common trade shock and the implied free-trade volume of interbloc trade for the given period. Current-period import tariffs are then simultaneously selected, and the corresponding payoffs are obtained. At the onset of the following period, all past tariff choices are common knowledge and a new value of e is realized.

An equilibrium cooperative tariff function for phase III, $\tau_3^c(e)$, must by definition be self-enforcing. In other words, for any e and for all countries, the onetime gain from defection from $\tau_3^c(e)$ must be exceeded by the discounted expected value of future cooperation. To formalize this condition, we first examine the static incentive a country has to cheat. Let us fix both e and a cooperative tariff level $\tau_3^c < \tau_3^N(e)$. It is obvious that a country choosing to deviate from the cooperative course does best by picking a tariff on its reaction curve. Therefore, from (7), its optimal defect tariff equals:

$$\tau_3^D(e, \tau_3^c) = \frac{4e}{15\beta} + \frac{1}{15}\tau_3^c. \tag{9}$$

Its static gain from defection is then given by:

$$\Omega_3(e, \tau_3^c) \equiv W_3\left(e, \overrightarrow{\tau}_3^D, \overrightarrow{\tau}_3^D, \overrightarrow{\tau}_3^c, \overrightarrow{\tau}_3^c\right) - W_3\left(e, \overrightarrow{\tau}_3^c, \overrightarrow{\tau}_3^c, \overrightarrow{\tau}_3^c, \overrightarrow{\tau}_3^c\right), \tag{10}$$

where $\overrightarrow{\tau}_3^D \equiv \left(\tau_3^D(e, \tau_3^c), \tau_3^c\right)$ and $\overrightarrow{\tau}_3^c \equiv (\tau_3^c, \tau_3^c)$.

Using the envelope theorem, it can be readily shown that $\frac{d\Omega_3(e,\tau_3^c)}{de} > 0$ and $\frac{d\Omega_3(e,\tau_3^c)}{d\tau_3^c} < 0$ if and only if $\tau_3^c < \frac{2e}{7\beta} = \tau_3^N(e)$, i.e., provided the cooperative tariff is below the static Nash one, the incentive for a country to cheat is stronger the smaller is τ_3^c and the greater is e. The intuition is straightforward. For a given τ_3^c, a greater e raises the volume of interbloc (and intrabloc) trade. This in turn heightens the countries' incentive to cheat as the defect tariff can then be applied to more import units and thereby higher tariff revenue can be collected. On the other hand, for a fixed e, a higher cooperative tariff has a dampening effect on Ω_3 because (i) it lowers the interbloc trade volume, limiting the tariff-revenue gain for a country associated with defecting from τ_3^c; and (ii) a defection then represents a less substantial tariff rise.

However, violating multilateral cooperation also bears consequences as a trade war ensues. Let $\delta \in \left(0, \frac{49}{59}\right)$ be the discount factor between periods, and E be the expectations operator with expectations taken over the distribution of e.[8] Then, we can write the present discounted value of the expected future gains for a country that upholds multilateral cooperation today as:

$$\begin{aligned}
&\frac{\delta}{1-\delta} EW_3 \left(e, \overrightarrow{\tau}_3^c (e), ..., \overrightarrow{\tau}_3^c (e)\right) - EW_3 \left(e, \overrightarrow{\tau}_3^N (e), ..., \overrightarrow{\tau}_3^N (e)\right) \\
&= \frac{\delta}{1-\delta} \left\{ \frac{2\left(Var(e) + (E(e))^2\right)}{49\beta} - \frac{\beta}{2}\left[Var\left(\tau_3^c(e)\right) + \left(E\left(\tau_3^c(e)\right)\right)^2\right] \right\} \equiv \omega_3 \left(\tau_3^c(\cdot)\right), \quad (11)
\end{aligned}$$

where $\overrightarrow{\tau}_3^c(e) \equiv \left(\tau_3^c(e), \tau_3^c(e)\right)$ and $\overrightarrow{\tau}_3^N(e) \equiv \left(\tau_3^N(e), \tau_3^N(e)\right)$. Three important observations can be drawn from equation (11). First, ω_3 is a function of the cooperative tariff function $\tau_3^c(\cdot)$ selected by the countries, but since e is i.i.d. across periods, ω_3 is independent of the current realization of e as well as of the corresponding level of the cooperative tariff for the present period, $\tau_3^c(e)$. Second, holding τ_3^c fixed, the per-country benefits from cooperation in any given period are strictly increasing in the interbloc trade volume. Third, a more liberal trade agreement acts to heighten the expected future welfare loss a defector faces.

Using equations (10) and (11), we can now formally state the phase-III no-defect condition:

$$\Omega_3\left(e, \tau_3^c(e)\right) \leq \omega_3\left(\tau_3^c(\cdot)\right), \forall e. \quad (12)$$

[8] We restrict the range of δ in order to avoid global free trade being the most cooperative equilibrium outcome in any of the three phases of our game, which would be an uninteresting (and unrealistic) scenario.

From all the cooperative tariff functions that satisfy the condition above, our interest lies in the most cooperative one, $\widehat{\tau_3^c}(e)$. To derive this tariff function, we follow the approach of Bagwell and Staiger (1990). More specifically, we initially fix ω_3 at an arbitrary nonnegative value $\overline{\omega}_3$ and solve for the smallest, nonnegative τ_3^c that does not violate (12). This generates a cooperative tariff function with both e and $\overline{\omega}_3$ as independent variables, $\tau_3^c(e, \overline{\omega}_3)$. Nevertheless, as (11) illustrates, ω_3 itself depends on the cooperative tariff function chosen by the four countries. Therefore, our subsequent step is to ensure that these two equations are consistent with each other. In particular, we first compute $\omega_3(\tau_3^c(e, \overline{\omega}_3)) \equiv \widetilde{\omega}_3(\overline{\omega}_3)$, and then make sure that there exists an $\overline{\omega}_3^\star$ such that $\widetilde{\omega}_3(\overline{\omega}_3^\star) = \overline{\omega}_3^\star$. Finally, plugging the largest such $\overline{\omega}_3^\star$ into $\tau_3^c(e, \overline{\omega}_3)$, we obtain $\widehat{\tau_3^c}(e)$.

The derivation of $\widehat{\tau_3^c}(e)$ is relegated to Appendix B. Lemma 1 summarizes our findings.

Lemma 1 *Define:*

$$F(x) \equiv 2(x)^{\frac{3}{2}} - 6x + 6(x)^{\frac{1}{2}}. \tag{13}$$

The phase-III most cooperative equilibrium tariff function equals:

$$\widehat{\tau_3^c}(e) = \begin{cases} 0, & if \quad e \in [0, \overline{e}_3] \\ \frac{2(e-\overline{e}_3)}{7\beta}, & if \quad e \in (\overline{e}_3, 1] \end{cases}, \tag{14}$$

where:

$$\overline{e}_3 = \sqrt{15\beta\omega^{III}}, \tag{15}$$

with $\omega^{III} \in \left(0, \frac{1}{15\beta}\right)$ being the unique interior fixed point of:

$$\widetilde{\omega}_3(\overline{\omega}_3) = \begin{cases} \frac{\delta}{1-\delta}\frac{F(15\beta\overline{\omega}_3)}{147\beta}, & if \quad \overline{\omega}_3 \in \left[0, \frac{1}{15\beta}\right] \\ \frac{\delta}{1-\delta}\frac{2}{147\beta}, & if \quad \overline{\omega}_3 > \frac{1}{15\beta} \end{cases}. \tag{16}$$

Intuitively, the countries can sustain free trade as long as the interbloc trade volume is relatively low or moderate, since defection with a tariff would then give rise to only limited static welfare gains. Nonetheless, free trade is no longer an option once e and thus the interbloc trade volume surpasses a critical threshold. In such case, a positive level of protection is required, high enough so that the flow of trade between the FTAs is sufficiently curbed, keeping the countries' incentive to cheat in check.

At a more general level, $\widehat{\tau_3^c}(e)$ can be thought of as consisting of a "normal"- and a "special"-protection part. In particular, the countries can maintain a relatively liberal multilateral trading environment as long as interbloc trade activity remains at "normal" levels (i.e., for $e \leq \overline{e}_3$). Nevertheless, whenever interbloc trade activity becomes "extreme" (i.e., for $e > \overline{e}_3$), the employment of "special" protection, such as safeguards, is required in equilibrium so that the soaring volume of interbloc trade is somewhat moderated and therefore, defection is prevented.

4 Phase II

We now turn to phase II. Phase II is the transition phase of our game, during which the countries trade normally with each other, but at the same time there are FTA talks in progress between, on the one hand, countries X and Y, and on the other hand, countries W and Z.

4.1 Phase-II Static Game

To characterize the static Nash equilibrium for phase II, let us once again focus on country X. Its equilibrium domestic prices, market-clearing import volumes, and national welfare now, respectively, equal:

$$P_X^X\left(\overrightarrow{\tau}_X\right) = \frac{\alpha-1}{\beta} - \frac{1}{4}\sum_{-x}\tau_X^{-x}, \tag{17}$$

$$P_{-x}^X\left(\overrightarrow{\tau}_{-x}\right) = \frac{\alpha-1}{\beta} - \frac{1}{4}\sum_{j\neq X,-x}\tau_{-x}^j + \frac{3}{4}\tau_{-x}^X, \tag{18}$$

$$M_{-x}^X\left(e, \overrightarrow{\tau}_{-x}\right) = e + \frac{\beta}{4}\sum_{j\neq X,-x}\tau_{-x}^j - \frac{3\beta}{4}\tau_{-x}^X, \text{ and} \tag{19}$$

$$\begin{aligned} W_2^X\left(e, \overrightarrow{\tau}_Y, \overrightarrow{\tau}_W, \overrightarrow{\tau}_Z, \overrightarrow{\tau}_X\right) = & \sum_i \int_{P_i^X\left(\overrightarrow{\tau}_i\right)}^{\frac{\alpha}{\beta}} C\left(P\right)dP + \int_0^{P_X^X\left(\overrightarrow{\tau}_X\right)} \left(1+3e\right)dP \\ & + \sum_{-x}\int_0^{P_{-x}^X\left(\overrightarrow{\tau}_{-x}\right)} \left(1-e\right)dP + \sum_{-x}\tau_{-x}^X M_{-x}^X\left(e, \overrightarrow{\tau}_{-x}\right), \end{aligned} \tag{20}$$

where $i, j \in \{X, Y, W, Z\}$.

Our next step is to derive country X's best-response tariffs. Setting $\frac{\partial W_2^X(\cdot)}{\partial \tau_{-x}^X} = 0$ and solving for τ_{-x}^X, we get:

$$\tau_{-x}^{X^R}\left(e, \sum_{j\neq X,-x}\tau_{-x}^j\right) = \frac{4e}{15\beta} + \frac{1}{15}\sum_{j\neq X,-x}\tau_{-x}^j. \tag{21}$$

Finally, using (21) and exploiting symmetry, we readily obtain the phase-II static Nash tariff:

$$\tau_2^N\left(e\right) = \frac{4e}{13\beta} \;\left(> \tau_3^N\left(e\right) \text{ for } e \in (0,1]\,\right). \tag{22}$$

4.2 Phase-II Dynamic Game

We next look for the most cooperative tariff function that can be supported in the transition phase of our game given $\widehat{\tau_3^c}\left(e\right)$. To this end, we first examine the static incentive a country has to defect from the cooperative path while in phase II. Let us fix both e and a cooperative tariff level $\tau_2^c < \tau_2^N(e)$. The static benefits from cheating may then be represented as:

$$\Omega_2(e, \tau_2^c) \equiv W_2\left(e, \overrightarrow{\tau}_2^D, \overrightarrow{\tau}_2^D, \overrightarrow{\tau}_2^D, \overrightarrow{\tau}_2^c\right) - W_2\left(e, \overrightarrow{\tau}_2^c, \overrightarrow{\tau}_2^c, \overrightarrow{\tau}_2^c, \overrightarrow{\tau}_2^c\right), \tag{23}$$

where $\overrightarrow{\tau}_2^D \equiv \left(\tau_2^D(e, \tau_2^c), \tau_2^c, \tau_2^c\right)$, $\overrightarrow{\tau}_2^c \equiv (\tau_2^c, \tau_2^c, \tau_2^c)$, and from (21):

$$\tau_2^D(e, \tau_2^c) = \frac{4e}{15\beta} + \frac{2}{15}\tau_2^c. \tag{24}$$

Using the envelope theorem, it is trivial to demonstrate that $\Omega_2(e, \tau_2^c)$ is strictly increasing in e and strictly decreasing in τ_2^c if and only if $\tau_2^c < \frac{4e}{13\beta} = \tau_2^N(e)$.

On the other hand, the discounted expected future welfare loss for a country that violates multilateral cooperation today equals:

$$\begin{aligned}
&\delta \sum_{r=1}^{\infty} \lambda (1-\lambda)^{r-1} \left\{ \sum_{q=1}^{r-1} \delta^{q-1} \left[EW_2\left(e, \overrightarrow{\tau}_2^c(e), ..., \overrightarrow{\tau}_2^c(e)\right) - EW_2\left(e, \overrightarrow{\tau}_2^N(e), ..., \overrightarrow{\tau}_2^N(e)\right) \right] \right.\\
&\qquad \left. + \sum_{k=r}^{\infty} \delta^{k-1} \left[EW_3\left(e, \overrightarrow{\widehat{\tau}_3^c}(e), ..., \overrightarrow{\widehat{\tau}_3^c}(e)\right) - EW_3\left(e, \overrightarrow{\tau}_3^N(e), ..., \overrightarrow{\tau}_3^N(e)\right) \right] \right\} \\
&= \frac{(1-\lambda)\delta}{1-(1-\lambda)\delta} \left\{ \frac{6}{169\beta} \left[Var(e) + (E(e))^2 \right] - \frac{3\beta}{8} \left[Var(\tau_2^c(e)) + (E(\tau_2^c(e)))^2 \right] \right\} \\
&\qquad + \frac{\lambda}{1-(1-\lambda)\delta} \omega^{III} \equiv \omega_2(\tau_2^c(\cdot)),
\end{aligned} \tag{25}$$

where $\overrightarrow{\tau}_2^c(e) \equiv (\tau_2^c(e), \tau_2^c(e), \tau_2^c(e))$, $\overrightarrow{\tau}_2^N(e) \equiv \left(\tau_2^N(e), \tau_2^N(e), \tau_2^N(e)\right)$, $\overrightarrow{\widehat{\tau}_3^c}(e) \equiv \left(\widehat{\tau}_3^c(e), \widehat{\tau}_3^c(e)\right)$, r indexes the date at which phase III will begin, with $r = 1$ signifying that phase III will start in one period's time, and where q and k correspond to periods within phases II and III, respectively.[9] Clearly, the function $\omega_2(\tau_2^c(\cdot))$ is symmetrically similar to $\omega_3(\tau_3^c(\cdot))$.

[9] We assume: $\sum_{q=1}^{0} \delta^{q-1}[...] \equiv 0$.

The phase-II no-defect condition is then given by the following inequality:

$$\Omega_2 \left(e, \tau_2^c \left(e\right)\right) \leq \omega_2 \left(\tau_2^c \left(\cdot\right)\right), \forall e. \tag{26}$$

The above condition simply states that a cooperative tariff function $\tau_2^c(e)$ can be sustained as an equilibrium in phase II as long as for all countries and for any e, defection to $\tau_2^D(e, \tau_2^c(e))$ and thereafter noncooperative Nash play is welfare inferior to the implementation at first of strategy $\tau_2^c(e)$, and once the final phase is reached, of strategy $\widehat{\tau_3^c}(e)$.

To obtain the most cooperative tariff function that satisfies (26), we adopt the same two-step solution approach as above. Since $\widehat{\tau_2^c}(e)$ is derived in a similar fashion as $\widehat{\tau_3^c}(e)$, the details are relegated to a technical appendix available from the authors upon request. The next lemma summarizes our findings.

Lemma 2 *The phase-II most cooperative equilibrium tariff function equals:*

$$\widehat{\tau_2^c}(e) = \begin{cases} 0, & if \quad e \in [0, \overline{e}_2] \\ \frac{4(e-\overline{e}_2)}{13\beta}, & if \quad e \in (\overline{e}_2, 1] \end{cases}, \tag{27}$$

where:

$$\overline{e}_2 = \sqrt{10\beta\omega^{II}}, \tag{28}$$

with $\omega^{II} \in \left(0, \frac{1}{10\beta}\right)$ *being the unique fixed point of:*

$$\widetilde{\omega}_2(\overline{\omega}_2) = \begin{cases} \frac{(1-\lambda)\delta}{1-(1-\lambda)\delta} \frac{F(10\beta\overline{\omega}_2)}{169\beta} + \frac{\lambda}{1-(1-\lambda)\delta}\omega^{III}, & if \quad \overline{\omega}_2 \in \left[0, \frac{1}{10\beta}\right] \\ \frac{(1-\lambda)\delta}{1-(1-\lambda)\delta} \frac{2}{169\beta} + \frac{\lambda}{1-(1-\lambda)\delta}\omega^{III}, & if \quad \overline{\omega}_2 > \frac{1}{10\beta} \end{cases}, \tag{29}$$

where F *is given by (13).*

With the most cooperative equilibrium tariff function for phase II determined, we now compare ω^{II} with ω^{III}.

Lemma 3 $\omega^{II} < \omega^{III}$.

An immediate corollary of Lemma 3 along with (15) and (28) is that:

Corollary 1 $\overline{e}_2 < \overline{e}_3$.

Using (14), (27), and Corollary 1, we may therefore conclude that:

Proposition 1 $\widehat{\tau_2^c}(e) = \widehat{\tau_3^c}(e) = 0$ *for* $e \in [0, \overline{e}_2]$*; and* $\widehat{\tau_2^c}(e) > \widehat{\tau_3^c}(e)$ *for* $e \in (\overline{e}_2, 1]$.

To gain some insight into Proposition 1, recall that once the FTAs are formed, trade diversion takes place (i.e., FTA partners trade less than previously with nonpartner countries).[10] It follows that for a given cooperative tariff function, the static incentive to cheat (in order to (i) provide extra protection to the domestic import-competing producers; and (ii) collect additional tariff revenue) is stronger in phase II than in phase III. As a result, in the transition phase of our game, a higher level of protection is required *on average* relatively to the final phase so that the incentive to defect is kept under control and thus, multilateral cooperation is not threatened. Nevertheless, the difference between the two phases is only felt for realizations of $e > \overline{e}_2$. For values of $e \leq \overline{e}_2$, the equilibrium trade policy in phase II is identical to the phase-III one: zero protection. Intuitively, for such "low" realizations of e, the static incentive to cheat in phase II, while stronger than in phase III, is still rather weak. In other words, Proposition 1 demonstrates that *targeted* enforcement is optimal.

At a more general level, our findings reveal that as soon as the bilateral trade talks are successfully concluded and the FTAs are established, a less protectionist multilateral

[10] Observe that our definition of "trade diversion" here and throughout the paper abstracts from any efficiency considerations and is, therefore, somewhat different from the standard definition due to Viner (1950).

trading environment emerges. More specifically, the employment of "special" protection, such as safeguards or anti-dumping duties, decreases. At the same time, MFN tariffs (i.e., "normal" protection) remain low, unchanged for the most part from the transition phase.

Consider finally Lemma 3. This lemma states that the expected discounted equilibrium value of future cooperation from a phase-III perspective (i.e., ω^{III}) strictly exceeds the one as viewed from phase II (i.e., ω^{II}). Intuitively, two offsetting forces are at work here. First, once the countries pass from phase II to phase III, the multilateral trading environment becomes more liberal, raising the value of cooperation. Second, the implementation of the FTAs results in trade diversion, which acts to diminish the gains from cooperation in phase III. It turns out that the former force dominates. Noting that ω^{II} is a weighted average of the phase-II and phase-III expected per-period equilibrium gains from cooperation whereas ω^{III} is just a function of the latter (see equations (11) and (25)), we must then have that $\omega^{III} > \omega^{II}$.

5 Phase I

Last, we come to phase I. During the initial phase of our game, the countries trade normally with each other; at the same time, there are FTA negotiations on the horizon. We proceed directly with the characterization of the dynamic game since the phase-I static game is identical to the phase-II one, implying $\tau_1^N(e) = \frac{4e}{13\beta} = \tau_2^N(e)$.

5.1 Phase-I Dynamic Game

We now derive the most cooperative equilibrium tariff function for the initial phase of our game, using our solutions for $\widehat{\tau_2^c}(e)$ and $\widehat{\tau_3^c}(e)$. Let us first determine the expected discounted value of future cooperation from a phase-I perspective, i.e., $\omega_1\left(\tau_1^c(\cdot)\right)$:

$$\delta\sum_{s=1}^{\infty}\rho\left(1-\rho\right)^{s-1}\left\{\sum_{t=1}^{s-1}\delta^{t-1}\left[EW_1\left(e,\overrightarrow{\tau}_1^c(e),...,\overrightarrow{\tau}_1^c(e)\right)-EW_1\left(e,\overrightarrow{\tau}_1^N(e),...,\overrightarrow{\tau}_1^N(e)\right)\right]\right.$$

$$\left.+\delta^{s-1}\left(\left[EW_2\left(e,\overrightarrow{\widehat{\tau_2^c}}(e),...,\overrightarrow{\widehat{\tau_2^c}}(e)\right)-EW_2\left(e,\overrightarrow{\tau}_2^N(e),...,\overrightarrow{\tau}_2^N(e)\right)\right]+\omega_2\left(\widehat{\tau_2^c}(\cdot)\right)\right)\right\}$$

$$=\frac{(1-\rho)\,\delta}{1-(1-\rho)\,\delta}\left\{\frac{6}{169\beta}\left[Var(e)+(E(e))^2\right]-\frac{3\beta}{8}\left[Var\left(\tau_1^c(e)\right)+\left(E\left(\tau_1^c(e)\right)\right)^2\right]\right\}$$

$$+\frac{\rho}{1-(1-\rho)\,\delta}\frac{\omega^{II}-\lambda\omega^{III}}{1-\lambda}\equiv\omega_1\left(\tau_1^c(\cdot)\right), \quad (30)$$

where $\overrightarrow{\tau}_1^c(e)\equiv\left(\tau_1^c(e),\tau_1^c(e),\tau_1^c(e)\right)$, $\overrightarrow{\tau}_1^N(e)\equiv\left(\tau_1^N(e),\tau_1^N(e),\tau_1^N(e)\right)$, $\overrightarrow{\widehat{\tau_2^c}}(e)\equiv\left(\widehat{\tau_2^c}(e),\widehat{\tau_2^c}(e),\widehat{\tau_2^c}(e)\right)$, s indexes the date at which phase II will begin, with $s=1$ denoting that phase II will commence in one period's time, and where t refers to periods within phase I. Regarding the phase-I per-country static incentive to cheat, Ω_1, it is obvious that given a trade shock and a cooperative tariff level, it equals Ω_2, since phases I and II are characterized by identical trading patterns.

The phase-I most cooperative equilibrium tariff function, $\widehat{\tau_1^c}(e)$, can then be readily obtained using the same two-step solution approach as before. Once again, the details are relegated to the technical appendix. The following lemma summarizes our results.

Lemma 4 *The phase-I most cooperative equilibrium tariff function equals:*

$$\widehat{\tau_1^c}(e)=\begin{cases}0, & if \quad e\in[0,\overline{e}_1]\\ \frac{4(e-\overline{e}_1)}{13\beta}, & if \quad e\in(\overline{e}_1,1]\end{cases}, \quad (31)$$

where:

$$\overline{e}_1=\sqrt{10\beta\omega^I}, \quad (32)$$

with $\omega^I \in \left(0, \frac{1}{10\beta}\right)$ *being the unique fixed point of:*

$$\widetilde{\omega}_1\left(\overline{\omega}_1\right) = \begin{cases} \frac{(1-\rho)\delta}{1-(1-\rho)\delta}\frac{F(10\beta\overline{\omega}_1)}{169\beta} + \frac{\rho}{1-(1-\rho)\delta}\frac{\omega^{II}-\lambda\omega^{III}}{1-\lambda}, & if \quad \overline{\omega}_1 \in \left[0, \frac{1}{10\beta}\right] \\ \frac{(1-\rho)\delta}{1-(1-\rho)\delta}\frac{2}{169\beta} + \frac{\rho}{1-(1-\rho)\delta}\frac{\omega^{II}-\lambda\omega^{III}}{1-\lambda}, & if \quad \overline{\omega}_1 > \frac{1}{10\beta} \end{cases}, \tag{33}$$

where F *is given by (13).*

Next, we compare ω^I with ω^{II}:

Lemma 5 $\omega^I < \omega^{II}$.

An immediate corollary of Lemmas 3 and 5 is that:

Corollary 2 $\omega^I < \omega^{III}$.

Using (28), (32), Lemma 5, and Corollary 1, we can now compare $\overline{e}_1$ with $\overline{e}_2$ and $\overline{e}_3$:

Corollary 3 $\overline{e}_1 < \overline{e}_2 < \overline{e}_3$.

Finally, using (27), (31), Corollary 3, and Proposition 1, we may conclude that:

Proposition 2 $\widehat{\tau_1^c}(e) = \widehat{\tau_2^c}(e) = \widehat{\tau_3^c}(e) = 0$ *for* $e \in [0, \overline{e}_1]$*;* $\widehat{\tau_1^c}(e) > \widehat{\tau_2^c}(e) = \widehat{\tau_3^c}(e) = 0$ *for* $e \in (\overline{e}_1, \overline{e}_2]$*; and* $\widehat{\tau_1^c}(e) > \widehat{\tau_2^c}(e) > \widehat{\tau_3^c}(e)$ *for* $e \in (\overline{e}_2, 1]$.

Figure 1 in Appendix A depicts the phase-I, phase-II, and phase-III most cooperative equilibrium tariff functions for $\delta \in \left(0, \frac{49}{59}\right)$, $\rho \in (0,1)$, and $\lambda \in (0,1)$.

To obtain some intuition for our results, consider first why a more liberal multilateral trading environment can be sustained as soon as the countries pass from the initial phase of our game to the transition phase. Note that the only difference between phases I and II is that once the bilateral trade negotiations get underway, the establishment of the FTAs draws closer. Recalling that the final phase is characterized by elevated expected per-period equilibrium gains from cooperation, it then follows that for a given cooperative tariff function, the expected discounted value of future cooperation from a phase-II standpoint (i.e., ω_2) strictly exceeds the one as viewed from phase I (i.e., ω_1). On the other hand, the static incentive to cheat is equally strong in both phases, since the FTA talks have no effect on the prevailing trading patterns. Therefore, in comparison with the initial phase, a lower level of protection can be supported *on average* in the transition phase. Observe though that the equilibrium protection level is higher in phase I only for realizations of $e > \overline{e}_1$, which reaffirms the optimality of *targeted* enforcement. More generally, our findings reveal that as soon as the countries enter into bilateral FTA discussions, trade cooperation at the multilateral level is enhanced. In particular, the countries now employ "special" protection on a more moderate scale in terms of both magnitude and frequency, while MFN tariffs remain low, largely unchanged from the initial phase.

Consider next why a more protectionist trading environment is required in phase I relatively to phase III. Intuitively, this is the case for two reasons. First, the incentive to defect is weaker in phase III than in phase I due to the trade diversion the former phase entails. Second, the relatively restrictive transition-phase equilibrium trade policies have a moderating effect on the expected cost of a future trade war as viewed from the initial phase of our game.

Finally, consider Lemma 5. This lemma states that the expected discounted equilibrium value of future cooperation from a phase-I perspective (i.e., ω^I) is lower than the one as viewed from phase II (i.e., ω^{II}). Here, two reinforcing forces are at work. First, once the countries pass from phase I to phase II, the multilateral trading environment becomes less protectionist, which acts to increase the per-period gains from cooperation. Second, the high final-phase expected per-period equilibrium gains from cooperation receive a larger weight in the derivation of ω^{II} than of ω^{I} (see equations (25) and (30)).

6 Conclusion

This paper has examined the impact of regional FTAs on the ability of countries to multilaterally cooperate in the use of both "normal" and "special" trade protection. Our analysis has rested on the assumptions that (i) countries are limited to cooperative multilateral agreements that are self-enforcing; and (ii) the economic environment is characterized by trade-flow volatility. We have demonstrated that the parallel formation of different FTAs leads to a gradual but permanent easing of multilateral trade tensions. In particular, we have shown that the emergence of the FTAs will be accompanied by a decline in global anti-dumping, safeguard, and/or countervailing activity, but will have less significant implications for MFN tariffs.

In concluding, a few final remarks are in order. Our results have been obtained for expositional simplicity within the context of a perfectly symmetric framework. Nevertheless, our basic findings would be preserved under alternative, asymmetric specifications. For instance, suppose it were only politically feasible for countries X and Y to negotiate and implement an FTA agreement. Clearly, our main results would carry through since trade diversion would still take place, even if to a lesser extent, enhancing countries' ability to multilaterally cooperate. Similarly, asymmetry between the FTAs would not alter our predictions in any fundamental way. To see this, recall that in the case of FTA agreements, member countries set their tariffs with respect to nonmember states independently, and therefore, market-power effects are absent.

Furthermore, it is important to emphasize that the inclusion of domestic political-economy pressures into our model would not affect qualitatively our basic results. For example, suppose the governments attached additional weight to the surplus of import-competing producers in their objective function. In this case, the main difference would be that the fully cooperative equilibrium would no longer involve zero trade protection (for $e \in [0, 1)$). Nonetheless, from any country's unilateral perspective, the fully cooperative policy for any given e, constrained to maximize countries' *joint* welfare, would still entail a suboptimal level of protection. Hence, our main findings would remain unaffected. In particular, in any phase of the game, for "extreme" import levels, an increase in trade protection above its fully cooperative level would be required to mitigate countries' heightened incentive to defect and avoid a breakdown in multilateral cooperation. Moreover, FTA formation would weaken countries' static incentive to cheat by curbing the flow of interbloc trade, permitting a reduction in trade barriers, especially with regard to the use of "special" protection. Thus, while the model we have chosen is special in a number of ways, the insights it generates appear to be much more general.

We should stress, though, that our findings are specific to FTA agreements. In Tabakis (2010), we restrict our attention to customs-union formation, where market-power effects are also present (unlike under the FTA scenario), and address a related question. In particular, we explore the implications of customs unions for both "normal" and "special" trade protection. The predictions we obtain there are qualitatively different in two major ways. First, the comparison between the phase-I, phase-II, and phase-III most cooperative equilibria is less clear-cut in the customs-union-formation game than here, as it hinges critically, in most cases, on the hazard rates characterizing the transition process between the three phases. Second, customs unions are shown to be less beneficial for multilateral trade cooperation than FTAs. More specifically, we find that in comparison with the pre-customs-union world, the employment of "special" protection in equilibrium in the post-customs-union world *might* be less frequent overall, but is *more severe* for "high" import volumes (see Figures 1–5 in Tabakis, 2010).

Appendix A

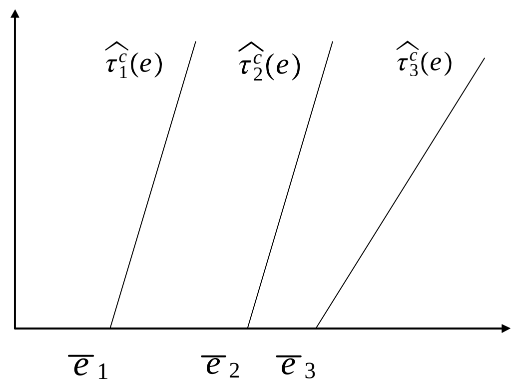

Figure 1: Phase-I, Phase-II, and Phase-III Most Cooperative Equilibria

Appendix B

Proof of Lemma 1

Let us begin by fixing ω_3 at $\overline{\omega}_3 \geq 0$. Solving for the lowest, nonnegative τ_3^c satisfying $\Omega_3\left(e, \tau_3^c\right) \leq \overline{\omega}_3$, we obtain:

$$\tau_3^c\left(e, \overline{\omega}_3\right) = \begin{cases} 0, & if \quad e \in [0, \widetilde{e}_3] \\ \frac{2(e-\widetilde{e}_3)}{7\beta}, & if \quad e \in (\widetilde{e}_3, 1] \end{cases}, \tag{34}$$

where:

$$\widetilde{e}_3 = \sqrt{15\beta\overline{\omega}_3}. \tag{35}$$

$\tau_3^c\left(e, \overline{\omega}_3\right)$ is the phase-III most cooperative equilibrium tariff function given $\overline{\omega}_3$. Next, we relax the assumption of an exogenously given ω_3. Using equations (11), (34), and

(35), we compute $\omega_3\left(\tau_3^c\left(e,\overline{\omega}_3\right)\right) \equiv \widetilde{\omega}_3\left(\overline{\omega}_3\right)$. Straightforward algebra reveals that $\widetilde{\omega}_3\left(\overline{\omega}_3\right) = \frac{\delta}{1-\delta}\frac{F(15\beta\overline{\omega}_3)}{147\beta}$ if $\overline{\omega}_3 \in \left[0, \frac{1}{15\beta}\right]$. For $\overline{\omega}_3 > \frac{1}{15\beta}$ on the other hand, $\widetilde{\omega}_3\left(\overline{\omega}_3\right) = \widetilde{\omega}_3\left(\frac{1}{15\beta}\right) = \frac{\delta}{1-\delta}\frac{2}{147\beta}$. We finally show that there exists a unique $\overline{\omega}_3^\star > 0$ such that $\widetilde{\omega}_3\left(\overline{\omega}_3^\star\right) = \overline{\omega}_3^\star$, where $\overline{\omega}_3^\star < \frac{1}{15\beta}$. It is direct to verify that $\widetilde{\omega}_3(0) = 0$, $\widetilde{\omega}_3'(0) = +\infty$, $\widetilde{\omega}_3'\left(\frac{1}{15\beta}\right) = 0$, and for all $\overline{\omega}_3 \in \left[0, \frac{1}{15\beta}\right]$: $\widetilde{\omega}_3'\left(\overline{\omega}_3\right) \geq 0$ and $\widetilde{\omega}_3''\left(\overline{\omega}_3\right) \leq 0$, with equalities only holding at $\overline{\omega}_3 = \frac{1}{15\beta}$. Thus, iff $\widetilde{\omega}_3\left(\frac{1}{15\beta}\right) < \frac{1}{15\beta} \Leftrightarrow \delta < \frac{49}{59}$, $\widetilde{\omega}_3\left(\overline{\omega}_3\right)$ admits a unique interior fixed point $\overline{\omega}_3^\star \equiv \omega^{III}$, where $\omega^{III} < \frac{1}{15\beta}$. Given that $\delta \in \left(0, \frac{49}{59}\right)$ by assumption, the lemma follows. Q.E.D.

Proof of Lemma 3

Recall that $\widetilde{\omega}_2\left(\overline{\omega}_2\right)$ has a unique fixed point $0 < \omega^{II} < \frac{1}{10\beta}$. Define now $\psi\left(\overline{\omega}_2\right) \equiv \widetilde{\omega}_2\left(\overline{\omega}_2\right) - \overline{\omega}_2$. Observe that $\psi\left(\overline{\omega}_2\right)$ is continuous and that $\psi(0) = \widetilde{\omega}_2(0) - 0 = \frac{\lambda}{1-(1-\lambda)\delta}\omega^{III} > 0$. It then follows that if $\psi\left(\omega^{III}\right) = \widetilde{\omega}_2\left(\omega^{III}\right) - \omega^{III} < 0$, $\psi\left(\overline{\omega}_2\right)$ must be equal to zero somewhere on $\left(0, \omega^{III}\right)$, implying that $\omega^{II} < \omega^{III}$. Therefore, to prove the lemma, it suffices to show that:

$$\widetilde{\omega}_2\left(\omega^{III}\right) < \omega^{III} \Longleftrightarrow \frac{(1-\lambda)\,\delta}{1-(1-\lambda)\,\delta}\frac{F\left(10\beta\omega^{III}\right)}{169\beta} + \frac{\lambda}{1-(1-\lambda)\,\delta}\omega^{III} < \omega^{III}$$
$$\Longleftrightarrow \frac{(1-\lambda)\,\delta}{1-(1-\lambda)\,\delta}\frac{F\left(10\beta\omega^{III}\right)}{169\beta} < \frac{(1-\lambda)(1-\delta)}{1-(1-\lambda)\,\delta}\omega^{III} \Longleftrightarrow F\left(10\beta\omega^{III}\right) < \frac{169\beta\omega^{III}}{\frac{\delta}{1-\delta}}.$$

$F(x)$ is a strictly increasing function ($\forall x \neq 1$), thus, $F\left(10\beta\omega^{III}\right) < F(15\beta\omega^{III}) = \frac{147\beta\omega^{III}}{\frac{\delta}{1-\delta}} < \frac{169\beta\omega^{III}}{\frac{\delta}{1-\delta}}$, where the equality follows from Lemma 1. Q.E.D.

Proof of Lemma 5

Recall that the function $\widetilde{\omega}_1$ has a unique fixed point $\omega^I \in \left(0, \frac{1}{10\beta}\right)$. Define now $\chi\left(\overline{\omega}_1\right) \equiv \widetilde{\omega}_1\left(\overline{\omega}_1\right) - \overline{\omega}_1$. Clearly, $\chi\left(\overline{\omega}_1\right)$ is a continuous function. In addition, we have that $\chi(0) =$

$\widetilde{\omega}_1(0) - 0 = \frac{\rho}{1-(1-\rho)\delta}\frac{\omega^{II}-\lambda\omega^{III}}{1-\lambda} = \frac{\rho}{[1-(1-\rho)\delta](1-\lambda)}\left[\frac{(1-\lambda)\delta}{1-(1-\lambda)\delta}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} + \frac{\lambda(1-\lambda)\delta}{1-(1-\lambda)\delta}\omega^{III}\right] > 0$. Hence, if $\chi\left(\omega^{II}\right) = \widetilde{\omega}_1\left(\omega^{II}\right) - \omega^{II} < 0$, $\chi(\overline{\omega}_1)$ must be equal to zero somewhere on $\left(0, \omega^{II}\right)$, implying that $\omega^I < \omega^{II}$. Thus, to prove the lemma, it suffices to show that:

$$\begin{aligned}
\widetilde{\omega}_1\left(\omega^{II}\right) < \omega^{II} \iff & \frac{(1-\rho)\delta}{1-(1-\rho)\delta}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} + \frac{\rho}{1-(1-\rho)\delta}\frac{\omega^{II}-\lambda\omega^{III}}{1-\lambda} < \omega^{II} \\
\iff & \frac{\rho}{[1-(1-\rho)\delta](1-\lambda)}\left[\frac{(1-\lambda)\delta}{1-(1-\lambda)\delta}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} + \frac{\lambda(1-\lambda)\delta}{1-(1-\lambda)\delta}\omega^{III}\right] \\
& + \frac{(1-\rho)\delta}{1-(1-\rho)\delta}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} < \frac{(1-\lambda)\delta}{1-(1-\lambda)\delta}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} + \frac{\lambda}{1-(1-\lambda)\delta}\omega^{III} \\
\iff & \frac{\lambda\delta}{[1-(1-\rho)\delta][1-(1-\lambda)\delta]}\frac{F\left(10\beta\omega^{II}\right)}{169\beta} + \frac{\delta-1}{1-(1-\rho)\delta}\frac{\lambda}{1-(1-\lambda)\delta}\omega^{III} < 0 \\
\iff & \frac{\lambda\delta}{[1-(1-\rho)\delta][1-(1-\lambda)\delta]}\left[\frac{F\left(10\beta\omega^{II}\right)}{169\beta} - \frac{F\left(15\beta\omega^{III}\right)}{147\beta}\right] < 0,
\end{aligned}$$

where the second "$\iff$" uses Lemma 2, while the fourth one uses Lemma 1. The first term of the product above is positive, whereas the second one is negative since: $F(x)$ is a strictly increasing function ($\forall x \neq 1$), and from Lemma 3, $\omega^{II} < \omega^{III}$. Q.E.D.

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