Lobbying, multisector trade, and sustain-ability of free-trade agreements

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Abstract. This paper is concerned with the sustainability of free-trade agreements (FTA). FTA sustainability is influenced by governments' valuations of political contributions, discount factors, the lobbying position of the specific-interest groups in the intra-industry trade sectors, and the sectoral coverage of the FTA. I find that (i) under certain conditions, the FTA under protectionist lobbying could be more sustainable than the FTA under no political pressure; (ii) the lobby-supported FTA is more sustainable than the lobby-opposed FTA and the FTA under no political pressure; and (iii) multisector trade enhances FTA sustainability. JEL Classification: F12, F13, F15.

Lobbying, commerce multisectoriel et durabilité des accords de libre échange. Ce mémoire examine la durabilité des arrangements de libre échange (ALE). Celle-ci est influencée par les évaluations par les gouvernements des contributions politiques, les facteurs d'escompte, la position de lobbying des groupes d'intérêt spécifiques dans les secteurs de commerce intra-industriel, et la couverture sectorielle de l'accord de libre échange. L'auteur trouve que (i),sous certaines conditions, l'ALE pourrait être plus durable s'il y a lobbying protectionniste que si pression politique il n'y a pas; (ii) l'ALE supporté par du lobbying est plus durable que l'ALE opposé au lobbying et sans pression de lobbying; et (iii) le commerce multisectoriel améliore la durabilité de l'ALE.

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1. Introduction

Free-trade agreements (FTAs), or free-trade areas, are outcomes of trade policy cooperation between countries. FTAs are often affected by both economic and political factors. Despite political pressures, we have witnessed a proliferation of FTAs, especially in the past decade. Since the inception of the General Agreement on Tariffs and Trade (GATT), there have been more than 240 regional trade agreements (WTO Web site 2003) in force, most of which are FTAs. Moreover, all of them have continued to exist. These observations raise two important questions: Why do countries form FTAs? Why are FTAs sustainable?

Economic analysis of FTAs began half a century ago with Viner's (1950) seminal work on customs unions. Influenced by Viner, economic studies of FTAs have been largely focused on welfare implications. The recent proliferation of FTAs has led to a revival of interest among trade economists. However, recent studies have been focused on FTA formation,[1] whereas less attention has been paid to the sustainability issue.[2] In this paper, we take a political-economy approach to examining FTA sustainability. Thus, our study is linked to two bodies of literature: studies of the political economy of international trade policy and studies on FTAs. With regard to the former, Hillman (1989), Rodrik (1995), and Helpman (1997) have provided excellent surveys.[3]

In their study of the political economy of FTA formation, Grossman and Helpman (1995) find that FTAs are more likely to be formed when there is a sufficient number of potential exporters in each country to lobby for FTAs and when FTAs afford enhanced protection rather than reduced protection to most sectors. In addition, they show that FTAs that exclude some 'politically sensitive' sectors are more likely to be achieved than those covering all sectors because governments can diffuse the opposition to FTAs.

As a complement to Grossman and Helpman's (1995) work, in this paper we explore conditions under which a country will not defect from an *existing* FTA. To this end, we construct a repeated game model with two countries, A and B, and three representative sectors, x, y, and z. Special-interest groups negotiate with their governments on their respective contribution schedules,

1 Grossman and Helpman (1995) examine the implications of political contributions by special-interest groups to FTAs. Maggi and Rodriguez-Clare (1998) offer three reasons for a small country to benefit from FTAs. Bagwell and Staiger (1999) emphasize the importance of and benefit from reciprocity of FTAs. Ethier (2002) views international trade liberalization agreements as a result of the negotiation between governments in a multilateral world.

2 Although Bagwell and Staiger (1990), Riezman (1991), Furusawa (1999), Levy (1999), and Maggi (1999) have analysed self-enforcing trade agreements, they do not deal with FTAs specifically. Moreover, with the exception of Levy (1999), they do not use a political-economy approach in their analysis.

3 They classify studies in this stream of literature into the median-voter approach, the political support function approach, the tariff formation function approach, the electoral competition approach, and, most recently, the political contribution approach.

either for continuous support of the existing FTA or for a switch to trade protection. Each government then decides whether to stay with the FTA or to switch to protection. An FTA is sustainable when and only when both governments stay with it. We show that FTAs subject to protectionist lobbying may be more sustainable than FTAs subject to no lobbying. The reason for this surprising result is that defecting from the FTA in the presence of protectionist lobbying will result in a more severe trade war than defecting from the FTA in the presence of no lobbying.[4]

We also show that FTAs are made more sustainable by their particular nature that they must cover a large number of products, as stipulated in GATT Article XXIV,[5] although this rule is not designed for such a purpose.[6] The basic idea is that although special-interest groups representing different sectors may have different, or even opposite, positions towards an FTA, governments that take an interest in all sectors often find an FTA to be beneficial overall. This result is similar to that of Bernheim and Whinston (1990), who, from the perspective of the industrial-organization literature, have shown that, under many circumstances, multimarket contacts between two firms facilitate collusive behaviour. In our paper, multisector trade enhances FTA sustainability because countries have different incentive constraints for FTAs in different sectors, and the multisector-FTA allows for transfers of credibility from one market to another.

None of the existing political-economy trade papers has analysed the role of multisector trade in facilitating either the formation or the sustainability of FTA. Grossman and Helpman (1995) do not examine the positive side of multisector trade in facilitating FTA formation. Indeed, using their model, one will find that adding more sectors to the economy, but keeping the same proportion of export to import-competing sectors, will not alter the government's incentive to engage in FTA. Bagwell and Staiger (1990, fn. 20) and Maggi (1999, fn. 16) mention multimarket contacts, but find that multisector trade is irrelevant to their models. Levy (1999) deals with this issue more explicitly and effectively, but not in relation to FTAs. Using a numerical example, he finds that the sustainable cooperative tariff in a pair of sectors

4 It is interesting to note that a parallel result has been derived by Richardson (1993) with regard to formation of FTAs. He finds that when the political factor is built in the traditional FTA model and protection is endogenously determined, protection declines after the FTA is formed. As a result, the welfare loss due to trade diversions is reduced and so an FTA is more likely to form in a political economy.

5 GATT Article XXIV 8(b) stipulates that 'A free-trade area shall be understood to mean a group of two or more customs territories in which the duties and other restrictive regulations of commerce. . .are eliminated on *substantially all the trade* between the constituent territories in products originating in such territories' (emphasis added).

6 Grossman and Helpman (1995) show that because GATT does *not* require FTAs to cover *all* trade, governments can exclude some sectors, albeit 'politically sensitive' ones, from FTAs. This makes it less difficult to achieve FTAs. In this sense, Article XXIV facilitates FTA formation. On the contrary, we show that, because the Article requires FTAs to cover *most*, if not all, trade, FTAs are more likely to be sustained.

that are subject to political pressures is higher than the sustainable cooperative tariff in a pair of sectors that are not subject to political pressures. After pooling these sectors together, the sustainable cooperative tariff is between those two tariffs. Hence, multisector trade enhances trade liberalization in some sectors, but it does so by raising tariffs in other sectors.

Our paper has some other interesting features too. First, we explicitly incorporate a sector (z) that is characterized by oligopolistic competition and two-way trade. A particular firm in this industry benefits from the protection of its own country, but loses if the foreign country likewise protects its own firms. Hence, the special-interest group from this industry faces a dilemma of whether to support an FTA or ask for protection.[7] Because this special-interest group may switch from lobbying for an FTA to lobbying for protection, it plays an important role in affecting FTA sustainability.

Second, in modelling the interaction between special-interest groups and governments, Grossman and Helpman (1994) use the common agency approach, in which special-interest groups offer their contribution schedules to incumbent governments in exchange for favourable trade policies. Using this framework, Grossman and Helpman (1995) examine issues related to FTA formation. In contrast, Maggi and Rodriguez-Clare (1998) study trade agreements assuming that the government and the special-interest groups bargain over the amount of contributions. Unlike them, we consider that the government and each lobby *bargain* over the contribution *schedules*. As Helpman (1997) points out, there is no agreed upon theory of domestic politics. It may be more reasonable to assume the Grossman-Helpman type of contribution in some industries in some countries, but the bargaining approach may be more realistic in other industries in other countries.[8]

The rest of this paper is organized as follows. In the next section we present and analyze the benchmark model in which lobbying is absent. In section 3, we introduce lobbying to the benchmark model to analyse the political bargaining game between the governments and various interest groups and to investigate FTA sustainability. In section 4, we examine the role of multisector trade in FTA sustainability. Finally, section 5 concludes the paper.

7 In all existing studies, it is crystal clear whether a given special-interest group lobbies for protection or for free trade (or export subsidy). But in reality, many firms are competing with foreign firms in both the home and foreign markets. As the situation changes, firms may switch their lobbying positions. For example, the U.S. auto makers demanded protection from Japanese cars imports in the 1980s, which resulted in voluntary export restraints. But in the 1990s they supported free trade and asked the U.S. government to put pressure on Japan to open the Japanese market to American cars.

8 There is another important strand of research that also uses the political-economy approach to FTAs. These studies, such as Levy (1997) and Krishna (1998), are concerned with the relationship between regional free trade and multilateral free trade, differing from the concerns of Grossman and Helpman (1995), Maggi and Rodriguez-Clare (1998), and the present paper, which focus on regional FTAs alone.

2. The benchmark model

In this section, we develop and analyse the benchmark model in which there is no lobbying.

2.1. The single-period economic structure and market equilibrium

There are two countries, A and B, and four products (sectors), x,y,z, and the numeraire good, 0. In each country, the representative consumer's utility function takes the following form: $u = q_0 + \Sigma_i u_i(q_i)$, where q_0 is consumption of good 0 and q_i is consumption of good i ($i = x,y,z$). Assume that $u_i(q_i) = v_i q_i - q_i^2/2$, which leads to the linear demand, $p_i = v_i - q_i$.

Production of all goods exhibits constant returns to scale. The numeraire good, 0, is produced using labour only. By choosing units appropriately, the wage rate will be equal to the price of the numeraire good. The aggregate labour supply, S, in each country is assumed to be sufficiently large so that the numeraire good is always produced. Producing non-numeraire goods requires both labour and sector-specific input. Labour is mobile among all sectors within the same country. To have a sharper focus, we assume that while both countries have the specific input to produce good z, A (B) has the specific input to produce good x (y) but no specific input to produce good y (x). Assume oligopolistic competition in z's market. Thus, the following pattern of specialization and trade prevails: country A produces and exports x; country B produces and exports y; there is two-way trade in z. Let $t_i(t_i^*)$ be the specific tariff that A (B) levies on import of good i. Neither of the two countries has an export policy.[9]

We now describe resource endowments and then derive equilibrium in each product market. There are X units of specific input used to produce good x, each owned by one individual. Producing each unit of x requires one unit of labour and one unit of the specific input. The owners are not organized in production and therefore they make production decisions taking price as given. This results in the following supply function: total supply equals X for $p_x \geq 1$, and zero otherwise. Suppose that the demand is sufficiently strong to ensure that p_x is no less than one. Then, the total supply of x, combining A's market and B's market, is X, with the following equilibrium quantity and price in each market:

$$\text{A}: q_x = \frac{X + t_x^*}{2},\ p_x = \frac{2v_x - X - t_x^*}{2};\ \text{and B}: q_x^* = \frac{X - t_x^*}{2},\ p_x^* = \frac{2v_x - X + t_x^*}{2}.$$

Thus, the total rent accrued to all specific-factor owners in this sector is equal to $\pi_x = (2v_x - 2 - X - t_x^*)X/2$.

9 An export policy is not considered by Grossman and Helpman (1995) either. It can be justified by the observation that export subsidies are not allowed by GATT/WTO and export taxes are rarely used in any country. Levy (1999) has shown the importance of excluding the export policy in the Grossman-Helpman (1994) framework.

Sector y in B is the same as sector x in A except that there are Y owners of the specific input. Thus, the equilibrium quantity and price of good y in each country's market are

$$\text{A}: q_y = \frac{Y - t_y}{2},\ p_y = \frac{2v_y - Y + t_y}{2};$$
$$\text{and B}: q_y^* = \frac{Y + t_y}{2},\ p_y^* = \frac{2v_y - Y - t_y}{2}.$$

The tariff revenue collected by A from imports of y is $r_y = t_y(Y - t_y)/2$.

In contrast to sectors x and y, the specific input for z's production is technology, which is owned by one individual (or firm) in each country. With the technology, the production of each unit of z requires one unit of labour. This leads to duopolistic competition in each market and, we assume, quantity competition. Denote $v \equiv (v_z - 1)$. Then, the Cournot-Nash equilibrium in A's market is

$$z_A = \frac{v + t_z}{3},\ z_A^* = \frac{v - 2t_z}{3},\ q_z = \frac{2v - t_z}{3},\ p_z = \frac{v + 3 + t_z}{3},$$

where z_A (z_A^*) is A's (B's) supply in market A, and $q_z \equiv z_A + z_A^*$. Correspondingly, the Cournot-Nash equilibrium in B's market is

$$z_B = \frac{v - 2t_z^*}{3},\ z_B^* = \frac{v + t_z^*}{3},\ q_z^* = \frac{2v - t_z^*}{3},\ p_z^* = \frac{v + 3 + t_z^*}{3}.$$

Moreover, firm z's profit is $\pi_z = z_A^2 + z_B^2$, and A's tariff revenue from this sector is $r_z = t_z z_A^*$.

Let $T = (t_x^*, t_y, t_z, t_z^*)$ be the tariff vector. Then, A's consumer surplus is $CS(T) = (\Sigma_i q_i^2)/2$. The aggregate income of A is equal to $E(T) = S + \pi_x + \pi_z + r_y + r_z$. The social welfare is defined as the sum of the aggregate income and the consumer surplus: $W(T) = E(T) + CS(T)$. Let w_i denote sectoral welfare components excluding labour income. Specifically, $w_x \equiv q_x^2/2 + \pi_x$, $w_y \equiv q_y^2/2 + r_y$ and $w_z \equiv q_z^2/2 + r_z + \pi_z$.

2.2. The single-period FTA

In this subsection, we consider the single-period FTA between countries A and B. This agreement covers *all* goods. In Section 4, we will allow the FTA to exclude some goods in order to examine the role of multisector trade.

If A and B reach an FTA, there will be no tariff levied on any import to either country. Using the result derived in the preceding subsection, we can easily obtain country A's social welfare under free trade as

$$W_F = S + \frac{(8v_x - 8 - 3X)X}{8} + \frac{Y^2}{8} + \frac{4v^2}{9},$$

where subscript F stands for the FTA. If there is no FTA between the two countries, government A will choose t_y and t_z to maximize its country's welfare while government B will choose t_x^* and t_z^* to maximize its country's welfare. Since markets are segmented and sectors are not linked, t_y is chosen to maximize w_y and t_z is chosen to maximize w_z in country A. As a result, the optimal tariffs in country A are

$$t_y^o = \frac{Y}{3} \text{ and } t_z^o = \frac{v}{3}.$$

Similarly, the optimal tariffs in country B are $t_x^{o*} = \frac{X}{3}$ and $t_z^{o*} = \frac{v}{3}$. Consequently, A's welfare is

$$W_N = S + \frac{(9v_x - 9 - 4X)X}{9} + \frac{Y^2}{6} + \frac{65v^2}{162},$$

where subscript N stands for a non-FTA.

Since in this study we are more interested in understanding FTA sustainability than in investigating factors that affect FTA formation, and any FTA requires mutual acceptance, we focus on the symmetric situation where $X = Y = u$. Hence, B's welfare $W_F^* = W_F$ and $W_N^* = W_N$. Then, the welfare difference for each country under the FTA and non-FTA is equal to

$$L \equiv W_F - W_N = \frac{u^2}{36} + \frac{7v^2}{162}. \tag{1}$$

Clearly, both countries agree to establish the FTA.

2.3. FTA sustainability: supergame

Grossman and Helpman (1995) use a single-period model to study incentives to form an FTA. We did this in the preceding subsection. However, to examine the sustainability of an established FTA, we must consider multiple periods. In particular, we will consider an infinitely repeated-period game. Our focus is on the governments' incentives to defect from the FTA.

Let us first discuss the methodology to be used in this paper for an analysis of FTA sustainability. First, suppose that A and B have already implemented the FTA for certain periods of time. If A defects in a period, B does not observe the defection until the next period.[10] Thus, B still follows the free trade rules during the defecting period, but the two countries engage in a tariff war thereafter. Second, FTAs are usually characterized by the 'prisoner's dilemma.' Specifically, both countries prefer FTA over a tariff war, but there is always a

10 Staiger (1995, fn. 39) has pointed out the availability of ample historical and anecdotal evidence about the lengthy delay in observing violations in international trade agreements. Qiu (1995) has particularly investigated the implications of such delay for export subsidization and countervailing duties.

one-time gain from defection. Therefore, to examine FTA sustainability in any given period, we need to compare the gain from defection to the loss due to subsequent reversion to protection. If the gain is no greater than the loss for any country, the FTA is sustainable. Otherwise, it is not. This approach is commonly used in game theory and industrial organization studies to consider cooperation and collusion (e.g., Bernheim and Whinston 1990) and in international trade studies as well to consider trade cooperation (e.g., Bagwell and Staiger 1990).

Using the above methodology, we now examine each government's incentive to deviate from the FTA. First, consider A's one-time gain from defection. When defecting, government A sets tariffs to maximize W, given free trade in B. The optimal tariffs are $Y/3$ on y and $v/3$ on z. The resulting welfare is

$$W_{NF} = S + \frac{(8v_x - 8 - 3X)X}{8} + \frac{Y^2}{6} + \frac{v^2}{2},$$

where subscript NF indicates non-free trade in A but free trade in B. Thus, the one-time gain from defecting is (recalling $X = Y = u$)

$$V \equiv W_{NF} - W_F = \frac{u^2}{24} + \frac{v^2}{18}. \tag{2}$$

Country A gains by applying its optimal tariffs on imports of goods y and z while country B is still practising free trade.

Second, country A's loss in each of the subsequent periods is equal to L as given in (1).

We are now ready to weigh the temptation of defecting against future punishment. Let $\delta \in (0,1)$ denote government A's discount factor (correspondingly, government B's discount factor is δ^*). Define government A's *defection incentive*, denoted by DI, as the one-time gain from defection minus the present value of future loss due to reversion to a tariff war:

$$DI \equiv V - \left(\frac{\delta}{1-\delta}\right)L = \left(\frac{u^2}{24} + \frac{v^2}{18}\right) - \left(\frac{\delta}{1-\delta}\right)\left(\frac{u^2}{36} + \frac{7v^2}{162}\right). \tag{3}$$

It is clear that the defection incentive is larger when the government discounts the future more (δ is smaller). Again, to focus on the political factor and multisector factor, we assume $\delta^* = \delta$. Hence, country B has the same defection incentive as country A has and the FTA is sustainable if and only if $DI \leq 0$.

3. Lobbying and FTA sustainability

In this section, we introduce lobbying into the benchmark model in order to see how lobbying affects FTA sustainability.

3.1. The single-period political game: protectionist lobbying

Let us first describe the political game in country A. That in country B follows the same structure. We will focus our analysis and discussion on country A to avoid repetition for country B.

In A, all specific-factor owners in sector x have a common interest and are therefore organized in lobbying government A to have the FTA. We call them special-interest group x or the x-lobby. However, the owner of the technology in sector z, called the z-lobby, may lobby for the FTA or for protection.[11] Lobbying takes the form of political contributions. In general, contributions made by the i-lobby (i = x, z), denoted $c_i(T)$, are a function of all trade policies, T.[12] Each lobby seeks to maximize the net returns. Government A also has some bargaining power vis-à-vis each lobby. We use Nash bargaining to model the interaction between government A and each lobby, with $\alpha_i \in (0,1)$ and $1-\alpha_i$ representing the government's and the i-lobby's bargaining power, respectively. Correspondingly, we let α_i^* represent government B's bargaining power over the i*-lobby (i* = y*, z*).

Following Grossman and Helpman (1994), government A's objective function is a weighted average of social welfare and lobbying contributions: $G(T) = W(T) + \lambda \Sigma_i c_i(T)$, where $\lambda \geq 0$ is the government's relative weight put on political contributions. One can write government B's objective function with its weight as λ^*, but we omit it here for succinctness.

As shown in subsection 2.1, in the absence of lobbying, both governments prefer the FTA to a tariff war in a single period. However, the z-lobby in country A may lobby its government not to have the FTA. As may the z*-lobby in country B. This is protectionist lobbying. In this and the next subsections, we analyse FTA sustainability in the presence of protectionist lobbying. Note that in country A, the x-lobby always likes the FTA and the z-lobby may also prefer the FTA over a trade war. If the x-lobby and z-lobby in country A and the y*-lobby and z*-lobby in country B all lobby for the FTA, we call this case pro-FTA lobbying. We will examine the FTA sustainability in the presence of pro-FTA lobbying in subsections 3.3 and 3.4.

11 As usual, we assume that consumers are not organized, and so they cannot lobby. Although the Grossman-Helpman (1994) approach is the first in the political-economy trade literature to provide microfoundations for the behaviour of organized lobbies and politicians, it sidesteps the important issues about the formation of lobbies. Mitra (1999) extends Grossman and Helpman (1994) by endogenizing lobby formation. However, he considers only the case when all people in the same interest group decide either to form an organized lobby or not to form an organized lobby. The traditional collective action problems are not solved. Hillman (1989, 45–7) presents an interesting discussion, in view of Olson (1965), on various industry factors that affect lobby formation. An interesting question in the content of the present paper is whether it is more difficult to form an organized lobby in sector x or in sector z. Answering such a question, however, is beyond the scope of the present paper. Therefore, we assume that the free-rider problems are solved.

12 Note that the special-interest groups cannot lobby the foreign government, but their contributions can be conditioned on the foreign country's trade policies.

Recall that the markets for good z in A and B are segmented and that the production has constant returns to scale. Thus, the z-lobby's contribution depends on nothing else but t_z and we use $c_z(t_z)$ to represent the lobby's contribution function. Given $c_z(t_z)$, government A chooses t_z to maximize $w_z + \lambda c_z(t_z)$. As a result, the optimal tariff is determined by

$$t_z = [v + \lambda c_z'(t_z)]/3. \tag{4}$$

The z-lobby and government A bargain over $c_z(t_z)$. If the bargaining breaks down, the z-lobby will make no contribution. However, government A may choose a tariff, t_z, to maximize sectoral welfare without political contributions, w_z, or choose the FTA. In the defection period, if the bargaining breaks down, the government will go back to the existing FTA, but in the punishment period it cannot go back to the FTA since government B is no longer willing to cooperate. Let us first examine the latter case. In that case, the optimal tariff on y remains as t_y^o, but the optimal tariff on good z is $t_0 = v/3$. Anticipating that t_0 will be chosen by government A in the case of bargaining breakdown, the z-lobby makes no contribution for $t_z \leq t_0$. Letting ΔF denote the "change of F when tariff increases from t_0 to t_z", then for $t_z > t_0$, the Nash bargaining over $c_z(t_z)$ is represented by

$$\max_{c_z(t_z)} [\Delta w_z + \lambda c_z(t_z)]^{\alpha_z} [\Delta \pi_z - c_z(t_z)]^{1-\alpha_z}, \text{ subject to } c_z(t_z) > 0.$$

The solution is

$$c_z(t_z) = \alpha_z \Delta \pi_z - \frac{1-\alpha_z}{\lambda} \Delta w_z. \tag{5}$$

Note that $\Delta \pi_z > 0$, but $\Delta w_z < 0$. Thus, for all α_z and λ, we have $c_z(t_z) > 0$ for $t_z > t_0$. Lemma 1 below shows some other properties of the political contribution schedule (5).

LEMMA 1. *The political contribution schedule (5) has the following properties: (i)*: $c_z'(t_z) > 0$ *and* $c_z''(t_z) > 0$; *(ii)*: $c_z(t_z)$ *is independent of* t_z^*.

Proof. See appendix A. □

Making use of the equilibrium results obtained in subsection 2.1 to calculate Δw_z and $\Delta \pi_z$ in (5) and then substituting them into (4) yields the optimal tariff:

$$t_z^o = \frac{(6 + 3\alpha_z + 2\alpha_z\lambda)v}{18 + 9\alpha_z - 2\alpha_z\lambda} > t_0, \text{ with } \frac{\partial t_z^o}{\partial \lambda} > 0 \text{ and } \frac{\partial t_z^o}{\partial \alpha_z} > 0. \tag{6}$$

If government A attaches a large weight to political contributions, then it is willing to offer a high tariff in exchange for a large contribution. However, as the tariff reaches $v/2$, the tariff becomes prohibitive. We avoid this extreme

case by assuming that $\lambda < 3/2$, which will ensure that $t_z^o < v/2$ for all $\alpha \in [0,1]$. In fact, the empirical studies by Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) show that $\lambda < 1$ for the United States government.

We next turn to the case when government A will choose the FTA if the bargaining breaks down. Denote this first-stage bargaining solution by $\tilde{c}_z(t_z)$. Compared with the above analysis, the only change is the threat point of the Nash bargaining. As a result, we obtain $t_z = [v + \lambda \tilde{c}_z'(t_z)]/3$. Let $\tilde{\Delta}F$ denote the 'change of F when the tariff increases from 0 (free trade) to t_z, with free trade in country B.' Then the optimal solution becomes

$$\tilde{c}_z(t_z) = \alpha_z \tilde{\Delta}\pi_z - \frac{1-\alpha_z}{\lambda}\tilde{\Delta}w_z, \text{ subject to } \tilde{c}_z(t_z) > 0.$$

Note that the values of π_z and w_z at the threat point affect $\tilde{c}_z(t_z)$, but not $\tilde{c}_z'(t_z)$. Also note that the expression of t_z and that of $\tilde{c}_z(t_z)$ are the same as in the case when t_0 is the threat point. These observations immediately lead to the following result: the optimal tariff in this case is also equal to t_z^o as given in (6), provided $\tilde{c}_z(t_z^o) > 0$. Moreover, $\tilde{c}_z(t_z)$ has all the properties of $c_z(t_z)$ as stated in lemma 1. Finally, it is not difficult to check that $\tilde{c}_z(t_z^o) > 0$ if neither α or λ is very close to zero.[13] We maintain this assumption in the rest of the analysis related to protectionist lobbying.

3.2. FTA sustainability under protectionist lobbying

Facing protectionist lobbying as described in the preceding subsection, the governments with the FTA contemplate whether to stay in the FTA or defect from it. In this subsection, we examine whether protectionist lobbying makes the FTA more or less sustainable.

Consider country A. If government A defects, then, in the defection period, the z-lobby contributes $\tilde{c}_z(t_z^o)$ to government A and the government's value becomes

$$G_{NF} = W_{NF} + g_{NF}, \text{ where } g_{NF} \equiv w_z(t_z^o; t_z^* = 0) + \lambda \tilde{c}_z(t_z^o) - v^2/2.$$

Thus, the one-time gain is: $V^p \equiv G_{NF} - G_F = V + g_{NF}$, where superscript p denotes protection. Note that $w_z(t_z; t_z^* = 0) + \lambda \tilde{c}_z(t_z)$ reaches its maximum at $t_z = t_z^o$ and takes the value $v^2/2$ at $t_z = v/3$. Thus, $g_{NF} > 0$, or $V^p > V$, because of the receipt of political contributions.

We now turn to the loss in each of the subsequent periods. Note that the bargaining threat point is no longer free trade, but t_0. Correspondingly, the z-lobby makes contribution $c_z(t_z^o)$, and the two countries set non-cooperative

13 Since $\tilde{c}_z(t_z)$ increases in t_z, $\tilde{c}_z(t_z) > 0$ iff $t_z > (6 - 6\alpha - 4\alpha\lambda)v/(9 - 9\alpha + 2\alpha\lambda)$. Then, comparing with t_z^o, we have $\tilde{c}_z(t_z^o) > 0$ iff $\Gamma \equiv -54 + 27\alpha(1+\alpha) + 114\alpha\lambda + 4\alpha^2\lambda(3-\lambda) > 0$. Γ increases in both α and λ, $\Gamma < 0$ when α or λ is close to zero, and $\Gamma > 0$ when neither α or λ is too small.

equilibrium tariffs, t_z^o and t_z^{o*}, respectively. As a result, government A's value becomes

$$G_N = W_N + g_N, \text{ where } g_N \equiv w_z(t_z^o; t_z^{o*}) + \lambda c_z(t_z^o) - 65v^2/162.$$

Note that $w_z(v/3,v/3) = 65v^2/162$, the value of w_z in the absence of political pressures. Consequently, every period's loss due to defection is $L^p \equiv G_F - G_N = L - g_N$. Whether the loss is larger or smaller compared with the case of no political contribution hinges on the sign of g_N. There are two factors that determine the comparison. First, country A's exports to country B face higher tariffs when government B is subject to lobbying than when it is not. Hence, country A's loss from defection is greater with the lobby than without. Second, government A receives a contribution with the lobby but none without. However, if government A gives a small weight to political contributions, then this second effect will be dominated by the first effect. In the proof of proposition 1 (appendix B), we confirm that g_N can be either negative or positive, depending on the value of λ.

With the above calculation, we obtain government A's defection incentive under the pressure of protectionist lobbying:

$$DI^p \equiv V^p - \left(\frac{\delta}{1-\delta}\right)L^p = DI + g_{NF} + \left(\frac{\delta}{1-\delta}\right)g_N. \tag{7}$$

Government B's defection incentive can be obtained similarly. Having derived the individual governments' defection incentives, we are now ready to analyse FTA sustainability. Note that the FTA is sustainable if and only if neither government defects. To see how various factors affect the sustainability, let us focus on a more symmetric case when $\alpha_z = \alpha_z^*$ and $\lambda = \lambda^*$. Also, to emphasize the important role of governments' valuations of political contribution and for analytical tractability, we set $\alpha_z = \alpha_z^* = \frac{1}{2}$.[14] The sustainability results are summarized in proposition 1.

PROPOSITION 1. *Suppose* $\alpha_z = \alpha_z^* = \frac{1}{2}$, *and* $\lambda = \lambda^*$. *The FTA is more (less) sustainable in a world when both governments are subject to protectionist lobbying than when there is no lobbying in any country, when both governments put a small (large) weight on political contributions and/or their discount factors are big (small).*

Proof. See appendix B. □

It is worthwhile to explain the seemingly surprising (or somewhat counterintuitive) result that benevolent governments (i.e., those not subject to lobbying) have larger incentives to defect from the FTA than have governments

14 We have checked many cases where α_z takes other values and found that proposition 1 holds. The proof is available upon request.

lobbied by anti-FTA lobbies. This case arises for the following reason. First, the gain to any government from defecting from the FTA and getting a one-off gain is always larger with lobbying than without. Second, the social welfare loss to any country is larger in the punishment periods with protectionist lobbying than without because its exports face a higher tariff from the importing country with lobbying than without. That is, defecting from the FTA in the presence of lobbying will result in a more severe trade war than in the presence of no lobbying. The comparison result holds when the second effect dominates the first one. The proof shows that the result occurs when the governments place a small weight on political contribution and discount the future less.

3.3. Lobbying for the FTA

In reality, some special-interest groups also lobby for free trade. Pro-trade groups have made significant contributions to FTA formation.[15] However, with the exception of Grossman and Helpman (1995) and Hillman and Moser (1996), this fact has been largely ignored in the literature on political-economy trade policy.[16] In this subsection, we analyze special-interest groups' lobbying for FTAs.

Note that as consumers of good z, the x-lobby does not want its government to protect sector z, but we preclude cross-sector lobbying because it very rarely occurs in the real world.[17] Hence, the x-lobby's contribution to the FTA is simply a scalar, denoted c_{x0}. Similarly, the z-lobby's contribution to the FTA is also a scalar, denoted c_{z0}. Suppose that in country A, both the x-lobby and the z-lobby for the FTA and government A bargains with the i-lobby (i = x, z), simultaneously and separately, over contributions c_{i0}. The threat point of the Nash bargaining is the non-cooperative tariff equilibrium without political contributions, which is: $t_x^{o*} = u/3, t_y^o = u/3$, and $t_0 = t_0^* = v/3$. Letting $\tilde{\Delta}F$

15 To take the North American Free Trade Agreement (NAFTA) as an example, lobbying took place before and after the agreement was finally signed in 1994. In the last week of July 1993 more than 150 executives from the largest exporting industry in the United States, that is, the chemical and pharmaceutical industry, descended on Washington, D.C. to drum up congressional and administration support for NAFTA (see *Chemical and Engineering News* 1993). Andrew Wheat (1994) supplies two other pieces of evidence that special-interest groups lobby for free trade in the United States. In November 1993 'the most powerful U.S. business lobbies have banded together to avoid the near miss they endured when Congress narrowly approved the North American Free Trade Agreement' (Wheat, 1994, 16). Another pro-trade lobby is the 'Alliance for GATT Now' formed in February 1994, which spent millions of dollars on a campaign for the U.S. support of the Uruguay Round of the GATT. This Alliance has a long membership list, including Potomac Electric Power Company and Consumers for World Trade, which is a corporate front group funded by multinational companies.

16 Hillman and Moser (1996) use the political-support-function approach to study FTAs. They emphasize mutual market access. It is evident that special interests in the export sectors support the FTA. Grossman and Helpman (1995) explicitly model political contributions made by special interests in the export sectors.

17 The absence of cross-sector lobbying in reality is also observed by Krueger (1996, 102), whose results are based on a number of case studies.

denote the 'change of F when all tariffs drop to zero,' the bargaining will be characterized by[18]

$$\max_{c_{i0}} \left[\tilde{\tilde{\Delta}} w_i + \lambda c_{i0}\right]^{\alpha_i} \left[\tilde{\tilde{\Delta}} \pi_i - c_{i0}\right]^{1-\alpha_i}, \text{ subject to } c_{i0} > 0, (i = x, z).$$

The bargaining solutions are

$$c_{i0} = \alpha_i \tilde{\tilde{\Delta}} \pi_i - \frac{1-\alpha_i}{\lambda} \tilde{\tilde{\Delta}} w_i. \tag{8}$$

Let us first examine the bargaining outcome between the government and the z-lobby. Direct calculation using the equilibrium results in subsection 2.1 yields $\tilde{\tilde{\Delta}} \pi_z = v^2/81$ and $\tilde{\tilde{\Delta}} w_z = 7v^2/162$. Substituting these values into (8) generates

$$c_{z0} = v^2[2\alpha_z \lambda - 7(1-\alpha_z)]/162\lambda. \tag{9}$$

Hence, we can establish the following lemma.

LEMMA 2. *A necessary condition for the z-lobby to make political contributions to the FTA is* $\alpha_z > 7/(7+2\lambda)$. *The contributions increase with* λ *and* α_z.

Condition $\alpha_z > 7/(7+2\lambda)$ requires both α_z and λ to be large. If λ is small, government A benefits little from political contributions. If α_z is small, the government cannot extract large contributions from the z-lobby. In either case, the Nash bargaining leads to a corner solution $c_{z0} = 0$. Since $\lambda \leq 1.5$, α_z must be sufficiently large ($\alpha_z > 7/10$) for the z-lobby to support the FTA. This implies that for the cases examined in proposition 1, where it is assumed that $\alpha_z = 1/2$, the z-lobby does not support the FTA and it indeed lobbies for protection.

We now turn to sector x. With similar calculation as for sector z, we obtain $\tilde{\tilde{\Delta}} \pi_x = u^2/6$ and $\tilde{\tilde{\Delta}} W_x = 5u^2/72$. Hence,

$$c_{x0} = u^2[12\alpha_x \lambda - 5(1-\alpha_x)]/72\lambda, \text{ if } \alpha_x > 5/(5+12\lambda). \tag{10}$$

Consequently, $\partial c_{x0}/\partial \lambda > 0$ and $\partial c_{x0}/\partial \alpha_x > 0$.

Finally, let us compare the two lobbies' contributions to the FTA. As no import exists in sector x, but sector z involves two-way trade, it is not surprising to find that the x-lobby has a stronger incentive to lobby for the FTA than has the z-lobby. To see this, note that $5/(5+12\lambda) < 7/(7+2\lambda)$. That is, given

18 Reaching FTA may be costly, using up government resources in international negotiation and monitoring. In an early version of Qiu (1999), we included such costs and assumed that the costs were proportional to the size of the industry, for example, kX^2 for sector x and kv^2 for sector z, where $k \geq 0$. However, including these costs will not alter the results in any qualitative aspect.

$\alpha_z = \alpha_x$, the x-lobby is more likely to make a positive contribution than is the z-lobby. Moreover, given that both lobbies make positive contributions, $c_{x0} > c_{z0}$ as long as u is not too small relative to v.

3.4. FTA Sustainability under pro-FTA lobbying

In this subsection, we consider when the x-lobby and z-lobby in country A and the y*-lobby and z*-lobby in country B are making contributions to their governments for maintaining the FTA. Moreover, we assume that without such contributions, a government will defect from the FTA. We are interested in knowing under what conditions a government will not have incentives to defect from this type of lobby-supported FTA and whether a lobby-supported FTA is more or less sustainable than the benchmark FTA.

When government A defects from the FTA, its one-time gain is equal to the difference between G with defection and G without defection. Using superscript s to denote support, direct computation yields $V^s = Y^2/24 + v^2/18 - \lambda(c_{x0} + c_{z0}) = V - \lambda(c_{x0} + c_{z0})$. Hence, the one-time gain is less than that in the case without lobbying because government A loses the political contributions.

We now turn to the loss in each of the subsequent periods, which is equal to the difference between G when both governments comply with the FTA and the lobbies make their free trade contributions and G when no lobby makes contributions and each government sets tariffs. Direct calculation produces $L^s = L + \lambda(c_{x0} + c_{z0})$. Thus, compared with (1), there is an additional loss to government A: the loss of political contributions made to support the FTA continously.

Then, government A's defection incentive in this case is given by

$$DI^s \equiv V^s - \left(\frac{\delta}{1-\delta}\right) L^s = DI - \frac{\lambda(c_{x0} + c_{z0})}{1-\delta}. \tag{11}$$

Based on (3), (11), and lemma 2, we can obtain various factors' effects on DI^s:

$$DI^s < DI, \frac{\partial DI^s}{\partial \lambda} < 0, \frac{\partial DI^s}{\partial \alpha_i} < 0, \frac{\partial DI^s}{\partial \delta} < 0, \frac{\partial DI^s}{\partial X} < 0, \frac{\partial DI^s}{\partial Y} > 0.$$

Hence, the defection incentive is lower when (i) a government values political contributions more, (ii) a government's bargaining power vis-à-vis the lobbies increases, (iii) a government discounts the future less, (iv) sector x becomes larger, or (v) sector y becomes smaller.

Note that c_{z0} and c_{x0}, as shown in (9) and (10), are independent of country B's conditions. It is easily seen from the above analysis that given $\alpha_z = \alpha_z^*$, $\alpha_x = \alpha_y^*$, and $\lambda = \lambda^*$, government B's defection incentive is also equal to DI^s. The FTA is sustainable under pro-FTA lobbying if and only if neither government defects; that is, $DI^s < 0$. The above analysis directly establishes the following result.

PROPOSITION 2. *Suppose* $\alpha_z = \alpha_z^*$, $\alpha_x = \alpha_y^*$ *and* $\lambda = \lambda^*$. *The FTA is more sustainable in a world when both governments are subject to pro-FTA lobbying than when there is no lobbying in any country*.

The result is not surprising and the intuition is simple. Compared with the benchmark case, if a government defects from the FTA in the case of pro-FTA lobbying, it loses receiving contributions in every period without any additional gain. Hence, it has less incentive to defect.

4. Multisector trade and FTA sustainability

In this section, we examine whether multisector trade is conducive to FTA sustainability. We have in mind a world with uncertainty in demand and/or technologies. First, we analyse the case of lobby-opposed FTAs (in subsection 4.1). Then, we investigate the case of lobby-supported FTAs (in subsection 4.2).

To simplify the exposition, let us impose a symmetrical assumption that governments A and B have the same discount factor and weight on political contributions. Assume $X = u$ and $Y = mu$. Then, $m = 1$ represents the initial symmetric case and $m > (<)1$ represents a positive (negative) shock to sector y. Moreover, a positive (negative) shock in sector z is captured by an increase (decrease) in v. Following Bernheim and Whinston (1990), to identify the role of multisector trade we compare the aggregate sustainability constraint (SC, for short) to individual sectors' SCs.

4.1. Lobby-opposed FTAs

In this subsection, we concentrate on the case in which government A is subject to the z-lobby's lobbying for defection from the FTA. The aggregate SC is given by the inequality $DI^p \leq 0$.

Note that country A (B) does not want to have an FTA covering sector y (x) only. Thus, the two countries will never reach an FTA in a single sector, x or y. Combining these two sectors, country A's sub-aggregate SC for the x-y sectors is (following the analysis in subsections 2.2 and 2.3):

$$-\frac{5\delta u^2}{72(1-\delta)} + \frac{m^2u^2}{24(1-\delta)} = \frac{(3u^2 - 5\delta)u^2}{72(1-\delta)} \leq 0, \text{ or, equivalently, } \delta \geq \frac{3m^2}{5}.$$

And B's sub-aggregate SC for the x-y sectors is:

$$-\frac{5\delta m^2u^2}{72(1-\delta)} + \frac{u^2}{24(1-\delta)} = \frac{(3 - 5u^2\delta)u^2}{72(1-\delta)} \leq 0, \text{ or, equivalently, } \delta \geq \frac{3}{5m^2}.$$

Hence, for $\delta \geq \delta_{xy}^p \equiv \max\{3m^2/5, 3/5m^2\}$, multisector trade, which includes x and y, makes the FTA sustainable.

However, a technology shock, positive or negative, makes the x-y-sector FTA less sustainable (i.e., a larger δ is required to ensure sustainability). For

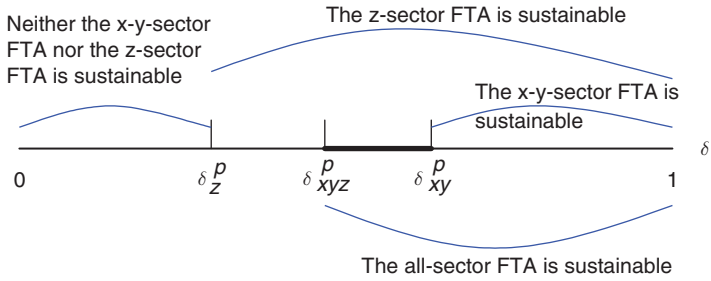

FIGURE 1 Multisector trade and FTA sustainability

$m > 1$, country B realizes a positive technology shock in its export sector and A's defection incentive increases. For $m < 1$, country B realizes a negative technology shock in its export sector, which increases its defection incentive.

Now, turn to sector z. Collecting the terms associated with sector z in DI^p and denoting the result by DI^p_z gives this sector's individual SC as, for country A,

$$DI^p_z \equiv \frac{(9-16\delta)v^2}{162(1-\delta)} + g_{NF} + \left(\frac{\delta}{1-\delta}\right)g_N < 0.$$

In appendix C, we calculate g_N and g_{NF} and show that (i) DI^p_z strictly decreases as δ increases, (ii) there exists a unique δ^p_z, which is independent on v, such that $DI^p_z \leq 0$ if and only if $\delta \geq \delta^p_z$ (the equality holds only at $\delta = \delta^p_z$). Technology shocks, positive or negative, do not affect this sector's FTA sustainability, because any technology shock affects both countries' imports and exports symmetrically.

Suppose the technology shock to the inter-industry trade sector is large (i.e., m is large). Then, $\delta^p_z < \delta_{xy}$. In appendix C, we show that there exists a unique $\delta^p_{xyz} \in (\delta^p_z, \delta^p_{xy})$ such that $DI^p \leq 0$ if and only if $\delta \geq \delta^p_{xyz}$ (the equality holds only at $\delta = \delta^p_{xyz}$). Accordingly, figure 1 reflects the above results. That is, if $\delta \in (\delta^p_{xyz}, \delta^p_{xy})$, then the x-y-sector FTA is not sustainable, but the all-sector FTA is sustainable.

In summary, technology shocks reduce the x-y-sector FTA's sustainability, but adding the intra-industry trade sector to the FTA makes it more sustainable.

4.2. Lobby-supported FTAs

We now turn to the case when lobbies make contributions for FTAs. Under the symmetrical assumption, the aggregate SC is $DI^s \leq 0$. As argued before, a single-sector FTA in x or y is infeasible. By substituting (3) into (11) and

collecting terms associated with sectors x and y, we obtain country A's sub-aggregate SC for the x-y sectors:

$$\frac{(3m^2 - 5\delta)u^2}{72(1-\delta)} - \frac{\lambda c_{x0}}{1-\delta} \leq 0. \tag{12}$$

A similar sub-aggregate SC can be derived for country B. Let us focus on the case in which the x-lobby and the y*-lobby make positive contributions, which is the case when $\lambda > 5(1-\alpha)/12\alpha$, as shown in (10), with simplification $\alpha_x = \alpha_y = \alpha$. Defining

$$\delta^s_{xy} \equiv \min\{\max\{\delta^p_{xy} - \frac{1}{5}(12\alpha\lambda + 5\alpha - 5), 0\}, 1\},$$

from (10) and (12), we know that the x-y-sector FTA is sustainable if and only if $\delta \geq \delta^s_{xy}$. Note that δ^s_{xy} is weakly increasing in m. Hence, multisector trade increases the sustainability of the lobby-supported FTA, but technology shocks reduce sustainability.

The SC for sector z is

$$\frac{(9 - 16\delta)v^2}{162(1-\delta)} - \frac{\lambda c_{z0}}{1-\delta} \leq 0.$$

Also, set $\alpha_z = \alpha$. Then, from (9), the z-lobby makes positive contributions if $\lambda > 7(1-\alpha)/2\alpha$. Define $\delta^s_z \equiv 1 - (7 + 2\lambda)\alpha/16 \in (0,1)$ because $\lambda < 3/2$ as assumed in Subsection 3.1. It is easily seen that the z-sector FTA is sustainable if and only if $\delta \geq \delta^s_z$.

We now examine sustainability of the all-sector FTA. Let us focus only on the case when all lobbies make their contributions by assuming $\lambda > 7(1-\alpha)/2\alpha$. It is clear that for sufficiently large m, $\delta^s_{xy} > \delta^s_z$. The above analysis shows that $DI^s > 0$ at $\delta = \delta^s_z$ and $DI^s < 0$ at $\delta = \delta^s_{xy}$. Recall that $\partial DI^s/\partial\delta < 0$ as shown in subsection 3.3. Hence, there exists a unique $\delta^s_{xyz} \in (\delta^s_z, \delta^s_{xy})$ such that $DI^s \leq 0$ if and only if $\delta \geq \delta^s_{xyz}$ (the equality holds only at $\delta = \delta^s_{xyz}$). We can draw a figure similar to figure 1 with $\delta^p_z, \delta^p_{xy}$ and δ^p_{xyz} replaced by $\delta^s_z, \delta^s_{xy}$ and δ^s_{xyz}, respectively. That is, if $\delta \in (\delta^s_{xyz}, \delta^s_{xy})$, then the x-y-sector FTA is not sustainable, but the all-sector FTA is sustainable.

We now summarize the main findings of this section below.

PROPOSITION 3. *Multisector trade between two countries enhances FTA sustainability.*

5. Concluding remarks

Special-interest groups continously lobby for or against free trade. Nevertheless, FTAs can be sustained. Recognizing this situation, we have taken a political-economy approach to investigate the issue of FTA sustainability. In

particular, we have modelled the interaction between special-interest groups and governments as a bargaining game over political contributions. We have shown that protectionist lobbying may not reduce FTA sustainability. Moreover, we have shown that lobbying by special-interest groups from a two-way trade sector crucially affects FTA sustainability.

The fact that most FTAs cover 'substantially all the trade' between countries, consistent with GATT Article XXIV, helps to explain why existing FTAs are sustainable. This is because multisector trade lowers defection incentives and thus facilitates FTA sustainability.

Admittedly, these results are derived in this paper under some specifications and restrictions. For example, we have adopted linear demand functions for clarity and simplicity. There are only two countries in the model, which excludes multi-country FTAs. We have applied the Nash bargaining concept to derive equilibrium political contributions, but one could use other bargaining approaches. Clearly, there is another important direction by which it is possible to extend the current study, that is, endogenize the lobbying position of the special-interest groups in the two-way trade sector.[19] In this study, we have treated the z-lobby's lobbying position as exogenously given and examined the two possibilities, that is, making contributions for the FTA and making contributions for protection. These issues are left for future research.

Appendix A

Proof of lemma 1
(i). Note

$$c_z'(t_z) = \alpha_z \frac{\partial \pi_z(t_z)}{\partial t_z} - \left(\frac{1-\alpha_z}{\lambda}\right) \frac{\partial w_z(t_z)}{\partial t_z}.$$

From the definition of t_0, we have $\partial w_z/\partial t_z < 0$ for $t_z > t_0$. It is obvious that $\partial \pi_z/\partial t_z > 0$. Hence, $c_z'(t_z) > 0$. By using the market equilibrium obtained before, we can directly compute $c_z''(t_z) = 2\alpha_z/9 + (1-\alpha_z)/\lambda > 0$. The result follows.
(ii). Note that t_z^* affects $c_z(t_z)$ as defined in (5) through its effect on the z-lobby's profit derived from B's market. However, given t_z^*, its effect does not change when A's tariff increases from t_0 to t_z. Thus, the z-lobby's market profit in B cancels out in $\Delta\pi_z$ and Δw_z. Mathematically, although t_z^* appears in π_z, it disappears in $c_z(t_z)$ when we substitute all variables in (5) using the equilibrium values obtained earlier. □

19 In Qiu (2002), we examine this issue but in a model without FTA.

Appendix B

Proof of proposition 1

We first examine the sign of g_N and g_N^*. Recall that $w_z(t_z = v/3; t_z^* = v/3) = 65v^2/162$. Using the equilibrium results in subsection 2.1, we can rewrite: $g_N = A(t_z^o) + B(t_z^{o*}) + \lambda c_z(t_z^o) - A(v/3) - B(v/3)$, where

$$A(w) \equiv \frac{1}{2}\left(\frac{2v-w}{3}\right)^2 + w\left(\frac{v-2w}{3}\right) + \left(\frac{v+w}{3}\right)^2 \text{ and } B(w) \equiv \left(\frac{v-2w}{3}\right)^2.$$

Since $\alpha_z = \alpha_z^*$ and $\lambda = \lambda^*$, we have $t_z^o = t_z^{o*}$ and $g_N = g_N^* = H(t_z^o) - H(\frac{v}{3}) + \lambda c_z(t_z^o)$, where $H(w) \equiv A(w) + B(w)$. Let

$$k \equiv \frac{6 + 3\alpha_z + 2\alpha_z\lambda}{18 + 9\alpha_z - 2\alpha_z\lambda} = \frac{15 + 2\lambda}{45 - 2\lambda} \quad (\text{when} \alpha_z = \frac{1}{2}).$$

Then, $t_z^o = kv$ and simplifying the expression yields $H(t_z^o) = (v^2/18)(2-k)(4+k)$ and $H(\frac{v}{3}) = 65v^2/162$.

Using π_z and w_z derived in subsection 2.1 to calculate $\Delta\pi_z$ and Δw_z, respectively, for $c_z(t_z^o)$ in (5), we obtain

$$\Delta\pi_z = \frac{v^2}{81}[9(1+k)^2 - 16] \text{and } \Delta w_z = \frac{v^2}{18}[(2-k)^2 + 6k(1-2k) + 2(1+k)^2 - 7].$$

Substituting these results into (5) gives $\lambda c_z(t_z^o) = (v^2/324)[9 - 54k + 81k^2 - 2\lambda(7 - 18k - 9k^2)]$. Hence,

$$g_N = g_N^* = \frac{v^2}{324}\tilde{g}(\lambda), \text{ where } \tilde{g}(\lambda) \equiv 23 - 90k + 63k^2 - 2\lambda(7 - 18k - 9k^2).$$

Substituting in $k(\lambda)$ yields $\tilde{g}(\lambda) = 64\bar{g}(\lambda)/(45 - 2\lambda)^2$, where $\bar{g}(\lambda) \equiv \lambda(-90 + 101\lambda - 2\lambda^2)$. It is easily seen that $\tilde{g}(\lambda)$ and $\bar{g}(\lambda)$ have the same sign, and that $\bar{g}(\lambda)$ is a convex function with $\bar{g}(\lambda = 0.1) < 0$ (in fact, even $\bar{g}(\lambda = 0.9) < -0.72 < 0$) and $\bar{g}(\lambda = 1) = 9 > 0$. Hence, there exists a unique $\lambda_0 \in (0,1.5)$ such that $\tilde{g}(\lambda) < 0$ for $\lambda \in (0,\lambda_0)$ and $\tilde{g}(\lambda) > 0$ for $\lambda \in (\lambda_0,1.5)$.

Now we are ready to analyse the property of $DI^p (= DI^{p*})$, which is given in (7). Recall that $g_{NF} > 0$. Hence, for any given $\lambda \in (0,\lambda_0)$, there exists a $\delta_\lambda \in (0,1)$ such that $g_{NF} + \left(\frac{\delta}{1-\delta}\right)g_N < 0$ for all $\delta \in (\delta_\lambda,1)$. Thus, under these conditions, $DI^p < DI$ (and by symmetry, $DI^{p*} < DI^*$). That is, governments in a world with lobbying have smaller incentives to deviate from the FTA than in a world without lobbying.

Also based on the signs of g_{NF} and g_N, we know that for any given λ (big or small), there exists a $\delta_\lambda \in (0,1)$ such that $g_{NF} + (\delta/1-\delta)g_N > 0$ for all $\delta \in (0,\delta_\lambda)$. Obviously, $g_{NF} + (\delta/1-\delta)\, g_N > 0$ for all δ as long as $\lambda > \lambda_0$. Hence, under these conditions, $DI^p > DI$ (and $DI^{p*} > DI^*$). That is, governments in a world with

lobbying have larger incentives to defect from the FTA than they have in a world without lobbying. This completes the proof. □

Appendix C

Proof of the basic results in subsection 4.1

In order to have a sharper focus, let us examine a special case in which $\alpha_x = \alpha_z = 0.5$. This does not affect the result qualitatively and we maintain it in the rest of this paper. First,

$$t_z^o = t_z^{o*} = \frac{(15+2\lambda)v}{45-2\lambda},\ \Delta\pi_z = \frac{64(45-\lambda)\lambda v^2}{81(45-2\lambda)^2},\ \Delta w_z = -\frac{32\lambda^2 v^2}{9(45-2\lambda)^2}.$$

Using the above results, we have $c_z(t_z^o) = 16(99-2\lambda)\lambda v^2/81(45-2\lambda)^2$ and $w_z(t_z^o, t_z^{o*}) = (25-2\lambda)(65-2\lambda)v^2/2(45-2\lambda)^2$. Hence,

$$g_N = w_z(t_z^o, t_z^{o*}) + \lambda c_z(t_z^o) - \frac{65v^2}{162} = \frac{16\lambda v^2}{81(45-2\lambda)^2}(-90+101\lambda-2\lambda^2),$$

which is negative for small λ, but positive for large λ (e.g., $\lambda \geq 0.91$).

Next, we calculate g_{NF}. It is not difficult to verify that $\tilde{c}_z(t_z^o) > 0$ given $\lambda \geq 0.146$. Let us maintain this condition for λ, which is not very restrictive, and so $0.146 \leq \lambda < 1.5$ is assumed throughout this subsection (recalling that $\lambda < 1.5$ has been imposed in subsection 3.1). Direct calculation yields

$$\tilde{\Delta}\pi_z = \frac{(15+2\lambda)(105-2\lambda)v^2}{9(45-2\lambda)^2},\ \tilde{\Delta}w_z = \frac{5(15+2\lambda)(9-2\lambda)v^2}{6(45-2\lambda)^2},$$

which gives rise to $\tilde{c}_z(t_z) = (15+2\lambda)(75+30\lambda-4\lambda^2)v^2/36\lambda(45-2\lambda)^2$ and $w_z(t_z^o, t_z^* = 0) = (18225-1620\lambda-28\lambda^2)v^2/18(45-2\lambda)^2$. Therefore,

$$g_{NF} = w_z(t_z^o, t_z^* = 0) + \lambda\tilde{c}_z(t_z^o) - \frac{v^2}{2} = \frac{(1125+600\lambda-128\lambda^2-8\lambda^3)v^2}{36(45-2\lambda)^2} > 0.$$

Using the above g_N and g_{NF}, we have $DI_z^p = v^2 G_A/324(1-\delta)(45-2\lambda)^2$, where $G_A \equiv 2(9-16\delta)(45-2\lambda)^2 + 9(1-\delta)(1125+600\lambda-128\lambda^2-8\lambda^3) + 64\delta\lambda(-90+101\lambda-2\lambda^2)$. Then, $\partial G_A/\partial\delta = -32(45-2\lambda)^2 - 9(1125+600\lambda-128\lambda^2-8\lambda^3) + 64\lambda(-90+101\lambda-2\lambda^2)$. Recall that $\lambda < 3/2$. Hence, $(1125+600\lambda-128\lambda^2-8\lambda^3) > 0$, $(45-2\lambda) > 42$, $64\lambda < 96$ and $(-90+101\lambda-2\lambda^2) < 112$. Using these inequalities, we immediately see $\partial G_A/\partial\delta < 0$, which then implies $\partial DI_z^p/\partial\delta < 0$.

Then, evaluating G_A at $\delta = 0$ and $\delta = 1$, we find $G_A|_{\delta=0} > 0$ and $\lim_{\delta\to 1} G_A < 0$ because $\lambda < 3/2$. Given these two inequalities with the strict monotonicity of G_A, there exists a unique $\delta_z^p \in (0, 1)$ such that $DI_z^p(\delta = \delta_z^p) = 0$

and $DI_z^p < 0$ for all $\delta > \delta_z^p$. Moreover, for sufficiently large m, we must have $\delta_z^p < \delta_{xy}^p$. Note δ_z^p is independent on v because G_A is not a function of v.

Finally, for country A we obtain

$$DI^p = \frac{G_F}{648(1-\delta)(45-2\lambda)^2}, \text{ where } G_F \equiv 9(3m^2 - 5\delta)(45-2\lambda)^2X^2 + 2G_A.$$

Since $\partial G_A/\partial\delta < 0$, we also have $\partial G_F/\partial\delta < 0$. Obviously, there exists a unique $\delta_A^p \in (\delta_z^p, 3m^2/5)$, such that $DI^p > 0$ if and only if $\delta > \delta_A^p$. Similarly, there exists $\delta_B^p \in (\delta_z^p, 3/5m^2)$ as a cut-off point for country B. Define $\delta_{xyz}^p \equiv \max\{\delta_A^p, \delta_B^p\}$. Then, the all-sector FTA is sustainable iff $\delta > \delta_{xyz}^p$. □

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