Political Economy, Uncertainty, and Contracting Costs: Agriculture and the Negotiation of Trade Agreements

Na Li

Research Associate

Department of Food, Agricultural and Resource Economics

University of Guelph

Alan P. Ker*

Professor, Department of Food, Agricultural and Resource Economics

OAC Research Chair in Agricultural Risk and Policy

Director, Institute for the Advanced Study of Food and Agricultural Policy

University of Guelph

Institute for the Advanced Study of Food and Agricultural Policy

University of Guelph

Institute Working Paper - 2019.2

*Corresponding author. Mailing address: University of Guelph, J.D. MacLachlan Building, Guelph, Ontario, Canada N1G 2W1. Phone: 519-824-4120. E-mail: aker@uoguelph.ca.

Political Economy, Uncertainty, and Contracting Costs: Agriculture and the Negotiation of Trade Agreements

Abstract

Recent negotiations of the United States Mexico Canada Agreement (USMCA) and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) highlight the impact of contracting costs, uncertainty, and the importance of political welfare. Agriculture exhibits these traits perhaps more than any other sector and subsequently tends to be pivotal in many trade negotiations. Moreover, these traits are -- to some extent -- responsible for the large increase in Regional Trade Agreements (RTAs). In this manuscript we extend the political economy model of trade agreements to include both contracting costs and uncertainty. Uncertainty is incorporated through trade and policy shocks while contracting costs are incorporated as a function of the number of policy instruments. The optimal conditions on domestic support differ considerably if governments maximize social surplus only versus some linear combination of both social surplus and private political welfare. We also show that the politically optimal structure of trade agreements allows for countervailing duties. Our model helps explain: (a) why tariffs rather than production subsidies are more common in agriculture; (b) differential treatment of agricultural producers in developed versus developing countries; (c) continued presence of agricultural subsidies in many RTAs even under significant trade volume growth; and (d) the trend toward harmonization of Sanitary and Phytosanitary Standards (SPS) measures.

.

1 Introduction

The divergence of trade policy from trade theory has justifiably drawn significant attention. Most economists advocate toward freer trade as do international institutions such as the World Bank, the International Monetary Fund, and the World Trade Organization (WTO). Yet trade agreements have never been easy to negotiate (e.g. WTO Doha round, USMCA, CPTPP, etc.) and the fate of the WTO has become increasingly uncertain. Gaisford et al. (2001) notes that agriculture has greater difficulty in coming to agreement because of heightened political ramifications. Example in point, President Trump incessantly argued that Canada's unwillingness to remove supply management for its agricultural sector continuously hindered the recent USMCA negotiations. Canadian Minister of Foreign Affairs Chrystia Freeland stated to CBC news after the completion of the negotiations:

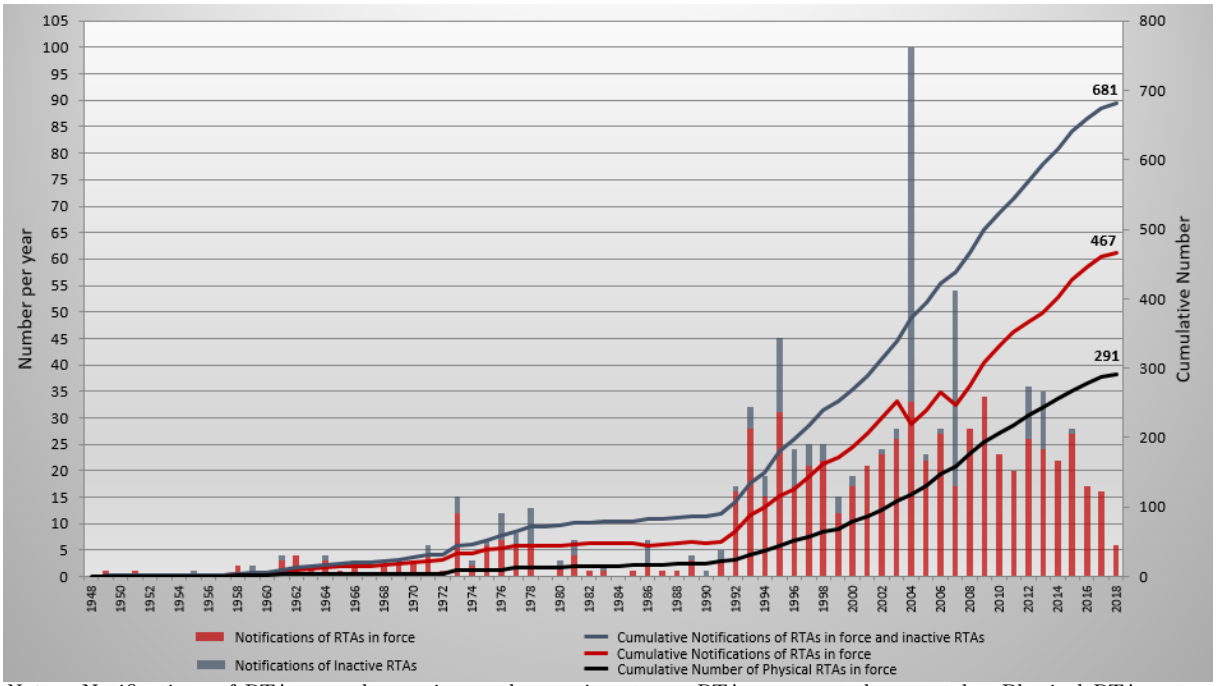
> *"[T]he issue - which Canadians are very aware was a difficult one and where the U.S. wanted increased access - was access to the Canadian dairy market".*

Very little change was made with respect to agriculture under USMCA; supply managed commodities in Canada are relatively unaffected while sugar and other protected US agricultural sectors also remain protected. This outcome is not unique to USMCA; CPTPP and CETA resulted in very little agricultural trade liberalization as well.[†]

Despite the difficulties in negotiating trade agreements, countries that liberalized their trade regimes experienced average annual growth rates that were approximately 1.5% higher over the 1950–98 period (Wacziarg and Welch, 2008). There exists a large body of literature showing considerable welfare gains for nearly all countries involved in agricultural trade liberalization (e.g., Grant and Boys (2011), Grant and Lambert (2008), Hertel et al. (2007), Vollrath et al. (2006)). Given that political welfare, contracting costs, and uncertainty increase with the number of negotiating countries, it is not surprising that a new global trade agreement has been abandoned in favour of Regional Trade Agreements (RTAs). As of June 2016, every member of the WTO had a RTA in force. As of January 2019, 291 RTAs were in force. Figure 1, taken from the WTO, illustrates the proliferation of RTAs over the past two decades. No doubt, agriculture was a contributing factor in this institutional shift toward RTAs given its relatively high contracting costs as well as its high sensitivity to both trade and political shocks.

Economists have provided frameworks/models that explain the structure of optimal trade agreements under varying assumptions. Two different avenues are prominent in the literature. The first

[†]CETA is the Comprehensive Economic and Trade Agreement between the European Union and Canada.



Notes: Notifications of RTAs: goods, services and accessions to an RTA are counted separately. Physical RTAs: goods, services accessions to an RTA are counted together.
Source: RTA section, WTO Secretariat, `https://www.wto.org/english/tratop_e/region_e/region_e.htm`, accessed 29 January, 2019

Figure 1: Evolution of Regional Trade Agreements in the world, 1948-2019

approach takes trade agreements as *contracts* to internalize potential externalities (see Copeland (1990), Horn (2006), Horn et al. (2010)). Because of uncertainty, a complete contract needs to foresee every possible regulatory need and be state-contingent. However, Horn (2006) noted that writing and enforcing such an agreement is impossibly complex and prohibitively costly and as such trade agreements are incomplete contracts. For instance, agricultural export subsidies were not subject to elimination in the WTO until the 2015 Nairobi Ministerial Conference. The typical incomplete-contract approach is build on the paradigm that policy intervention or tax policies are a means of "correcting" for externalities, in particular negative externalities. However, externalities are not readily verifiable and thus it may be impossible (or prohibitively costly) to determine the optimal tax or subsidy rate. In addition, an implicit assumption is that governments are benevolent and immune from political pressure.

The second approach follows an alternative paradigm by arguing economic policy, including trade-related policy intervention, is determined by both political and economic self-interest. This paradigm is consistent with the empirical evidence that many free-trade-resistant industries (i.e. agriculture) engage in significant rent-seeking activities. U.S. President Trump's trade policy, actions, and narrative, suggest that political self interest is more relevant than ever.

The political economy paradigm of trade policy has a long history in the literature. The seminal work of Grossman and Helpman (1994) brought rent-seeking behavior into the realm of trade policy analysis and concluded tariff rates are affected both by a *political support* motive and a *terms-of-trade* motive. The "protection for sale" (PFS) model predicts: (a) the relationship between trade protection and import penetration depends on whether an industry is politically organized; and (b) protection depends inversely on the import demand elasticity. Schleich and Orden (1996) extended the original PFS model by incorporating domestic production policies and concluded that production subsidies can substitute for trade policies that would have otherwise resulted from rent-seeking efforts. As a result, without trade agreements, the tariff rate represents only the *terms-of-trade* motive (assuming production subsidies are readily available). Maggi and Rodriguez-Clare (1998, 2007) argued that in addition to the *terms-of-trade* motive, there is a *domestic-commitment* motive in which governments use trade agreements as a credible announcement in a principal-agent game with domestic lobbies. Unlike the incomplete contract paradigm, the political economy paradigm lends itself to empirical verification. The predictions from the PFS model were first tested in Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) in a U.S. context. Recent work of McCalman (2004) has applied the PFS model to analyze ongoing trade liberalization in Australia. Mitra et al. (2002) tested the PFS predictions in a developing country (Turkey). In general, the literature has found the PFS predictions to be consistent with the empirical data. Eicher and Osang (2002) compare predictions from the PFS model with those of Findlay and Wellisz (1982) tariff formation function model and find both models consistent with the data.

Our approach takes from both frameworks and is based on the concept that governments are agents of the general public they represent, act in their own political interest, and trade policy is a means of such interest. The underlying idea is that governments weight the rent-seeking demand of various lobby groups against the general interest of voters. We extend the previous work on trade agreement policy formation within the PFS framework by: (a) allowing for contracting costs; (b) introducing uncertainty via trade and policy shocks; and (c) allowing for heterogeneous policy options and effects (across countries). We pay special attention to the harmonization of SPS measures given their increasing importance to agricultural (and food) trade.

Using a competitive two-country model, we endogenously characterize the choice of policy instruments and binding contingencies in trade agreements, given that the state of the world is uncertain during the lifetime of a trade agreement. The consideration of both political and social welfare motives yields greater insights into the mechanisms that drive trade agreements. For example, when contracting is costly, a politically optimal trade agreement does not maximize social welfare unless

every sector is represented by a lobby. Moreover, a politically motivated trade agreement permits the use of countervailing duties. Finally, the conditions under which restricting domestic support is optimal are different under politically motivated governments versus governments that only aim to maximize social welfare.

In the following section we develop our political economy model under zero contracting costs and identify the optimal trade and domestic production policies. Section 2 extends the model by accounting for both uncertainty and contracting costs. Section 3 further extends the model by incorporating harmonized SPS measures. Our conclusions are outlined in the final section.

2 A Political Economy Model of Production Subsidies and Trade Policies

We consider trade between two countries (Home, Foreign) and denote Foreign by *. We assume that there is a numeraire good 0 which is not subject to any policy interventions and n other non–numeraire goods in each country. Prior to policy intervention some of these n goods are imported while others may be exported. A representative individual of Home maximizes the following utility:

$$u = c_0 + \sum_{i=1}^{n} u_i(c_i), \tag{1}$$

where c_0 is the consumption of numeraire good 0 and c_i is the consumption of good i. The sub-utility functions $u_i(\cdot)$ are assumed differentiable, increasing and strictly concave. We let q_i denote the domestic consumer price of good i in Home, and $D_i(q_i)$ denote the representative individual's demand for good i, which is the inverse of $u_i'(\cdot)$. Their indirect utility is given by

$$v(q, e) = e + S(q), \tag{2}$$

where e is total spending, and $q = (q_1, q_2, \ldots, q_n)$ is the vector of domestic consumer prices of the non-numeraire goods and $S(q) \equiv \sum_i u_i[D_i(q_i)] - \sum_i q_i D_i(q_i)$ is the consumer surplus associated with these goods.

The numeraire good 0 is produced using only labor, has constant returns to scale, and an input-output ratio of 1. We assume that the aggregate labor supply is large enough to maintain positive production of this good. The competitive wage is 1. Each of the other goods is produced from labor and an industry-specific input. Letting p_i represent domestic producer price, the aggregate

profit accruing to the specific factor used in industry i, denoted by $\Pi_i(p_i)$, is an increasing function of p_i. The aggregate supply of good i is the slope of the profit function ($X(p_i) = \Pi_i'(p_i) > 0$ for $i = 1, 2, \ldots, n$.)

In this section we assume that each government can intervene in any of its non-numeraire sectors using an *ad valorem* tariff/export subsidy and a specific domestic production subsidy/tax. We denote the *ad valorem* tariff or export subsidy for industry i by τ_i and thus

$$q_i = \tau_i \omega_i, \tag{3}$$

where ω_i represents the world price. If $\tau_i > 1$ it represents the tariff on an import good or the export subsidy on an export good. Conversely, if $\tau_i < 1$ it represents an import subsidy or an export tax. We introduce a domestic production subsidy/tax for industry i and denote by s_i. The pricing relationship between the Home producer price and the Home consumer price can be expressed as

$$p_i = q_i + s_i. \tag{4}$$

Net imports of good i in Home are $M_i = ND_i(q_i) - X_i(p_i)$, where N is the size of the population, which we normalize to 1. Similarly, net imports of good i in Foreign are $M_i^* = D_i^*(q_i^*) - X_i^*(p_i^*)$. Note that $q_i = \tau_i \omega_i$, $p_i = \tau_i \omega_i + s_i$, $q_i^* = \tau_i^* \omega_i$ and $p_i^* = \tau_i^* \omega_i + s_i^*$. Clearing of the world market requires that

$$M_i(\tau_i \omega_i, s_i) + M_i^*(\tau_i^* \omega_i, s_i^*) = 0, \ \forall \ i = 1, 2, \ldots, n. \tag{5}$$

Equation (5) allows us to solve for ω_i, the world market clearing price of good i, as a function of τ_i, τ_i^*, s_i and s_i^*. We denote this functional relationship by $\omega_i(\tau_i, \tau_i^*, s_i, s_i^*)$.

The vector of trade policies $\tau = (\tau_1, \tau_2, ..., \tau_n)$, the vector of domestic production subsidy policies $s = (s_1, s_2, ..., s_n)$, and market clearing prices $\omega = (\omega_1, \omega_2, ..., \omega_n)$ generate government revenue of

$$R(\tau, s, \omega) = \sum_i (\tau_i - 1)\omega_i [D_i(\tau_i \omega_i) - X_i(\tau_i \omega_i + s_i)] - \sum_i s_i X_i(\tau_i \omega_i + s_i). \tag{6}$$

A representative individual obtains income from wages, possible claims (profits) to one of the industry-specific inputs, as well as government transfers. Individuals are assumed to own at most one type of claim to the industry-specific inputs (e.g., claims to industry-specific human capital). The owners of the specific factor used in industry i, with their common interest in protection or

subsidies for that industry, may choose to create a lobby or join an existing lobby in an attempt to influence government policy. However, not all owners of specific factors succeed in organizing politically (free-rider problems, transaction costs, etc.) and thus some industries have no means to effectively influence policy. The set of industries, denoted by L, where specific factor owners are organized is assumed exogenous. Following Grossman and Helpman (1994) we assume that lobby groups express their policy demands by means of political contribution schedules.

Each lobby group represents a certain industry i and sets contribution schedules $C_i(\tau, s, \cdot)$ to maximize the joint welfare of its members.[‡] Note that we have omitted arguments that represent Foreign policies thus allowing us to distinguish the case of a non-cooperative equilibrium (where the contribution schedule depends only on the policies of the Home government) from that of cooperative equilibrium (where the contributions may also depend on policies implemented by the Foreign government). The objective of a lobby group i can be expressed as

$$V_i = W_i(\tau, s, \omega) - C_i(\tau, s, \cdot), \tag{7}$$

where $W_i(\tau, s, \omega) \equiv l_i + \Pi_i(p_i) + \alpha_i[R(\tau, s, \omega) + S(\tau\omega)]$ is its gross joint welfare. Note l_i is the joint labor income of these factor owners, α_i is the fraction of the voting population that owns the specific factor used in industry i and $S(\cdot)$ is the consumer surplus as previously defined.

We assume that each government maximizes its utility which depends on the weighted sum of the welfare of its voters and total political contributions received. The Home government's objective is

$$G = \sum_{i \in L} C_i(\tau, s, \cdot) + aW(\tau, s, \omega), \qquad a \geq 0 \tag{8}$$

where a reflects the government's weighting of aggregate social welfare relative to political contributions and W represents the aggregate social welfare which is given by

$$W(\tau, s, \omega) \equiv l + \sum_i \Pi_i(p_i) + R(\tau, s, \omega) + S(\tau\omega), \tag{9}$$

where l is the aggregate labor income.

The sequence of actions by the various political forces in the two-level game are as follows. First, at the intra–national level, various lobbies in each country simultaneously and non-cooperatively set contribution schedules that make the amount of political contributions contingent on possible policy outcomes. Each lobby takes as given the contribution schedules of all other lobbies at home

[‡]Industries which do not organize have $C_i(\tau, s, \cdot) = 0$.

and abroad. Second, at the international level, both governments weigh net payoffs from acting cooperatively versus non-cooperatively. In either case, the contribution schedules in one country are unobservable to the other. At this level, costs of cooperation—drafting and negotiating a detailed trade agreement—which we refer to as contracting costs, become important. An implicit assumption throughout is that trade agreements are perfectly enforceable; we abstract from issues of self-enforcement of trade agreements.

The Non-cooperative Equilibrium

We derive the policy choices which occur in the absence of a trade agreement (i.e., a non-cooperative equilibrium). Taking Foreign government's policies (τ^*, s^*) as given, Home government's non-cooperative policy vector satisfies the following two conditions:

$$\left(\tau^N, s^N\right) = \arg\max_{(\tau,s)} G\left(\tau, s, \tau^*, s^*\right), \tag{10}$$

and

$$(\tau^N, s^N) = \arg\max_{(\tau,s)} [V_i(\tau, s, \tau^*, s^*) + G(\tau, s, \tau^*, s^*)] \text{ for every } i \text{ in } L. \tag{11}$$

The above two conditions follow directly from the proposition 1 of Grossman and Helpman (1994) by setting $P^N = (\tau^N, s^N)$ and $P^{*N} = (\tau^{*N}, s^{*N})$, and the system of equations can be easily solved (see appendix) to obtain an expression for Home's equilibrium policies given by

$$\tau_i^N - 1 = -\frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{X_i}{\omega_i M_i'} + \frac{1}{e_i^*} + s_i^N \frac{X_i'}{\omega_i M_i'}, \tag{12}$$

and

$$s_i^N = \frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{X_i}{X_i'} - \frac{M_i + (\tau_i^N - 1)\omega_i M_i^{*\prime} \tau_i^*}{D_i' \tau_i^N + M_i^{*\prime} \tau_i^*}, \tag{13}$$

where I_{iL} is an indicator variable that equals 1 if industry i is represented by a lobby and 0 otherwise, $\alpha_L \equiv \sum_{j \in L} \alpha_j$ is the fraction of voters who are represented by lobbies, and $e_i^* \equiv \tau_i^* \omega_i M_i^{*\prime} / M_i^*$ is the elasticity of Foreign export supply or import demand (corresponding to M_i^* is negative or positive) in industry i.

Equation (12) defines the non-cooperative choice of τ_i given domestic production policy s_i and Foreign policies (s_i^* and τ_i^*). The three terms on the right-hand side of equation (12) represent the *political support* motive, the *terms-of-trade* motive, and the *substitutability* of domestic production

subsidies for trade policies respectively. The first two components consist of the expression for non-cooperative trade policies in Grossman and Helpman (1995a). Thus, the non-cooperative equilibrium trade policies defined by Grossman and Helpman (1995a) is a special case when the government cannot implement production policies ($s_i^N \equiv 0$). Equation (12) also shows that the *substitutability* of s_i is limited if the industry has low price sensitivity of supply (X_i' is small) or high price sensitivity of import demand ($|M_i'|$ is large). This observation suggests a possible cross-industry prediction for uses of tariff policies. That is, sectors whose market conditions may limit the use of a domestic production subsidy as a substitute for a tariff. These would include infant industries and agricultural and food sectors thus possibly explaining the popular use of tariff policies for agri-food products. As we will show later, it therefore saves contracting costs by leaving out production subsidies while maintaining trade policy commitments for these industries in trade agreements.

Equation (13) defines the non-cooperative choice of s_i given Home trade policy τ_i and Foreign policies (s_i^* and τ_i^*). The two terms on the right-hand side of equation (13) represent the *political support* motive, and the *substitutability* of trade policies for production subsidies respectively.

Solving equations (12) and (13) yields Home's non-cooperative policies

$$\tau_i^N - 1 = \frac{1}{e_i^*}, \tag{14}$$

and

$$\frac{s_i^N}{p_i} = \frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{1}{\eta_i}, \tag{15}$$

where $\eta_i \equiv p_i X_i'/X_i$ is the elasticity of supply in industry i in Home. Not surprisingly, equation (14) illustrates that Home exploits any international market power by exerting a tariff (or export tax) at the same level as Johnson's optimal tariff rate (the inverse of elasticity of Foreign export supply or import demand). This is because the production subsidy (tax) replaces the tariff (export tax) to compensate the lobbyists' political contributions.

Equation (15) reflects that, in a non-cooperative equilibrium, the optimal production policy for each country is to subsidize domestic production in industries represented by lobbies ($I_{iL} = 1$) at the expenses of industries not represented by lobbies ($I_{iL} = 0$). Note, as indicated by equation (15), the fraction of voters represented by lobbies α_L goes down, the rate of the production subsidy in politically organized industries increases while the rate of the production tax in politically unorganized industries decreases. The intuition is that as the share of voters who are in lobbies decreases, each lobby could gain a greater fraction of the total economic rent, while each politically unorganized

industry is likely to bear a less fraction of the burden of production subsidies. This explains the success for lobbying activities in the agricultural and food sectors in developed versus developing countries. Farmers account for less than 2% of the population in the US (Moon and Pino, 2018). By contrast farmers account for a much greater percent of the population in developing countries. Hertel et al. (2007) notes that farmers in developing countries usually have little or no influence in the political process and tend to be taxed rather than subsidized.

.

The Efficient Trade Agreement under No Contracting Costs

Assuming there is no contracting costs, we define globally efficient policies as those policy vectors the two governments cooperatively choose to maximize the global Policy Preference Function, denoted by Ω:

$$\Omega \equiv a^* G + aG^* = a^* \sum_{i \in L} C_i(P; P^*) + a \sum_{i \in L^*} C_i^*(P; P^*) + a^* a[W(P, P^*) + W^*(P^*, P)].^{\S} \qquad (16)$$

Note, the weight of each country's aggregate social welfare are equalized (to a^*a) while the relative weights of aggregate social welfare and political contributions within each country are identical to that of the non-cooperative case. The interpretation is Ω represents the payoff of a global government that consists of two countries where each has its own policy preference and international lump-sum transfers are available. A real life example is the European Union (EU). Following a similar process by Grossman and Helpman (1995a), it can be shown that the bargaining game can achieve the same equilibrium when international transfer payments are unfeasible.

The following proposition establishes a first-best agreement that achieves global efficiency:

Proposition 1. *In a globally efficient trade agreement free of contracting costs, for any industry i: (a) the tariff rate τ_{i} in the importing country is equal to the export subsidy rate τ_{i}^* in the exporting country; and (b) for a given state of the world, the rate of production subsidy/tax (s_i/p_i) is the same as in the absence of trade agreements, and is determined by*

$$s_i^E = \frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{p_i}{\eta_i}$$

Proof: See appendix.

[§]This function of global welfare follows Grossman and Helpman (1995a), further research would consider alternative forms such as using different Nash weights reflecting relative bargaining abilities of the two governments.

Proposition 1 provides a novel rationale for WTO's countervailing duty law: provided production subsidies are available to meet lobbies' demand for economic rent, a clause that stipulates equal rates of tariff τ and foreign export subsidy τ^* will remove any inefficiencies resulting from trade policies as the distortions directly offset each other.[¶] Note this prediction differs from that in Grossman and Helpman (1995a), where tariffs and export subsidies in the same industry exactly offset each other only in special cases, such as when the lobby groups in the two countries are equally powerful. Grossman and Helpman (1995a) relies on the assumption that governments can not use domestic subsidies at their disposal. Recall the interpretation of equation (14) is that absent a trade agreement, trade policy will not be used for redistribution despite the lobbying, when production subsidies/taxes are available. The interpretation of the second part of Proposition 1 is that global inefficiency cannot be created by the lobbying over domestic production policies. It follows that an agreement which only has the constraints for domestic subsidies cannot increase global payoff relative to the non-cooperative equilibrium and thus is not politically optimal.

3 The Optimal Trade Agreement under Uncertainty

Before characterizing the optimal agreement we need to introduce two important assumptions. First, there are five sources of uncertainty during the lifetime of the agreement that may lead to an incomplete contract: the relative weight of aggregate social welfare (a and a^*), the fraction of population that is represented by lobbies (α_L and α_L^*), whether an industry organizes or dissolves its political lobby (I_{iL} and I_{iL}^*), the price elasticity of supply (η_i and η_i^*), and international trade shocks.[‖] Second, we assume that there are two categories of contracting costs: the costs of including state variables (e.g. a, α_L, I_{iL}, M_i and their foreign counterparts), and the costs of including policy variables (e.g. τ and s and their foreign counterparts).[**] Following Battigalli and Maggi (2002), we assume that contracting costs are increasing in the number of state variables and policies included in the trade agreement. We use the following function to denote contracting cost:

$$c = c(n_p, n_s), \qquad c'_{n_p} > 0, c'_{n_s} > 0, \tag{17}$$

[¶]Bagwell and Staiger (1999) also observed that even a politically motivated governments signs a trade agreement only to correct terms of trade externalities; this is shown via a thought experiment by hypothesizing a world where governments are not motivated by terms-of-trade effects. Their approach is quite different from our approach as they do not consider domestic production policies as a substitute for trade policy.

[‖]Technological changes can affect the price elasticity of supply (η_i) and the number of employees remaining in a certain industry. Political circumstances can change significantly through time as different political parties may come into government, particularly in developing countries. Nordhaus (1975) noted the implicit weighting function on consumption has a positive weight during the electoral period and zero (or small) weights in the future. In addition, some industries may create or dissolve a lobby during the lifetime of the agreement.

[**]We adopt the definition of contracting costs by Horn et al. (2010), where the cost of including a variable in the agreements captures both the cost of describing the variable, the cost of verifying its value ex post, and more broadly, negotiation costs.

where n_p and n_s are the number of policy and state variables in the agreement respectively.

The optimal agreement maximizes the expected joint net payoff of both governments, represented by the expected global Policy Preference Function (PPF) less contracting costs. An agreement of the form

$$A^0 = \left\{ \tau_i = \tau_i^*, s_i = \frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{p_i}{\eta_i}, s_i^* = \frac{I_{iL}^* - a_L^*}{a^* + \alpha_L^*} \frac{p_i^*}{\eta_i^*} \right\}, \tag{18}$$

which imposes the first-best policies derived previously has $n_p = 4n$ and $n_s = 4 + 4n$ and therefore costs $c(4n, 4 + 4n)$ and yields an expected net payoff of $\mathbb{E}(\Omega^0) - c(4n, 4 + 4n)$. It is easy to verify that if contracting costs are negligible, A^0 is the optimal trade agreement. At the other extreme if contracting costs are prohibitively high then the non-cooperative equilibrium occurs. Clearly, the interesting case is where contracting costs matter but do not preclude a trade agreement.

We have previously shown that the inefficiency in the non-cooperative equilibrium results from τ, not s, and thus an optimal trade agreement should at least impose commitment on τ. The question remaining is whether s should be exempt from reduction commitments under the agreement. Recall equation (13) gives the expression for $s_i^N(\tau_i, \tau_i^*)$, the non-cooperative choice of s_i if τ_i and τ_i^* are contingently bound but s_i and s_i^* are left to discretion. Similarly, we can get

$$s_i^{*N}(\tau_i, \tau_i^*) = \frac{I_{iL}^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{X_i^*}{X_i^{*\prime}} - (\tau_i^* - 1)\omega_i \frac{M_i' \tau_i}{D_i^{*\prime} \tau_i^* + M_i' \tau_i} - \frac{M_i^*}{D_i^{*\prime} \tau_i^* + M_i' \tau_i}. \tag{19}$$

The efficient choice of production policies, $s_i^E(\tau_i, \tau_i^*)$ and $s_i^{*E}(\tau_i, \tau_i^*)$ solves $\nabla_{s_i} \Omega(P, P^*) = 0$, and $\nabla_{s_i^*} \Omega(P, P^*) = 0$ simultaneously.

Whether a trade agreement which binds τ_i should also includes commitment over s_i depends on the magnitude of the gain in expected Ω implied by replacing $s_i^N(\tau_i, \tau_i^*)$ with $s_i^E(\tau_i, \tau_i^*)$. If the expected gain is less than the contracting cost incurred by negotiating on s_i, then it is better to exclude s_i from the trade agreement. Without loss of generality, assuming that $s_i^N(\tau_i, \tau_i^*) > s_i^E(\tau_i, \tau_i^*)$ and $s_i^{*N}(\tau_i, \tau_i^*) > s_i^{*E}(\tau_i, \tau_i^*)$ for a given state of the world, the gain of restricting s_i and s_i^* is given by

$$\begin{aligned} &\Omega(s_i^E(\tau_i, \tau_i^*), s_i^{*E}(\tau_i, \tau_i^*), \tau, \tau^*, \cdot) - \Omega(s_i^N(\tau_i, \tau_i^*), s_i^{*N}(\tau_i, \tau_i^*), \tau, \tau^*, \cdot) \\ &= \int_{s_i^N(\tau_i, \tau_i^*)}^{s_i^E(\tau_i, \tau_i^*)} \frac{\partial \Omega}{\partial s_i}(P, P^*) \mathrm{d}s_i + \int_{s_i^{*N}(\tau_i, \tau_i^*)}^{s_i^{*E}(\tau_i, \tau_i^*)} \frac{\partial \Omega}{\partial s_i^*}(P, P^*) \mathrm{d}s_i^*, \end{aligned} \tag{20}$$

Since $\nabla_s \Omega(s^E(\tau, \tau^*), s^{*E}(\tau, \tau^*), \tau, \tau^*) = \nabla_{s^*} \Omega(s^E(\tau, \tau^*), s^{*E}(\tau, \tau^*), \tau, \tau^*) = 0$ and it is assumed that Ω is concave in s and s^*, a sufficient condition for the right-hand side in equation (20) to be small is

that $|\frac{\partial\Omega}{\partial s_i}\left(s_i^N(\tau_i,\tau_i^*),s_i^{*N}(\tau_i,\tau_i^*),\tau,\tau^*,\cdot\right)|$ and $|\frac{\partial\Omega}{\partial s_i^*}\left(s_i^N(\tau_i,\tau_i^*),s_i^{*N}(\tau_i,\tau_i^*),\tau,\tau^*,\cdot\right)|$ are small. After manipulating we find

$$|\frac{\partial\Omega}{\partial s_i}\left(s_i^N(\tau_i,\tau_i^*),s_i^{*N}(\tau_i,\tau_i^*),\tau,\tau^*,\cdot\right)| = \frac{a(a^*+\alpha_L^*)X_i'}{|D_i^{*\prime}|\tau_i+|M_i'|\tau_i^*}|B_i(\tau_i^*,M_i)| \tag{21}$$

where $B_i(\tau_i^*,M_i)\equiv M_i-(\tau_i^*-1)\omega_i\tau_i^*|D_i^{*\prime}|$. Due to the possible state of the world and henceforth the ambiguity of the sign of the term of $B_i(\tau_i,M_i)$ it is difficult to assess the effect of *trade volume* ($|M_i|$).

With some more specific assumptions, we are able to shed light on circumstances under which it is desirable to exclude s and s^* from the trade agreement. Suppose Home is the natural importer of product i, the level of Foreign export subsidy is limited to be below the ceiling that make the term $B_i(\tau_i^*,M_i)$ equal to zero, (in fact WTO now bans export subsidies), we refer to the policy ceiling as a *sufficient restriction*. Then we have

$$|\frac{\partial\Omega}{\partial s_i}\left(s_i^N(\tau_i,\tau_i^*),s_i^{*N}(\tau_i,\tau_i^*),\tau,\tau^*,\cdot\right)| = \frac{a(a^*+\alpha_L^*)X_i'}{|D_i^{*\prime}|\tau_i+|M_i'|\tau_i^*}B_i(\tau_i^*,M_i),^{\dagger\dagger} \tag{22}$$

where $\partial B_i(\tau_i^*,M_i)/\partial M_i>0$.

Looking closer at equations (22), it is intuitive to replicate Horn et al. (2010) in that it is optimal to exclude production subsidy s_i from trade agreement when s_i is a poor substitute for τ_i (*price sensitivity of supply* X_i' is sufficiently small, or *price sensitivity of import demand* $|M_i'|$ is sufficiently large). As discussed earlier and investigated empirically by Baier and Bergstrand (2007), nearly all free trade agreements have a phase-in period provision, particularly in the case of agriculture and food products. A possible explanation is that those free trade agreements foresee the changes of market conditions of country members possibly due to technological changes and wealth accumulation, from those that limit the substitution of production subsidies for tariffs (e.g. small price elasticity of supply and/or large price sensitivity of import demand) to ones that are less likely to do so.

Proposition 2. *If a* sufficient restriction *has been imposed on Foreign border measures that increase the trade volume, i.e.,* $B_i(\tau_i^*,M_i)>0$*, so that* M_i *is positively associated with the payoff of regulating* s_i*, and* M_i *is sufficiently small, it is optimal to leave discretion over the production subsidy* s_i*.*

Proposition 2 summarizes a condition under which the gains from binding production subsidies are so small that they may not offset the accompanying contracting costs and thus it is better to

††Similarly, we can assuming a *sufficient restriction* on Home import subsidy $B_i^*(\tau_i^*,M_i^*)=|M_i^*|+(\tau_i-1)\omega_i\tau_i|D_i'|>0$.

omit them from trade agreements. In particular, the trade volume has a positive effect on B_i (B_i^*) and is sufficiently small. This is the case when Home (Foreign) is a "small country" that has too little trade volume to gain much from changes in terms of trade, given that Foreign (Home) were refrained from using export (import) subsidies to increase trade flow.

Proposition 2 suggests differential treatment across industries with respect to production subsidies. Industries with small import volume, are more likely to benefit from a trade agreement that does not restrict production subsidies. Nascent industries in developing countries, for example, tend to meet these conditions. Our model is therefore consistent with the *infant industry argument* and provides a rationale for the WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement) which offers preferential treatment to those industries in developing countries. On the other hand, differing from Horn et al. (2010), the *trade volume* effect is not always positive, i.e., a rise in trade volume does not always increase the expected payoff of restricting s and s^* in trade agreements. The difference stems from the different assumption about government interest; we assume governments' objective is a weighted sum of national welfare and political contributions. As a result, an increase in trade volume and therefore a rise in dead weight loss does not necessarily lower a government's utility as the government can be sufficiently compensated by political contributions. This difference also provides scope for empirical investigation. For example, agricultural subsidies often remain intact in many RTAs even when the trade volume has grown tremendously over the past several decades.

4 The Optimal Trade Agreement with Harmonized SPS Measures

So far we have ignored the use of non-tariff barriers, however, they are becoming an increasingly important policy instrument, especially for trade in agricultural and food products. Examples abound. For example, in 2014, China rejected shipments of US grain corn because of the trait Viptera and shipments have remained well below expected levels despite subsequent Chinese approval; not surprisingly this came at a time when China corn growers were experiencing significant surpluses. Similarly, the US restricted shipments of Canadian beef following an outbreak of BSE in May, 2003; the border remained partially closed until the end of 2007 at the lobbying of US beef producers.

We define the harmonized SPS (HSPS) measures as a provision in an agreement that an international standard is in place and shared by all parties. Assessing the effect of HSPS requires a broader

class of trade agreements which takes into account the regulatory cost of meeting a particular standard. Suppose without the HSPS provision, each country can set its own standards where products in one country might not meet another importing country's standard, and the regulatory costs that would eventually passed on to Home and Foreign consumers are t and t^* respectively. In this setting, suppose Home is a natural importer of good i, the pricing relationships of imported goods for Home can be expressed as

$$q_i = \tau_i \omega_i + t_i, \tag{23}$$

and

$$p_i = q_i - t_i + s_i = \tau_i \omega_i + s_i \tag{24}$$

Note that while the wedge between the producer and world prices did not change because the same internal standard is applied to both domestic produced and imported goods, the wedge between the consumer price and the world price, however, increased by the amount of regulatory cost t_i. Assume the efficient level of SPS for Home σ_i is higher than that of the Foreign counterpart σ_i^*. When acting non-cooperatively, for Home, setting the level of SPS, t_i somewhere between $(\sigma_i^*, \sigma_i]$ would make SPS measure act the same way as tariff.

To find out the first-best agreement without an HSPS provision, we can transform these new pricing relationships in the familiar form:

$$q_i = \mathrm{T_i} \omega_\mathrm{i}, \tag{25}$$

and

$$p_i = \mathrm{T_i} \omega_\mathrm{i} + \mathrm{S_i}, \tag{26}$$

where $\mathrm{T_i} = (\tau_\mathrm{i} + \mathrm{t_i}/\omega_\mathrm{i})$ and $\mathrm{S_i} = \mathrm{s_i} - \mathrm{t_i}$. Therefore the role of the import tariff τ_i is now replaced by $\mathrm{T_i}$, the "total tax on imports" and the role of the production subsidy s_i is now played by $\mathrm{S_i}$, the "effective production subsidy." Hence, in the absence of an HSPS clause, the previous first-best agreement can be replicated by applying $\mathrm{T_i}$ and $\mathrm{S_i}$, with the same cost of including the same state variables, but doubling the cost of including policy variables $\mathrm{T_i} = (\tau_\mathrm{i} + \mathrm{t_i}/\omega_\mathrm{i})$ and $\mathrm{S_i} = \mathrm{s_i} - \mathrm{t_i}$.

$$A^1 = \left\{ \mathrm{T_i} = \mathrm{T_i^*}, \mathrm{S_i} = \frac{\mathrm{I_{iL}} - \alpha_\mathrm{L}}{\mathrm{a} + \alpha_\mathrm{L}} \frac{\mathrm{p_i}}{\eta_\mathrm{i}}, \mathrm{S_i^*} = \frac{\mathrm{I_{iL}^*} - \alpha_\mathrm{L}^*}{\mathrm{a}^* + \alpha_\mathrm{L}^*} \frac{\mathrm{p_i^*}}{\eta_\mathrm{i}^*} \right\}, \tag{27}$$

This has $n_p = 6n$ and $n_s = 4 + 4n$ and therefore costs $c(6n, 4 + 4n)$.

When the HSPS provision is included in trade agreements, we have $t_i = t_i^*$. The question to be

answered is under what circumstances is it desirable to include the HSPS provision while leaving the level of SPS, proxied by t_i, to discretion. First, observing that an agreement

$$A^2 = \left\{ \text{HSPS}, \tau_{\text{i}} = \tau_{\text{i}}^*, \text{s}_{\text{i}} = \frac{\text{I}_{\text{iL}} - \alpha_{\text{L}}}{\text{a} + \alpha_{\text{L}}} \frac{\text{p}_{\text{i}}}{\eta} + \sigma_{\text{i}}^{\text{E}}, \text{s}_{\text{i}}^* = \frac{\text{I}_{\text{iL}}^* - \alpha_{\text{L}}^*}{\text{a}^* + \alpha_{\text{L}}^*} \frac{\text{p}_{\text{i}}^*}{\eta^*} + \sigma_{\text{i}}^{\text{E}}, \text{t}_{\text{i}} = \sigma_{\text{i}}^{\text{E}} \right\}, \tag{28}$$

where σ_i^E is the efficient level of SPS, and, $HSPS$ represents using $2n$ policy instruments (t_i=t_i^*). It is straightforward to see that the HSPS-based agreement A^2 can realize the same $\mathbb{E}(\Omega)$ as non-HSPS first best agreement A^1, but costs $c(6n, 4+5n)$, so it may not qualify as an optimal trade agreement. Consider the following HSPS-based agreement:

$$A^3 = \left\{ \text{HSPS}, \tau_{\text{i}} = \tau_{\text{i}}^*, \text{s}_{\text{i}} = \frac{\text{I}_{\text{iL}} - \alpha_{\text{L}}}{\text{a} + \alpha_{\text{L}}} \frac{\text{p}_{\text{i}}}{\eta}, \text{s}_{\text{i}}^* = \frac{\text{I}_{\text{iL}}^* - \alpha_{\text{L}}^*}{\text{a}^* + \alpha_{\text{L}}^*} \frac{\text{p}_{\text{i}}^*}{\eta^*} \right\}. \tag{29}$$

A^3 saves on contracting costs by reducing the number of required contingencies as a result of omitting σ_i^E but may result in a reduction of payoff of the agreement because of possible distortions to terms-of-trade caused by leaving t_i unregulated.

Again, we can denote the non-cooperative choice of t conditional on P and P^* as $t^N(P, P^*)$ and the efficient level of t conditional on P and P^* as $t^E(P, P^*)$. The gain in $\mathbb{E}(\Omega)$ implied by substituting $t^E(P, P^*)$ for $t^N(P, P^*)$ is the additional gain of restricting SPS level in an HSPS-based trade agreement, which can be expressed as:

$$\begin{aligned}
&\Omega\left(t_i^E(P,P^*), t_i^E(P,P^*), P, P^*, \cdot\right) - \Omega\left(t_i^N(P,P^*), t_i^N(P,P^*)P, P^*, \cdot\right) \\
&= \int_{t_i^N(P,P^*)}^{t_i^E(P,P^*)} \frac{\partial \Omega}{\partial t_i}\left(t_i, t_i, P, P^*\right) \mathrm{d}t_i. \\
&= \int_{t_i^N(P,P^*)}^{t_i^E(P,P^*)} \frac{\partial \Omega}{\partial t_i}(t_i, t_i^*, P, P^*)\mathrm{d}t_i + \int_{t_i^{*N}(P,P^*)}^{t_i^{*E}(P,P^*)} \frac{\partial \Omega}{\partial t_i^*}\left(t_i, t_i^*, P, P^*\right) \mathrm{d}t_i^* + \mathcal{O}(t_i^E(P,P^*) - t_i^{*E}(P,P^*))
\end{aligned} \tag{30}$$

where it is assumed that Home has the political power of unilaterally determining non-coopoerative level of t_i in an HSPS based agreement. Following steps similar to those in last section, we observe that a sufficient condition for this gain in $\mathbb{E}(\Omega)$ to be small is that $|\frac{\partial \Omega}{\partial t_i}\left(t_i^N(P,P^*), t_i^{*N}(P,P^*), P, P^*, \cdot\right)|$ and $|\frac{\partial \Omega}{\partial t_i^*}\left(t_i^N(P,P^*), t_i^{*N}(P,P^*), P, P^*, \cdot\right)|$ are small. After some manipulation, we get:

$$|\frac{\partial \Omega}{\partial t_i}\left(t_i^N(P,P^*), t_i^{*N}(P,P^*), P, P^*, \cdot\right)| = \frac{a|D_i{}'|}{|M_i'|\tau_i + X_i^{*\prime}\tau_i^*}|Z_i(\tau_i^*, s_i^*, M_i)|, ^{\ddagger\ddagger}$$

[‡‡]It is straightforward to derived similar expression for Z_i^*

where $Z_i(\tau_i^*, s_i^*, M_i) = (I_{iL}^* - a_L^*)X_i^*\tau_i^* - (a^* + a_L^*)X_i^{*\prime}\tau_i^*[(\tau_i^* - 1)\omega_i + s_i^*] + (a^* + a_L^*)M_i$.

Based on equation (31), again it is straightforward to reach the following proposition related to an HSPS-based trade agreement following similar procedures to last section:

Proposition 3. *(a) If* sufficient restriction *has been imposed on Foreign border and production measures that increase the trade volume, i.e., $Z_i(\tau_i^*, s_i^*, M_i) > 0$, so that M_i is positively associated with the payoff of binding internal regulation t_i, and M_i is sufficiently small, there is a range of contracting costs for which it is optimal to include the the HSPS clause and leave the common regulatory level, proxied by t_i to discretion. (b) If D_i' is sufficiently small, or $|M_i'|$ is sufficiently large, so that t_i is a poor substitute for τ_i as an instrument for manipulating terms of trade, there is a range of contracting costs for which it is optimal to include the HSPS clause and leave the common regulatory level, proxied by t_i to discretion.*

Proposition 3 summarizes two sufficient conditions under which the payoff of binding the SPS (t) is too small to offset accompanying contracting costs; that is, it is optimal to include an HSPS clause without specifying a particular SPS level in a trade agreement. This helps explain the emerging trend of the provision towards the progress of harmonization of SPS measures primarily dealing with agriculture and food products (i.e. the creation of joint SPS Committees). Other examples include the adoption of international standards and mutual agreed determinations recognizing regional conditions regarding SPS in recent RTAs (i.e. USMCA, CPTPP, the EU-Japan trade agreement, the China-Australia Free Trade Agreement (ChAFTA)), where significant liberalizations are made on subsidies and tariffs, while specific regulation levels of SPS measures are largely left to discretion.

5 Conclusions

In this manuscript, we attempt to merge two disparate frameworks by incorporated both political pressure and contracting costs in analyzing trade agreements. Like many previous studies in the political economy literature, we view governments as agents that maximize their own interests in response to political pressure rather than as benevolent agents that maximize aggregate social welfare. Grossman and Helpman (1994) introduced the first coherent theoretical model of endogenous trade policy formation and concluded that tariff rates are affected both by a *political support* motive and a *terms-of-trade* motive. However, an implicit assumption is that less distorting domestic policies are not available for redistribution (which is not the case). Schleich and Orden (1996) included both trade and domestic production policies and concluded that production subsidies can perfectly

substitute for trade policies that would have otherwise resulted from rent seeking efforts. As a result, when countries act non-cooperatively, tariff rates are exactly Johnson's optimal tariff rates, which represents *only* the *terms-of-trade* motive. Our proposed political economy model goes further by identifying the politically optimal policy choices in a cooperative equilibrium, or, a first-best trade agreement with zero contracting costs. In addition, we extend the literature on politically motivated trade agreement policy formation by: (i) allowing for contracting costs; (ii) introducing uncertainty via trade and policy shocks; and (iii) allowing for heterogeneous policy options and effects (across countries).

Similar to models based on externalities, our political economy model predicts that uncertainty induces a trade-off between contracting costs and including more state contingent policies. The sources of uncertainty, however, focus on economic and political shocks in place of empirically non-verifiable externalities. This replacement yields additional insights into the mechanisms that drive trade agreements. For example, when contracting is costly, a politically optimal trade agreement does not replicate the social optimum unless all sectors are organized. In particular, a politically optimal trade agreement permits the use of countervailing duties. In addition, conditions under which restricting domestic support is optimal are different under politically motivated goverments versus benevolent governments that do not value political interest. Our model provides a political economy rationale for countervailing duty law by showing that a costless politically optimal trade agreement would lead to equalization of tariff rates in the importing country and export subsidy rates in the exporting country (as production subsidies can be used to redistribute and meet interest groups' demand). Our derivation shows that when political economy motives are considered, cooperative production subsidy rates are the same as those in a non-cooperative equilibrium, confirming that a trade agreement which restricts production subsidies but not tariffs is not optimal.

Finally, our model helps explain why tariffs rather than production subsidies are more common in agriculture, differential treatment of agricultural producers in developed versus developing countries, continued presence of agricultural subsidies in many RTAs even under significant trade volume growth, and the trend toward harmonization of SPS measures.

References

Bagwell, K. and R.W. Staiger (1999), "An Economic Theory of GATT." *American Economic Review*, 89, 215–248.

Baier, Scott L and Jeffrey H Bergstrand (2007), "Do free trade agreements actually increase members' international trade?" *Journal of International Economics*, 71, 72–95.

Battigalli, P. and G. Maggi (2002), "Rigidity, discretion, and the costs of writing contracts." *American Economic Review*, 92, 798–817.

Copeland, B.R. (1990), "Strategic interaction among nations: negotiable and non-negotiable trade barriers." *Canadian Journal of Economics*, 84–108.

Eicher, Theo and Thomas Osang (2002), "Protection for sale: An empirical investigation: Comment." *The American Economic Review*, 92, 1702–1710.

Findlay, Ronald and Stanislaw Wellisz (1982), "Endogenous tariffs, the political economy of trade restrictions, and welfare." In *Import competition and response* (Jagdish Bhagwati, ed.), 223–244.

Gaisford, James D, William A Kerr, et al. (2001), *Economic analysis for international trade negotiations. The WTO and agricultural trade.* Edward Elgar Publishing.

Gawande, Kishore and Usree Bandyopadhyay (2000), "Is protection for sale? evidence on the grossman-helpman theory of endogenous protection." *Review of Economics and statistics*, 82, 139–152.

Goldberg, Pinelopi Koujianou and GiovanniI Maggi (1999), "Protection for sale: An empirical investigation." *The American Economic Review*, 89, 1135–1155.

Grant, Jason H and Kathryn A Boys (2011), "Agricultural trade and the gatt/wto: does membership make a difference?" *American Journal of Agricultural Economics*, 94, 1–24.

Grant, Jason H and Dayton M Lambert (2008), "Do regional trade agreements increase members' agricultural trade?" *American journal of agricultural economics*, 90, 765–782.

Grossman, G.M. and E. Helpman (1994), "Protection for sale." *American Economic Review*, 84, 833–850.

Grossman, G.M. and E. Helpman (1995a), "Trade wars and trade talks." *Journal of Political Economy*, 103, 675–708.

Hertel, Thomas W, Roman Keeney, Maros Ivanic, and L Alan Winters (2007), "Distributional effects of wto agricultural reforms in rich and poor countries." *Economic Policy*, 22, 290–337.

Horn, H. (2006), "National treatment in the GATT." *American economic review*, 96, 394–404.

Horn, H., G. Maggi, and R.W. Staiger (2010), "Trade agreements as endogenously incomplete contracts." *The American Economic Review*, 100, 394–419.

Maggi, G. and A. Rodriguez-Clare (1998), "The value of trade agreements in the presence of political pressures." *Journal of Political Economy*, 574–601.

Maggi, G. and A. Rodriguez-Clare (2007), "A political-economy theory of trade agreements." *American economic review*, 97, 1374–1406.

McCalman, Phillip (2004), "Protection for sale and trade liberalization: an empirical investigation." *Review of International Economics*, 12, 81–94.

Mitra, Devashish, Dimitrios D Thomakos, and Mehmet A Ulubasoglu (2002), ""protection for sale" in a developing country: democracy vs. dictatorship." *Review of Economics and Statistics*, 84, 497–508.

Moon, Wanki and Gabriel Pino (2018), "Do us citizens support government intervention in agriculture? implications for the political economy of agricultural protection." *Agricultural Economics*, 49, 119–129.

Nordhaus, W.D. (1975), "The political business cycle." *Review of Economic Studies*, 42, 169–190.

Schleich, J. and D. Orden (1996), "Efficient choice among domestic and trade policies in the grossman-helpman interest-group model." Bulletins 7458, University of Minnesota, Economic Development Center, URL `http://ideas.repec.org/p/ags/umedbu/7458.html`.

Vollrath, Thomas L, Charles B Hallahan, and Mark J Gehlhar (2006), "Consumer demand and cost factors shape the global trade network in commodity and manufactured foods." *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, 54, 497–511.

Wacziarg, Romain and Karen Horn Welch (2008), "Trade liberalization and growth: New evidence." *The World Bank Economic Review*, 22, 187–231.

Appendix

Derivation of Home's non-cooperative policies defined by equations(12) and (13)

Let $P^0 = (\tau^0, s^0)$ and $P^{*0} = (\tau^{*0}, s^{*0})$ and assume that contribution schedules are differentiable around the equilibrium point. The first-order conditions (FOC) of equations (10) and (11) give

$$\sum_{j \in L} \nabla_P C_j^0(P^0, P^*) + a \nabla_P W(P^0, P^*) = 0, \tag{A.1}$$

and

$$\begin{aligned} &\nabla_P W_i(P^0, P^*) - \nabla_P C_i^0(P^0, P^*) \\ &+ \sum_{j \in L} \nabla_P C_j^0(P^0, P^*) + a \nabla_P W(P^0, P^*) = 0 \text{ for all } i \text{ in } L. \end{aligned} \tag{A.2}$$

The system above implies

$$\nabla_P C_i^0(P^0, P^*) = \nabla_P W_i(P^0, P^*) \text{ for all } i \text{ in } L. \tag{A.3}$$

Summing equation (A.3) over all i and substituting into equation (A.1) gives

$$\sum_{i \in L} \nabla_P W_i(P^0, P^*) + a \nabla_P W(P^0, P^*) = 0. \tag{A.4}$$

This equation gives the equilibrium Home policy choices conditional on Foreign policy vector P^*. Similarly, we can obtain the following equilibrium Foreign policy vectors

$$\sum_{i \in L^*} \nabla_{P^*} W_i^*(P^{*0}, P) + a^* \nabla_{P^*} W^*(P^{*0}, P) = 0. \tag{A.5}$$

We characterize the non-cooperative equilibrium policy vectors by substituting P^{*0} for P^* in equation (A.4) and P^0 for P in equation (A.5) and treating these as a system of simultaneous equations. Substituting $P^0 = (\tau^0, s^0)$ into equation (A.4) and taking derivatives gives

$$\begin{aligned} &(I_{iL} - \alpha_L)(\omega_i + \tau_i^0 \omega_{i1}) X_i + (a + \alpha_L)[(\tau_i^0 - 1)\omega_i M_i'(\omega_i + \tau_i^0 \omega_{i1}) \\ &- \omega_{i1} M_i - s_i^0 X_i'(\omega_i + \tau_i^0 \omega_{i1})] = 0, \end{aligned} \tag{A.6}$$

and

$$(I_{iL}-\alpha_L)(\tau_i^0\omega_{i2}+1)X_i+(a+\alpha_L)\{(\tau_i^0-1)\omega_i[D_i'\tau_i^0\omega_{i2}-X_i'(\tau_i^0\omega_{i2}+1)]$$
$$-\omega_{i2}M_i-s_i^0X_i'(\tau_i^0\omega_{i2}+1)\}=0. \tag{A.7}$$

From equation (5) we find the partial derivatives of the world price functions, $\omega_{i1}=\partial\omega_i/\partial\tau_i=-M_i'\omega_i/(M_i'\tau_i+M_i^{*\prime}\tau_i^*)$, $\omega_{i2}=\partial\omega_i/\partial s_i=X_i'/(M_i'\tau_i+M_i^{*\prime}\tau_i^*)$. Substituting them into equations (A.6) and (A.7) yields equations (12) and (13).

Proof of Proposition 1

Following the same derivations as the non-cooperative case, we can show that the following two conditions are satisfied:

$$a^*\sum_{i\in L}\nabla_P W_i(P^0,P^{*0})+a\sum_{i\in L^*}\nabla_P W_i^*(P^{*0},P^0)+a^*a[\nabla_P W(P^0,P^{*0})$$
$$+\nabla_P W^*(P^{*0},P^0)]=0, \tag{A.8}$$

and

$$a^*\sum_{i\in L}\nabla_{P^*} W_i(P^0,P^{*0})+a\sum_{i\in L^*}\nabla_{P^*} W_i^*(P^{*0},P^0)+a^*a[\nabla_{P^*} W(P^0,P^{*0})$$
$$+\nabla_{P^*} W^*(P^{*0},P^0)]=0. \tag{A.9}$$

It is convenient to begin with the case in which factor owners represented by lobby groups comprise a negligible fraction of the voters in each country, i.e., $a_L=a_L^*=0$. Substituting $P^0=(\tau^0,s^0)$ into equation (A.8) and solving yield the globally efficient policies defined by

$$\tau_i^0-\tau_i^{*0}=\left(-\frac{I_{iL}}{a}\frac{X_i}{\omega_i M_i'}+s_i^0\frac{X_i'}{\omega_i M_i'}\right)-\left(-\frac{I_{iL}^*}{a^*}\frac{X_i^*}{\omega_i M_i^{*\prime}}+s_i^{*0}\frac{X_i^{*\prime}}{\omega_i M_i^{*\prime}}\right), \tag{A.10}$$

and

$$a^*aX_i'[s_i^0(D_i'\tau_i^0+M_i^{*\prime}\tau_i^{*0})+s_i^{*0}X_i^{*\prime}\tau_i^{*0}]=a^*(D_i'\tau_i^0+M_i^{*\prime}\tau_i^{*0})I_{iL}X_i+aX_i'\tau_i^{*0}I_{iL}^*X_i^*$$
$$-a^*aX_i'(\tau_i^0-\tau_i^{*0})\omega_i M_i^{*\prime}\tau_i^{*0}. \tag{A.11}$$

Solving the system of equations gives

$$s_i^e = \frac{I_{iL}}{a} \frac{X_i}{X_i'}. \tag{A.12}$$

Similarly, from equation (A.9) we get

$$s_i^{*e} = \frac{I_{iL}^*}{a^*} \frac{X_i^*}{X_i^{*\prime}}. \tag{A.13}$$

Substituting equations (A.12) and (A.13) into equation (A.10) yields:

$$\tau_i^e = \tau_i^{*e}, \tag{A.14}$$

We can extend the analysis to the more general case. When $a_L > 0$ and $a_L^* > 0$, equation (A.14) still holds. With respect to production policies, it is straightforward to replace a^*, a, I_{iL} and I_{iL}^* with $a^* + \alpha_L^*$, $a + \alpha_L$, $I_{iL} - \alpha_L$ and $I_{iL}^* - \alpha_L^*$ in equations (A.10) and (A.11) and follow the process as the derivation of equation (A.12) to obtain:

$$s_i^e = \frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{p_i}{\eta_i}, \tag{A.15}$$

and

$$s_i^{*e} = \frac{I_{iL}^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{p_i^*}{\eta_i^*}, \tag{A.16}$$

where $\eta_i^* \equiv p_i^* X_i^{*\prime} / X_i^*$ is the elasticity of supply in industry i in Foreign. Comparing equation (A.15) with equation (15), we find that the expression for the non-cooperative and globally efficient levels of s_i are the same. For a given state of the world, that is, fixing I_{iL}, α_L, a, η_i, the rate of production subsidy/tax ($|s_i|/p_i$) remains unchanged whether or not Home and Foreign cooperate.