Trade Agreements and Endogenously Incomplete Contracts: A Political Economy Approach

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Abstract

We develop a political economy model of trade agreements that incorporates contracting costs and uncertainty. The model delivers simple expressions for policy bindings with parameters relating to trade shocks and to political demand shocks. We identified conditions under which the trade volume is positively associated with the payoff of restricting production subsidy/consumption tax. Our model helps explain differential treatment on subsidies, countervailing duties, and the national treatment principle—all key provisions of the current WTO agreement.
Introduction

The divergence of trade policy from trade theory has justifiably drawn significant attention. Trade agreements have never been easy to negotiate (e.g. World Trade Organization (WTO) Doha round) nor have they always been effectively enforced. 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 approach takes trade agreements as incomplete contracts and utilizes contract theory (see [1–3]). Because of uncertainty, a complete contract needs to be able to foresee every possible regulatory need and state-contingent. However, as noted by Horn [2], writing and enforcing such an agreement is impossibly complex and costly. As a result, in reality trade agreements are incomplete contracts. Internal measures, for instance, are not explicitly covered in the General Agreement on Tariffs and Trade (GATT). Horn et al. [3] explain the forms of contractual incompleteness of trade agreements by assuming the set of policy instruments to be endogenous determined. They identify a monopoly power effect (denoted by Johnston’s optimal tariff rate), a trade volume effect, and an instrument substitutability effect as the key features of the contracting environment that determine the welfare loss of leaving discretion over production subsidy/consumption tax in a trade agreement.

The second approach explicitly accounts for political pressure and argues trade-related policy intervention is largely shaped in response to rent seeking demand. This approach is consistent with the empirical evidence that many free-trade-resistant industries such as the agricultural and food sector maintain significant rent seeking activities. The milestone work of Grossman and Helpman [4–6] “protection for sale” (PFS) model brings rent seeking behavior into the realm of trade policy analysis and concludes tariff rates are affected both by a political support motive and a terms-of-trade motive. The central predictions emphasize determinants of cross-sectional differences in protection. First, the relationship between trade protection and import penetration depends fundamentally on whether or not an industry is politically organized. Second, protection depends inversely on import demand elasticity. Schleich and Orden [7] extended the original PFS model by incorporating domestic production policies and conclude 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 given the presence of production subsidies. Maggi and Rodriguez-Clare [9,10] argued that in addition to the terms-of-trade motive, there is a domestic-commitment motive for trade agreements as governments use trade agreements as a credible announcement in a principal-agent game with domestic lobbies.

Both approaches contribute to our understanding of the structure of trade agreements. The incomplete-contract approach helps to explain why certain policy instruments are included in a trade agreement while the political economy approach helps to determine endogenously the formation of commitments on each policy given the set of policy instruments. The typical incomplete-contract approach, however, assumes that production and consumption externalities give rise to policy intervention. However, externalities are not readily verifiable and thus there is very little empirical investigation on the theoretical predictions of optimal policy levels. In addition, an implicit assumption is that governments are benevolent and immune from political pressure. As noted by Bagwell and Staiger [11], it is thus important to consider further the rationale for a trade agreement, within a richer model in which governments may have political

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1Schleich and Orden [8] incorporated both externality and political economy motive in the trade agreement framework to address the issue of environment quality.

2Horn et al. [3] explored a political economy version of their model as well but utilized a reduced form for the politician’s objective function and assumed that governments place a greater weight on producer surplus. However, as Grossman and Helpman [4, pg. 834] noted in their paper, a reduced form would catch the effects of institutional changes on a government’s willingness and ability to protect particular interest groups but not on the government’s weighting of political contributions relative to national welfare. In addition, most of our results could not be obtained with a reduced-form approach, for example, the political economy rationale for countervailing duty law and the implication of uncertainty about the structural change of lobbies, and governments’ weight on contributions.
concerns. Note that the political economy approach lends itself to empirical verification. The predictions from PFS model were first tested in [12] and [13] in a U.S. context. Recent work of McCalman [14] has applied the PFS model to analyze ongoing trade liberalization in Australia. Mitra et al [15] have tested the PFS predictions in Turkey, a developing country. These analyses generally found the PFS predictions to be consistent with the empirical data. Eicher and Osang [16] perform a comparison of predictions from the PFS model with those of Findlay and Wellisz’s [17] tariff formation function model and found both models perform well with the data. Note however that the political economy literature does not explain why trade agreements feature discretion over a production subsidy and/or an internal consumption tax.

We develop a political economy model of trade agreements which incorporates uncertainty and contracting costs. Adding incomplete contract theory to the political economy framework yields new insights into the mechanisms that drive trade agreements. First, if contracting costs are zero it is optimal to use only a tariff to offset a foreign export subsidy, as domestic production subsidies can substitute for trade policies to manipulate terms of trade and still meet lobbyists’ rent seeking demand. This provides a novel rationale for countervailing duties (CVDs) in WTO. Second, if contracting costs are positive and finite, an agreement should consider a trade-off between contracting costs and including more state contingent policy bindings. We argue that the uncertainty of the contracting environment comes not only from trade shocks but also from political demand shocks. The political economy motives, as Horn et al note, are clearly important considerations for real-world trade policy determination.

Working within a competitive two-country setting, we characterize the choice of policy instruments and binding contingencies in trade agreements endogenously following steps in Horn et al [3]. There are several differences between our paper and that of Horn et al: First, they assume governments as benevolent agents that intervene in markets to counteract the externality. By contrast, we view trade-related policy instruments as a means of meeting rent seeking demand. We follow Grossman and Helpman [5] by assuming that governments’ objective function is an expected weighted sum of aggregate social welfare and total political contributions received from the lobbies. Second, the sources of uncertainty in the contracting environment are different. Horn et al [3] consider three sources of uncertainty: the consumption externality, the production externality, and the import demand shocks. While retaining the trade volume shocks, we introduce additional four sources of uncertainty: the policy preference parameters, the proportion of lobbies, the lobbying status of an industry and the price elasticity of supply. Third, it is assumed that each government can intervene only in its import sector in Horn et al’s two goods model, whereas we use a multi-commodity model where both countries can interact in any import or export sector, permitting the use and necessary regulation of anti-subsidy (countervailing) duties.

Analysis

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 nonnumeraire 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:

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

Maggi and Rodriguez-Clare [9,10] also utilized incomplete contract theory as they found that the optimal agreement that stipulates discretionary tariffs below the upper bound is identical to an incomplete contract which fails to specify the future contributions of a lobby. However, as they noted, their model does not capture other important factors such as uncertainty and contracting costs, which is the focus of our present paper.
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

$$v(q, e) = e + S(q),$$

where $e$ is total spending, and $q = (q_1, q_2, \ldots, q_n)$ is the vector of domestic consumer prices of the nonnumeraire goods and $S(q) \equiv \sum_i u_i[D_i(q_i)] - \sum_i q_iD_i(q_i)$ 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 functions $u_0$. 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 nonnumeraire sectors using an \textit{ad valorem} tariff/export subsidy and a specific domestic production subsidy/tax.\footnote{We introduce consumption taxes as a policy instrument later when analyzing the effect of a National Treatment clause.} We denote the \textit{ad valorem} tariff or export subsidy for industry $i$ by $\tau_i$ and thus

$$q_i = \tau_i \omega_i,$$

where $\omega_i$ 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

$$p_i = q_i + s_i.$$

Net imports of good $i$ in Home are $M_i = N D_i(q_i) - X_i(p_i)$, where $N$ is the size of the population, which we henceforth 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

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

Equation (1) allows us to solve for $\omega_i$, the world market clearing price of good $i$, as a function of $\tau_i$, $\tau_i^*$, $s_i$ and $s_i^*$. We denote this functional relationship by $\omega_i(\tau_i, \tau_i^*, s_i, s_i^*)$.

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

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

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 [4] 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 noncooperative 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 lobby group $i$ can be expressed as

$$V_i = W_i(\tau, s, \omega) - C_i(\tau, s, \cdot),$$

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, $\alpha_i$ 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

$$G = \sum_{i \in L} C_i(\tau, s, \cdot) + a W(\tau, s, \omega), \quad a \geq 0$$

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

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

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 the intra-national level, various lobbies in each country simultaneously and noncooperatively 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 and abroad. Second, at the international level, both governments weigh net payoffs from acting cooperatively versus noncooperatively. 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 Noncooperative Equilibrium

We derive the policy choices which occur in the absence of a trade agreement (i.e., a noncooperative equilibrium). Taking foreign government’s policies $(\tau^*, s^*)$ as given, Home government’s noncooperative policy vector satisfies the following two conditions:

$$\left(\tau^0, s^0\right) = \arg \max_{(\tau, s)} G(\tau, s, \tau^*, s^*),$$

5Those industries which do not organize have $C_i(\tau, s, \cdot) = 0$. 
and

\[(\tau^0_i, s^0_i) = \arg \max \left[ V_i(\tau, s, \tau^*, s^*) + G(\tau, s, \tau^*, s^*) \right] \text{ for every } i \in L.\]  

(3)

The above two conditions follow directly from the proposition 1 of Grossman and Helpman [4] by setting \( P^0 = (\tau^0, s^0) \) and \( P^\ast = (\tau^\ast, s^\ast) \), and the system of equations can be easily solved (see appendix) to obtain an expression for Home’s equilibrium policies given by

\[
\tau_i^0 - 1 = \frac{I_{iL} - \alpha L}{a + \alpha L} \frac{X_i}{M_i} + \frac{1}{\epsilon_i^s} + s_i^0 \frac{X'_i}{\omega_i M'_i},
\]

(4)

and

\[
s_i^0 = \frac{I_{iL} - \alpha L}{a + \alpha L} \frac{X_i}{X'_i} - \frac{M_i + (\tau_i^0 - 1)\alpha L M'_i/\omega_i M_i}{D'_i \tau_i^0 + M'_i \epsilon_i^s \tau_i^s},
\]

(5)

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 \( \epsilon_i^s \equiv \tau_i^s \omega_i M'_i/\omega_i M_i \) is the elasticity of Foreign export supply or import demand (corresponding to \( M_i^* \) is negative or positive) in industry \( i \).

Equation (4) defines the noncooperative choice of \( \tau_i \) given domestic production policy \( s_i \) and Foreign policies (\( s_i^* \) and \( \tau_i^* \)). The three terms on the right-hand side of equation (4) 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 noncooperative trade policies in Grossman and Helpman [5]. Thus, the noncooperative equilibrium trade policies defined by Grossman and Helpman [5] is a special case when the government cannot implement production policies (\( s_i \equiv 0 \)). Equation (4) 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 (e.g. infant industries), may be more likely to lobby for high tariffs in comparison to other sectors. As we will show later in this manuscript, it therefore saves contracting costs by leaving out production subsidies while maintaining trade policy commitments for these industries in trade agreements.

Equation (5) defines the noncooperative choice of \( s_i \) given Home trade policy \( \tau_i \) and Foreign policies (\( s_i^* \) and \( \tau_i^* \)). The two terms on the right-hand side of equation (5) represent the political support motive, and the substitutability of trade policies for production subsidies respectively.

Solving equations (4) and (5) yields Home’s noncooperative policies

\[
\tau_i^0 - 1 = \frac{1}{\epsilon_i^s},
\]

(6)

and

\[
\frac{s_i^0}{p_i} = \frac{I_{iL} - \alpha L}{a + \alpha L} \frac{1}{\eta_i},
\]

(7)

where \( \eta_i \equiv p_i X'_i/X_i \) is the elasticity of supply in industry \( i \) in Home. Not surprisingly, equation (6) illustrates that Home exploits any international markets 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 production subsidy (tax) replaces tariff (export tax) to compensate the lobbyists’ political contributions. Equation (7) reflects that, in a noncooperative 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 (\( I_{iL} = 0 \)).
The Costless Efficient Trade Agreement

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 \( \Omega \):

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

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 noncooperative case. The interpretation is \( \Omega \) represents the payoff of a global government that consists of two countries each has its own policy preference, and international lump-sum transfers are available. A close real life example is the European Union (EU). Following similar process by Grossman and Helpman [5], it can be shown that the bargaining game can achieve the same equilibrium when international transfer payment is infeasible.

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 \( i \), (i) the tariff rate \( \tau_i \) in the importing country is equal to the export subsidy rate \( \tau_i^* \) in the exporting country, and (ii) 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

\[
s_i^e = \frac{I_i - \alpha L \ p_i}{a + \alpha L \ \eta_i}
\]

Proposition [4] provides a novel rationale for WTO’s countervailing duty law: provided production subsidies are the available domestic policy to meet lobbies’ demand for economic rent, a clause that stipulates equal rates of tariff \( \tau \) and foreign export subsidy \( \tau^* \) removes inefficiency resulting from trade policies by making distortionary border measures offset each other. Note this prediction differs from that in Grossman and Helpman [5], which rely on the assumption that governments can not use domestic subsidies at their disposal. Recall the interpretation of equation [6] is that absent 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 [4] is that global inefficiency cannot be created by the lobbying over domestic production policies. It follows intuitively that, as predicted by Horn et al. [3], an agreement that only has commitment for domestic subsidies \( s \) cannot increase global payoff relative to the noncooperative equilibrium and thus is not an optimal agreement.

The Optimal Trade Agreement

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 \( (a \text{ and } a^*) \), the fraction of population that is...
represented by lobbies ($\alpha_L$ and $\alpha^*_L$), whether an industry organizes or dissolves its political lobby ($I_{IL}$ and $I^*_{IL}$), the price elasticity of supply ($\eta_i$ and $\eta^*_i$), and international trade shocks. Second, we assume that there are two categories of contracting costs: the costs of including state variables (e.g. $a$, $\alpha_L$, $I_{IL}$, $M_i$ and their foreign counterparts), and the costs of including policy variables (e.g. $\tau$ and $s$ and their foreign counterparts). Following Battigalli and Maggi [19], 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:

$$c = c(n_p, n_s), \quad c'_{n_p} > 0, c'_{n_s} > 0,$$

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 expected global Policy Preference Function (PPF) less contracting costs. An agreement of the form

$$A^0 = \left\{ \tau_i = \tau_i^*, s_i = \frac{I_{IL} - \alpha_L \rho_i}{a + \alpha_L \eta_i}, s^*_i = \frac{I^*_{IL} - \alpha^*_L \rho^*_i}{a^* + \alpha^*_L \eta^*_i} \right\},$$

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 $E(\Omega) - c(4n, 4 + 4n)$. 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 noncooperative equilibrium occurs. The interesting case is where contracting costs matter but do not preclude a trade agreement.

We have previously shown that the inefficiency in the noncooperative equilibrium results from $\tau$, not $s$, and thus an optimal trade agreement should at least impose commitment on $\tau$. The question remaining is whether $s$ should be exempt from reduction commitments under the agreement.

Recall equation (5) gives the expression for $s^N_i(\tau_i, \tau^*_i)$, the noncooperative choice of $s_i$ if $\tau_i$ and $\tau^*_i$ are contiguously bound but $s_i$ and $s^*_i$ are left to discretion. That is

$$s^N_i(\tau_i, \tau^*_i) = \frac{I_{IL} - \alpha_L X_i}{a + \alpha_L X^*_i} - (\tau_i - 1)\omega_i \frac{M'_i \tau^*_i}{D'_{\tau_i} + M''_i \tau^*_i} - \frac{M_i}{D'_{\tau_i} + M''_i \tau^*_i}.$$

Similarly, we can get

$$s^*_N_i(\tau_i, \tau^*_i) = \frac{I^*_{IL} - \alpha^*_L X^*_i}{a^* + \alpha^*_L X^*_i} - (\tau^*_i - 1)\omega_i \frac{M'_i \tau^*_i}{D'_{\tau^*_i} + M''_i \tau^*_i} - \frac{M^*_i}{D'_{\tau^*_i} + M''_i \tau^*_i}.$$

The efficient choice of production policies, $s^E_i(\tau_i, \tau^*_i)$ and $s^*_E_i(\tau_i, \tau^*_i)$ solves $\nabla_s \Omega(P, P^*) = 0$, and $\nabla_{\tau_i} \Omega(P, P^*) = 0$ simultaneously.

Whether a trade agreement which binds $\tau_i$ should also includes commitment over $s_i$ depends on the magnitude of the gain in expected $\Omega$ implied by replacing $s^N_i(\tau, \tau^*)$ with $s^E_i(\tau, \tau^*)$. 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 $s^N_i(\tau_i, \tau^*_i) > s^*_E_i(\tau, \tau^*)$ and $s^*_N_i(\tau_i, \tau^*_i) > s^*_E_i(\tau, \tau^*)$ for a given state of the world, the gain of restricting $s_i$ and the of $s^*_i$ is given by

$$\Omega(s^E_i(\tau_i, \tau^*_i), s^*_E_i(\tau_i, \tau^*_i), \tau, \tau^*, \cdot) - \Omega(s^N_i(\tau_i, \tau^*_i), s^*_N_i(\tau_i, \tau^*_i), \tau, \tau^*, \cdot).$$

$$= \int s^E_i(\tau, \tau^*) \frac{\partial \Omega}{\partial s_i}(P, P^*) ds_i + \int s^*_N(\tau, \tau^*) \frac{\partial \Omega}{\partial s^*_i}(P, P^*) ds^*_i. \quad (8)$$

9Technological changes can affect the price elasticity of supply ($\eta_i$) 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 [18, pg. 188] noted the implicit weighting function on consumption has 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.

10We adopt the definition of contracting costs by Horn et al. [3], 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.
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 \( \Omega \) is concave in \( s \) and \( s^* \), a sufficient condition for the right-hand side in equation (5) 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 \( \frac{\partial \Omega}{\partial s_i} \left( s_i^N(\tau_i, \tau_i^*), s_i^N(\tau_i, \tau_i^*), \tau, \tau^*, \cdot \right) = \frac{aa^*X_i^*}{D_i^*|\tau_i^*| + |M_i|^2|\tau_i^*|}[M_i - (\tau_i^* - 1)\omega_i\tau_i^*|D_i^*|] \equiv B_i. \)

Due to the possible state of the world and henceforth the ambiguity of the sign of the term of \( M_i - (\tau_i^* - 1)\omega_i\tau_i^*|D_i^*| \) it is difficult to assess the effect of trade volume \(|M_i|\). Note this differs from Horn at al. [9], where trade volume effect is identified as always positive, i.e., a rise in trade volume always increases the expected payoff of restricting \( s \) and \( s^* \) in trade agreements. The difference stems from the different rationale for policy intervention, now 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 not necessarily lower a government’s utility as the government is compensated from political contributions. This difference also provides scope for empirical investigation. For example, agricultural subsidies often remain intact in many trade agreements even when the trade volume has grown tremendously over the past several decades.

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 net importer in industry \( i \), the level of Foreign export subsidies is limited to be below the ceiling that make the term \( M_i - (\tau_i^* - 1)\omega_i\tau_i^*|D_i^*| \) equal to zero (in fact the GATT/WTO bans export subsidies), we refer to the policy ceiling as a sufficient restriction. Then we have

\[
B_i = \frac{aa^*X_i^*}{D_i^*|\tau_i^*| + |M_i|^2|\tau_i^*|}[M_i - (\tau_i^* - 1)\omega_i\tau_i^*|D_i^*|]^{11}
\]

Looking closer at equations (6) leads the following proposition:

**Proposition 2.** (i) If a sufficient restriction has been imposed on Foreign border measures that increase the trade volume, i.e., \( M_i - (\tau_i^* - 1)\omega_i\tau_i^*|D_i^*| > 0 \), 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 subsidy \( s_i \). (ii) If \( X_i^* \) is sufficiently small, or \( |M_i|^2 \) is sufficiently large, so that \( s_i \) is a poor substitute for \( \tau_i \) as an instrument to manipulate terms of trade, it is optimal to leave discretion over the subsidy \( s_i \).

Proposition 2 summarizes two conditions under which the gains binding production subsidies brings are so small that they may not offset the accompanying contracting costs and thus better to be omitted from the trade agreement. First, 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 and refrain from using import (export) subsidy to increase trade volume, and therefore gains little to manipulate the terms of trade. Second, the price sensitivity of supply in Home (Foreign) is sufficiently low or the price sensitivity of import demand in Home (Foreign) is sufficiently high. As equation (4) predicts, this represents a circumstance under which a production subsidy is a poor substitute for a tariff to manipulate terms of trade.

Proposition 2 suggests differential treatment across industries, with respect to production subsidies. Industries with small import volume, and market conditions limit the substitution of production subsidies for tariffs, 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 provide rationale for the WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement) which offers preferential treatment to those industries in developing countries.

\[11\] Similarly, assuming a sufficient restriction on Home import subsidy, we get \( B_i^* = aa^*X_i^*|M_i^*| + (\tau_i - 1)\omega_i\tau_i|D_i^*| / (|D_i^*|\tau_i + |M_i^*|\tau_i^*) \).
The Optimal Trade Agreement Based on National Treatment Principle

So far we have assumed that consumption tax is negligible in the two countries, however, it is an important policy instrument. National Treatment (NT), which stipulates equal consumption taxes on domestically produced and imported goods, is a basic principle of GATT/WTO. Assessing the effect of the NT principle requires a broader class of trade agreements which take into account consumption tax.

Suppose without the NT provision, each country can implement an internal tax on the consumption of the domestically produced goods and an internal tax on the consumption of the imported goods, respectively, \( t^h \) and \( t^f \). In this setting, pricing relationships can be expressed as

\[
q_i = \tau_i \omega_i + t^f_i = \left( \tau_i + \frac{t^f_i}{\omega_i} \right) \omega_i,
\]

and

\[
p_i = \tau_i \omega_i + t^f_i + s_i - t^h_i = \left( \tau_i + \frac{t^f_i}{\omega_i} \right) \omega_i + (s_i - t^h_i).
\]

Note that the above two equations are laid out such that the term \( \tau_i + \frac{t_i^f}{\omega_i} \) behaves like \( \tau_i \) and the term \( s_i - t_i^h \) behaves like \( s_i \) when no consumption taxes are present. Consequently, a non-NT fist-best agreement

\[
A^1 = \left\{ \left( \tau_i + \frac{t_i^f}{\omega_i} \right), s_i - t_i^h = \frac{I_{iL} - \alpha_L p_i}{a + \alpha_L \eta}, s_i^* - t_i^{h*} = \frac{I_{iL}^* - \alpha_L^* p_i^*}{a^* + \alpha_L^* \eta^*} \right\},
\]

where the world trade price \( \omega_i \) is proxy for a state variable reflecting trade shocks. It has \( n_p = 8n \) and \( n_s = 4 + 5n \) and therefore costs \( c(8n, 4 + 5n) \).

When the NT provision is included in trade agreements, however, we have \( t_i^f = t_i^h = t_i \). So these relationships become

\[
q_i = \tau_i \omega_i + t_i,
\]

and

\[
p_i = \tau_i \omega_i + s_i.
\]

Not surprisingly, consumption tax does not affect the relationship between the world and the producer prices but does affect the relationship between the world and the consumer prices. Therefore, while it is possible to reduce the wedge between the producer and the world prices (by reducing \( \tau \) and \( s \)) and leave consumption taxes to discretion in an NT-based agreement, this is not the case in the absence of the NT principle.

The question to be answered is under what circumstances is it desirable to include the NT provision while leaving consumption taxes to discretion. First, observing that an agreement

\[
A^2 = \left\{ NT, \tau = \tau^*, s_i = \frac{I_{iL} - \alpha_L p_i}{a + \alpha_L \eta}, s_i^* = \frac{I_{iL}^* - \alpha_L^* p_i^*}{a^* + \alpha_L^* \eta^*}, t = t^* \right\},
\]

where \( NT \) represents the NT principle equivalent to using \( 4n \) policy instruments (\( t^h = t^f \) and \( t^{h*} = t^{f*} \)). It is straightforward to see that the NT-based agreement \( A^2 \) can realize the same \( E(\Omega) \) as non-NT agreement \( A^1 \), but costs \( c(10n, 4 + 4n) \), so it may not qualify as an optimal trade agreement. Consider the following NT-based agreement

\[
A^3 = \left\{ NT, \tau = \tau^*, s_i = \frac{I_{iL} - \alpha_L p_i}{a + \alpha_L \eta}, s_i^* = \frac{I_{iL}^* - \alpha_L^* p_i^*}{a^* + \alpha_L^* \eta^*} \right\}.
\]
A^3 saves on contracting costs as a result of omitting \( \omega_i \) but may result in a reduction of payoff of the agreement because of possible distortions caused by leaving \( t_i \) and \( t^* \) unregulated.

Again, we can denote the noncooperative 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 \( E(\Omega) \) implied by substituting \( t^E(P,P^*) \) and \( t^N(P,P^*) \) for \( t^N(P,P^*) \) and \( t^N(P,P^*) \) then is the extra gain of restricting consumption taxes in an NT-based trade agreement, and can be expressed as

\[
\Omega \left( t^E_i(P,P^*), t^E_i(P,P^*), P, P^*, \cdot \right) - \Omega \left( t^N_i(P,P^*), t^N_i(P,P^*), P, P^*, \cdot \right)
\]

\[
= \int_{t^N_i(P,P^*)}^{t^E_i(P,P^*)} \frac{\partial \Omega}{\partial t_i}(t, t^*, P, P^*) \, dt_i + \int_{t^N_i(P,P^*)}^{t^E_i(P,P^*)} \frac{\partial \Omega}{\partial t_i}(t, t^*, P, P^*) \, dt_i.
\]

Following steps similar to those in last section, we observe that a sufficient condition for this gain in \( E(\Omega) \) to be small is that \( |\frac{\partial \Omega}{\partial t_i}(t^N_i(P,P^*), t^N_i(P,P^*), P, P^*, \cdot)| \) and \( |\frac{\partial \Omega}{\partial t_i}(t^N_i(P,P^*), t^E_i(P,P^*), P, P^*, \cdot)| \) are small. Letting

\[
\left| \frac{\partial \Omega}{\partial t_i}(t^N_i(P,P^*), t^N_i(P,P^*), P, P^*, \cdot) \right| = Z_i
\]

and after some manipulation we get

\[
Z_i = \frac{a|D_i|}{|M_i|} \left| \frac{M_i}{M_i} \cdot \frac{1}{\tau_i + X_i \tau_i} \right| \left| I_i^L X_i^* \tau_i^* - a^* X_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i^* \right] + a^* M_i \right|
\]

(10)

Based on equation (10), our discussion of whether \( t \) should be disciplined by an NT-based trade agreement can be summarized by the following proposition:

**Proposition 3.** (i) If sufficient restriction has been imposed on Foreign tax instruments that increase the trade volume, i.e., \( I_i^L X_i^* \tau_i^* - a^* X_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i^* \right] + a^* M_i > 0 \), so that \( M_i \) is positively associated with the payoff of regulating the consumption tax \( t_i \), and \( M_i \) is sufficiently small, it is optimal to include the NT clause and leave discretion over the consumption tax \( t_i \). (ii) If \( D_i^* \) is sufficiently small, or \( |M_i^*| \) is sufficiently large, so that \( t_i \) is a poor substitute for \( \tau_i \) as an instrument for manipulating terms of trade, it is optimal to include the NT clause and leave consumption tax \( t_i \) to discretion.

Proposition 3 summarizes sufficient conditions under which the payoff of binding the consumption tax \( t \) is too small to offset accompanying contracting costs, so that it is optimal to include an NT clause without specifying particular consumption taxes in a trade agreement. Firstly, if Home is the net importer in industry \( i \), as equation (10) indicates, \( Z_i \) is small when \( |D_i^*| \) is sufficiently small, meaning low price sensitivity of demand, or when \( |M_i^*| \) is sufficiently large, meaning high price sensitivity of import demand. In either case, \( t_i \) is a poor substitute for \( \tau_i \).

Secondly, however, since Horn et al. [3], it is difficult to determine the trade volume (\( M_i \)) effect, as the sign of the term \( I_i^L X_i^* \tau_i^* - a^* X_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i^* \right] + a^* M_i \) is ambiguous due to the possible state of the world. However, suppose Home is the net importer in industry \( i \), if \( s_i^* \) and \( \tau_i^* - 1 \) are restricted to be negative or small enough such that \( I_i^L X_i^* \tau_i^* - a^* X_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i^* \right] + a^* M_i \) is positive, a situation which we refer to as an sufficient restriction on Foreign production and export subsidy, then

\[
Z_i = \frac{|a|D_i^*|}{|M_i^*|} \left[ \frac{1}{\tau_i + X_i \tau_i^*} \left( I_i^L X_i^* \tau_i^* - a^* X_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i^* \right] + a^* M_i \right) \right].
\]

In this situation, if the trade volume \( M_i \) is sufficiently small then it is optimal to exclude \( t_i \) from the NT-based trade agreement. Similarly, we can assume an sufficient restriction on the production tax (\( |s_i| \)) and the import subsidy in Home such that \( -I_i^L X_i^* \tau_i + aX_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i \right] + a|M_i^*| \) is positive, then

\[
Z_i^* = \frac{a^*|D_i^*|}{|M_i^\tau_i^*|} \left[ -I_i^L X_i^* \tau_i + aX_i^\tau_i^* \left[ (\tau_i^* - 1) \omega_i + s_i \right] + a|M_i^*| \right].
\]
Again, if trade volume $|M^*_i|$ is sufficiently small then it is optimal to exclude $t_i$ from the NT-based trade agreement.

Proposition 3 identifies circumstances in which it is optimal to exclude $t$ from the NT-based trade. This helps explain the existence of the NT clause in the current WTO, where significant restrictions are placed on subsidies and tariffs while internal consumption taxes are largely left to discretion. For sectors where trade volumes are little and sufficient restrictions are already placed on other policy instruments that artificially increase the trade volume, or consumption taxes are not readily available to governments, it is attractive to leave consumption taxes to discretion while applying NT principle.

Conclusion

In this manuscript we have incorporated both political pressure and contracting costs in analyzing trade agreements. Like many previous studies in the political economy literature [4–6, 20, 21], 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 [4] brought a first coherent theoretical model of endogenous trade policy formation and concludes tariff rates are affected both by a political support motive and a terms-of-trade motive. However, an implicit assumption of the mainstream political economy model is that less distortionary domestic policies are not available for redistribution, which is clearly not the case in current policy mechanism. Schleich and Orden [7] included both trade and domestic production policies in their political economy model and concluded that production subsidies substitute for trade policies that would have otherwise resulted from rent seeking efforts. As a result, when countries act noncooperatively, tariff rates are exactly Johnson’s optimal tariff rates, which represents only the terms-of-trade motive. Our political economy model goes one step further by identifying the efficient policy choices in a cooperative equilibrium, or a costless first-best trade agreement.

Our model provides a political economy rationale for countervailing duty law by showing that a costless globally efficient trade agreement would lead to equal tariff rate in the importing country and export subsidy rate in the exporting country, since production subsidies can be used to redistribute and meet interest groups’ demand for rent. Our derivation shows that even political economy motives are considered, cooperative production subsidy rates are the same as those in a noncooperative equilibrium confirming that a trade agreement which restricts production subsidies but not tariffs is not optimal.

Using externality as the rationale for policy intervention, Horn et al. [3] propose a monopoly power effect, a trade volume effect and an instrument substitutability effect as the key features of the circumstances that determine the payoff of restricting domestic production subsidies and that of restricting consumption taxes in an NT-based trade agreement. Like Horn et al. [3], our model predicts that uncertainty induces a trade-off between contracting costs and including more state contingent polices in a trade agreement. The uncertainty over production and consumption externalities is replaced with political economy shocks. This replacement yields additional insights into the mechanisms that drive trade agreements. For example, when contracting is costly, instead of binding the tariff to be contingent on non-verifiable consumption externality, an optimal trade agreement should at least permit the use of Countervailing duties. In addition, the positive trade volume effect on the gains of restricting production policy or consumption policy proposed by Horn et al. [3] is identified as special cases where the government assign zero to the weight of political contribution or sufficient restrictions have already been imposed on policies that aim to increase trade volume.
Appendix

Derivation of Home’s noncooperative policies defined by equations (4) and (5)

Let \( P^0 = (\tau^0, s^0) \) and \( P^{a0} = (\tau^{a0}, s^{a0}) \) and assume that contribution schedules are differentiable around the equilibrium point. The first order conditions (FOC) of equations (2) and (3) give

\[
\sum_{j \in L} \nabla P C^0_j(P^0, P^*) + a \nabla P W(P^0, P^*) = 0,
\]

(A.1)

and

\[
\nabla P W_i(P^0, P^*) - \nabla P C^0_i(P^0, P^*)
\]

\[
+ \sum_{j \in L} \nabla P C^0_j(P^0, P^*) + a \nabla P W(P^0, P^*) = 0 \quad \text{for all } i \in L.
\]

(A.2)

The system above implies

\[
\nabla P C^0_i(P^0, P^*) = \nabla P W_i(P^0, P^*) \quad \text{for all } i \in L.
\]

(A.3)

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

\[
\sum_{i \in L} \nabla P W_i(P^0, P^*) + a \nabla P W(P^0, P^*) = 0.
\]

(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

\[
\sum_{i \in L^*} \nabla P^* W_i^*(P^{a0}, P) + a^* \nabla P^* W^*(P^{a0}, P) = 0.
\]

(A.5)

We characterize the noncooperative equilibrium policy vectors by substituting \( P^{a0} \) 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.3) and taking derivatives give

\[
(I_{IL} - \alpha_L)(\omega_i + \tau^0_i \omega_1) X_i + (a + \alpha_L)[(\tau^0_i - 1)\omega_i M_i(\omega_i + \tau^0_i \omega_1)] - \omega_i M_i - s^0_i X_i(\omega_i + \tau^0_i \omega_1) = 0,
\]

(A.6)

and

\[
(I_{IL} - \alpha_L)(\tau^0_i \omega_2 + 1) X_i + (a + \alpha_L)[(\tau^0_i - 1)\omega_i [D_i^r \tau^0_i \omega_2 - X_i(\tau^0_i \omega_2 + 1)] - \omega_i M_i - s^0_i X_i(\tau^0_i \omega_2 + 1) = 0.
\]

(A.7)

From equation (1) we find the partial derivatives of the world price functions, \( \omega_{i1} = \partial \omega_i / \partial \tau_i = -M_i(\omega_i / (M_i \tau_i + M_i^* \tau_i^*) \), \( \omega_{i2} = \partial \omega_i / \partial s_i = X_i / (M_i \tau_i + M_i^* \tau_i^*) \). Substituting them into equations (A.6) and (A.7) yields equation (4) and (5).

Proof of Proposition 1

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

\[
a^* \sum_{i \in L} \nabla P W_i(P^0, P^{a0}) + a \sum_{i \in L^*} \nabla P^* W_i^*(P^{a0}, P^0) + a^* a^* \nabla P W(P^0, P^{a0}) + \nabla P^* W^*(P^{a0}, P^0) = 0,
\]

(A.8)
and
\[ a^* \sum_{i \in L} \nabla p^* W_i(p^0, P^{s_0}) + a \sum_{i \in L^*} \nabla p^* W_i^*(p^0, P^0) + a^* a [\nabla p^* W(P^0, P^{s_0}) + \nabla p^* W^*(P^{s_0}, P^0)] = 0. \] (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., \( a_L = a^* \) = 0. Substituting \( P^0 = (s^0, s^0) \) into equation (A.8) and solving yield the globally efficient policies defined by
\[ a^* a_i \equiv \frac{I_{IL} X_i}{a X_i^*}, \] (A.12)
and
\[ a^* a_i X_i^*[s_i^0 (D_i^0 + M_i^0) + s_i^0 X_i^* \tau_i^0] = a^* (D_i^0 + M_i^0) I_{IL} X_i + a X_i^* \tau_i^0 I_{IL} X_i^* \]
\[ - a^* a_i X_i^* (\tau_i^0 - \tau_i^0) \omega_i M_i^0 \tau_i^0. \] (A.11)

Solving the system of equations gives
\[ s_i^0 = \frac{I_{IL} X_i}{a X_i^*}. \] (A.12)
Similarly, from equation (A.9) we get
\[ s_i^{r \tau} = \frac{I_{IL} X_i^*}{a X_i^*}. \] (A.13)
Substituting equations (A.12) and (A.13) into equation (A.10) yields:
\[ \tau_i^{r \tau} = \tau_i^{r \tau}, \] (A.14)
We can extend the analysis to the more general case. When \( a_L > 0 \) and \( a^* > 0 \), equation (A.14) still holds. With respect to production policies, it is straightforward to replace \( a^* \), \( a \), \( I_{IL} \) and \( I_{IL}^* \) with \( a^* + a^*_L \), 
\( a + \alpha_L \), \( I_{IL} - \alpha_L \) 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:
\[ s_i^0 = \frac{I_{IL} - \alpha_L p_i}{a + \alpha_L \eta_i}, \] (A.15)
and
\[ s_i^{r \tau} = \frac{I_{IL} - \alpha_L^* p_i}{a^* + a^*_L \eta_i^*}, \] (A.16)
where \( \eta_i^* \equiv p_i^* X_i^{r \tau} / X_i^* \) is the elasticity of supply in industry \( i \) in Foreign.
Comparing equation (A.15) with equation (7), we find that the expression for the noncooperative and globally efficient levels of \( s_i \) are the same. For a given state of the world, that is, fixing \( I_{IL}, \alpha_L, a, \eta_i \), the rate of production subsidy/tax \( (|s_i|/p_i) \) remains unchanged whether or not Home and Foreign cooperate.

Acknowledgments

References