# Legislated Protection and the WTO*

T. Renee Bowen†

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**Abstract**

Tariff bindings and administered protection are two characteristics of the World Trade Organization (WTO) that are little understood. Tariff bindings place a ceiling on tariffs that is not always reached, while administered protection ensures that all sectors have access to some minimum import protection, effectively creating a floor for protection. How do these policies affect applied MFN tariff rates that are enacted through the legislature? More specifically, can these policies embolden legislatures to enact lower applied tariffs? I address this question using a model of tariffs determined by a dynamic legislative process. I show existence of a set of symmetric Markov perfect equilibria in which a low level of protection is a possible outcome, and show that it is more difficult to achieve this outcome with tariff bindings and easier to achieve with administered protection, than it is under purely legislated protection.

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†Stanford Graduate School of Business and the Hoover Institute - trbowen@stanford.edu

# 1 Introduction

How does the WTO affect tariffs that are enacted by a domestic legislature? The main objective of the WTO is to reduce tariffs among its member countries. It does this by facilitating the negotiation of tariff limits (or *bindings*) among members, and allowing domestic governments the freedom to set their applied MFN tariff rates within those limits.[1] Since a high tariff in one industry benefits producers in that industry at the expense of all consumers, a broad-based tariff reduction can only come about through a compromise among industries. What effect does the WTO have on the ability of legislatures to reach the political compromise necessary to enact lower applied tariffs?

I first present a formal model of tariff determination through the legislative process and ask under what circumstances will the legislative process result in low applied MFN tariffs. I develop a dynamic model of a small open economy based on the static economy of Grossman and Helpman (1994). Within the economy there are legislative districts that specialize in different industries. Individuals in each district are identical, so preferences of elected representatives reflect the preferences of all members of the district. These members have preferences for high tariffs on the good produced in their district and negative tariffs (import subsidies) on all other goods. In this model such preferences lead to dead-weight losses because of losses in consumer surplus, whereas free trade is the utilitarian optimum.

Each period trade policy is determined through the legislative process as a game among locally elected representatives. A trade policy vector is proposed by a randomly selected legislator and is passed by a majority vote. If the current period's proposal fails to achieve a majority vote, the previous period's tariff vector remains effective. This stylized legislative process is common in the literature on legislative bargaining. It was introduced by Baron and Ferejohn (1989) who argued that, with a large number of legislators, each seeking to put forward his own policy, a legislative process that does not favor a particular legislator will result in a randomly selected proposer each period. This is appropriate in the context of trade policy, as legislators are constantly vying for protection for their industry. By modeling each district with a single industry I provide the starkest possible representation of trade policy conflict. In trade policy, a reversion to the status quo tariff reflects the fact that trade policies remain effective until amendments are passed by the legislature.

I show that a set of equilibria exists in which *low applied tariffs* – defined as an outcome where all districts, except one, maximize their joint stage utility, resulting in low positive tariffs for all but a single industry – is a possible outcome of the legislative process. However

[1] Applied MFN (Most Favored Nation) tariffs are those generally applied to all members of the WTO by another WTO member.

this equilibrium is dependent on initial conditions. For initial conditions that closely resemble free trade, the outcome will be low applied tariffs, whereas for any other set of conditions the outcome will be a *biased outcome* – where each period a single industry receives high protection, and all other industries receive negative protection.[2]

Given this model of legislated trade policy, I consider the impact on the equilibrium outcome of two characteristics of the WTO. The first is tariff bindings when they are set above applied rates. This applies mainly to developing countries who negotiate tariff bindings well above applied rates to comply with WTO requirements. Negotiations over tariff bindings are usually conducted by an executive branch of the government, whereas applied MFN tariffs are set by a domestic legislature who view tariff bindings as an exogenous ceiling. The second characteristic considered is administered protection, for example, anti-dumping duties. This ensures that all sectors have access to some minimum import protection, effectively creating a floor for applied tariffs.[3] I show that tariff bindings decrease the set of initial conditions that result in low applied tariffs, but low levels of administered protection expands the set of initial conditions that results in low applied tariffs.

The intuition for the result is as follows. To sustain an equilibrium in which low applied rates are possible, there must be a threat of spiralling towards the *biased outcome*. The biased outcome therefore acts as a "punishment", because it results in a lower long-run payoff than low applied tariffs.[4] Tariff bindings essentially impose a ceiling on protection allowed to all industries thereby making the biased outcome less biased. This increases the expected payoff to the biased outcome hence increases the incentive to enact the biased tariffs versus low applied tariffs.

Administered protection, on the other hand, essentially imposes a floor on tariffs applied to any industry in equilibrium. In order to achieve a biased outcome, legislators will cherry-pick minimum winning coalitions and freeze out the remaining legislators by reducing tariffs on their industries. Placing a floor on tariffs raises the cost of freezing out legislators, hence decreases the incentive to go to the biased outcome. It should be noted that if administered protection is sufficiently large, or tariff bindings sufficiently low, the equilibrium breaks down. This is consistent with the fact that bindings set low enough result in low applied tariffs trivially.

Little formal work has been done to examine the equilibrium effects of administered

[2]By a re-normalization, this can be interpreted as no protection.

[3]An alternate interpretation of administered protection is allowing a tariff strictly higher than the maximum tariff with some exogenous but small probability. The results are robust to this interpretation.

[4]Note that this is not a punishment in the traditional "trigger strategy" sense since it is the equilibrium outcome in some cases.

protection and tariff bindings, and even less has been done to look at protection as an outcome of the legislative process. Mayer (1984) looks at tariff determination through direct democracy, where citizens vote directly over the formation of tariff policy rather than having elected representatives decide it through a dynamic legislative process. He focuses on the effects of voter eligibility rules and shows how actual tariff policy may reflect the preferences of a small minority of well-endowed citizens. Anderson (1992) considers the impact of the *prospect* of administrative protection on a country's incentives to export, and the protectionist response of the exporting country. Thus Anderson (1992) argues that administrative protection in the domestic country may have the adverse effect of encouraging protectionism in the exporting country. Bagwell and Staiger (1990) develop a model that explains administered protection. They consider two countries' governments setting trade taxes to maximize national welfare, and show that when future trade volumes are uncertain, equilibrium tariffs will be high when trade volumes are high. I do not provide here a model that explains the existence of administered protection and tariff bindings. I provide a model that determines MFN tariffs as decided through the legislative process, and assess the effect of administered protection and tariff bindings on applied MFN tariffs. Grossman and Helpman (2005) discuss the protectionist bias of majoritarian politics, but focus on intra-party incentives to maintain protection. This paper argues, conversely, that a legislative process characterized by a majority voting rule can sustain low tariff levels, and need not be biased towards protectionism. When combined with administered protection, the legislature may in fact have a greater likelihood of maintaining low tariffs.

Anderson (1992) and Bagwell and Staiger (1990) consider the effect of administered protection on the non-cooperative interaction between two countries while Grossman and Helpman (2005) consider trade policy determination as the result of interaction within political parties. This paper is a first attempt to model trade policy determination as the outcome of a legislative process *combined* with administered protection, and tariff bindings. Further, by showing that tariffs corresponding to the Pareto frontier in a commonly used model in trade policy sum to a constant, I provide a useable framework for further analysis of legislative bargaining over tariff policy using exisiting results on legislative bargaining.

Kucik and Reinhardt (2008), in a recent empirical paper consider evidence for what they call the "efficient breach" hypothesis. This is in a sense what Bagwell and Staiger (1990) find theoretically. When states can temporarily be excused from contractual obligations, it promotes greater cooperation. He further shows that WTO members with stronger anti-dumping laws in place sustain lower applied tariffs. This mirrors the result I show for administered protection.

The model of the legislative process I follow is similar to that in Baron and Ferejohn (1989), Dixit, Grossman and Gul (2000), Kalandrakis (2010), Kalandrakis (2004), and Bowen and Zahran (2012). Policies in these papers are purely distributive, allocating a share of a fixed surplus each period to legislators. Trade policy, in contrast, is a multi-dimensional public good. A positive tariff on any good imposes negative externalities on all industries through losses in consumer surplus, but creates a benefit to the industry on which the tariff is applied through gains in producer surplus. This paper is therefore the first to show that equilibria exist in a dynamic status quo game for a multi-dimensional public good. Baron (1996) showed the existence of an equilibrium with a single-dimensional public good. The paper extended the characterization of Bowen and Zahran (2012) by characterizing a set of equilibria rather than a single equilibrium.

The remainder of the paper is organized as follows: Section 2 presents the model of a dynamic endowment economy and derives preferences of individuals in different legislative districts over trade policies. Section 3 specifies the legislative process. Section 4 defines the Markov perfect equilibrium, and section 5 characterizes a set of Markov perfect equilibria of the legislative game with low tariffs. In sections 6 and 7 I examine the effects of tariff bindings and administered protection, and present the main propositions. Section 8 presents a discussion of welfare, and Section 9 concludes.

## 2 The Economy

A small open economy produces $K+1$ goods, $k = 0, 1, \ldots, K$ each period over an infinite horizon. The number of goods, $K$, is odd and at least 3 (for majority voting to be applicable). The economy in each period is modeled as in Grossman and Helpman (1994). Let $y_k$ be the total output in sector $k$ in each period. The production technology is such that one unit of each good requires one unit of a sector specific factor, hence $y_k$ is also the total endowment of the factor used specifically in sector $k$ in each period. All goods are traded. Good zero is the freely traded numeraire with price, $p_0 = 1$. All other goods, $k = 1, \ldots, K$, have world price $p_k^*$. These prices are exogenously given and constant each period. The domestic price of each of the non-numeraire goods is the world price, $p_k^*$, plus a specific tariff, $\tau_k^t$, so $p_k^t = p_k^* + \tau_k^t$. The vector of specific tariffs in period $t$, $\tau^t$, is determined by the legislative process at the beginning of the period, and once a tariff policy is selected, individuals make consumption decisions.

There are $N$ citizens in the economy who live in $K$ legislative districts, each having an equal number of citizens. A citizen in legislative district $k$ is endowed with $\frac{y_0}{N}$ units of the factor used in the numeraire sector and $\frac{y_k K}{N}$ units of the factor used in non-numeraire sector $k$ each period. Hence legislative district $k$ is the exclusive producer of non-numerarie good $k$. To simplify the calculations, I assume that the legislative districts are symmetric.

**Assumption** (Symmetry)**.** *Legislative districts are symmetric such that,*

*(a) output in each legislative district is $y_k = y$ for all $k$,*

*(b) the world price of each good is $p_k^* = p^*$ for all $k$.*

Consumption of good $j$ is given by $c_j$. Each period, a citizen's quasi-linear preferences are given by

$$U(c) = c_0 + \sum_{j=1}^{K} u(c_j),$$

with $u(c_j) = \beta c_j - \frac{1}{2}c_j^2$ and $\beta$ is an exogenous constant. An individual from legislative district $k$ derives income from his allocation of the numeraire factor plus his allocation of non-numeraire factor $k$, so total factor income is $\frac{1}{N}(yp_k K + y_0)$. Government revenue derived from tariffs is evenly rebated to individuals. Government revenue from tariffs for each individual is therefore $\frac{1}{N}\sum_{j=1}^{K} \tau_j(Nc_j - y)$. So individuals maximize utility from consumption subject to the budget constraint

$$\textstyle\sum_{j=1}^{K} p_j c_j + c_0 = \frac{1}{N}\left[(yp_k K + y_0) + \sum_{j=1}^{K} \tau_j(Nc_j - y)\right].$$

Each individual's demand for non-numeraire good $j$ is given by $c_j = \beta - p_j$, hence, given a tariff vector, $\tau$, an individual from district $k$ has indirect utility

$$v^k(\tau) = \frac{\tau_k y K}{N} - \textstyle\sum_{j=1}^{K}\left[\frac{\tau_j^2}{2} + \frac{\tau_j y}{N}\right] + \lambda, \tag{1}$$

where $\lambda$ is a constant.[5]

I restrict attention to trade policy vectors that lie on the Pareto-frontier. That is, legislated tariffs will maximize a weighted sum of the utilities of all districts. It is reasonable to expect that if a tariff policy not on the Pareto frontier would be accepted by the legislature, then the proposing legislator could do better by choosing a payoff that does lie on the frontier, while holding everyone else's payoff constant. Note that payoffs that lie on the Pareto frontier do not imply that there are no deadweight losses induced by the corresponding tariff vectors. The only tariff vector that does not involve deadweight losses

[5] $\lambda = \frac{y_0}{N} + K\left[\frac{p^* y}{N} + \frac{1}{2}(\beta - p^*)^2\right]$.

is the free trade vector which weights everyone's utility equally. Denote the Pareto set $\mathbb{T} \subset \mathbb{R}^K$ as the set of trade polices that correspond to payoffs on the Pareto frontier, that is

$$\mathbb{T} = \{\tau \in \mathbb{R}^K : \tau = \arg\max \textstyle\sum_{j=1}^{K} \phi_j v^j(\tau), \forall \phi_j \in [0,1] \text{ s.t. } \textstyle\sum_{j=1}^{K} \phi_j = 1\}.$$

Lemma 1 states that tariff vectors in the Pareto set $\mathbb{T}$ sum to zero. This will allow the use of tools from the dynamic legislative bargaining literature that examines distributive policies, since these policies lie in a simplex.

**Lemma 1.** *All tariff vectors in the set* $\mathbb{T}$ *satisfy*

$$\textstyle\sum_{k=1}^{K} \tau_k = 0. \tag{2}$$

*Proof.* Tariff vectors in $\mathbb{T}$ are given by

$$\arg\max \sum_{j=1}^{K} \phi_j \left[ \tfrac{\tau_j y K}{N} - \sum_{m=1}^{K} \left( \tfrac{\tau_m^2}{2} + \tfrac{\tau_m y}{N} \right) + \lambda \right].$$

The first order condition for an arbitrary tariff, $\tau_k$, satisfies

$$\phi_k \left( \tfrac{yK}{N} \right) - \left( \tau_k + \tfrac{y}{N} \right) \sum_{j=1}^{K} \phi_j = 0.$$

Since $\sum_{j=1}^{K} \phi_j = 1$, we can rearrange this expression to obtain the value of an arbitrary tariff on the Pareto frontier, $\tau_k$, as

$$\tau_k = \tfrac{y}{N}(\phi_k K - 1). \tag{3}$$

Hence the sum of these tariffs is given by

$$\sum_{k=1}^{K} \tau_k = \tfrac{y}{N} \sum_{k=1}^{K} (\phi_k K - 1).$$

Using again that $\sum_{j=1}^{K} \phi_j = 1$ we have the result. ■

An interesting feature of the application of legislative bargaining to trade is that inequality in the tariff vector selected generates negative externalities for all legislative districts since it implies consumers are not able to consume varieties of goods in equal quantities. This is in contrast to most of the dynamic legislative bargaining literature where policies affect each legislative district only through the dimension related to that district (for example, the share of the budget allocated to district $k$).

Since tariffs on the Pareto frontier sum to a constant they can be conveniently represented in a $(K-1)$-dimensional simplex. In the case of 3 legislators the 2-dimensional simplex is as in Figure 1. The vertices represent a tariff vector where a single district maximizes its utility at the expense of all other districts, that is, $\phi_k = 1$ for some $k$, or $\tau_k = \frac{y(K-1)}{N}$. The closer to the vertices the tariff vector is, the more uneven the tariff vector is, hence the higher the deadweight losses. The centroid of the simplex represents the free trade tariff vector with $\phi_k = \frac{1}{K}$ for all $k$. The free trade tariff vector is the utilitarian optimal, so the further trade policy is from the centroid, the higher are the deadweight losses.

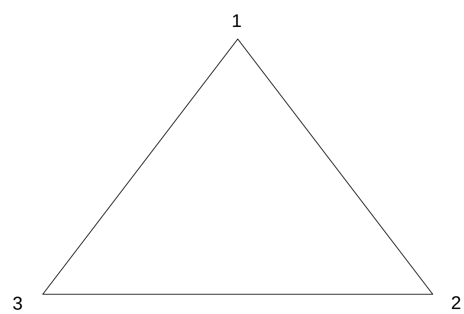


Figure 1: Tariffs Corresponding to the Pareto Frontier

For simplicity, I normalize the worst payoff to zero. That is the payoff for legislator $k$ when he receives tariff $-\frac{y}{N}$, and a single legislator receives $\frac{y(K-1)}{N}$. This implies, $\lambda = \frac{y^2K(K+1)}{2N^2}$, and the highest static payoff is $\frac{y^2K^2}{N^2}$ for the legislator receiving $\tau_k = \frac{y(K-1)}{N}$.

# 3 Legislative Process

Tariff policy is determined by the legislative process in each period. Elections are held within each district to select a local representative. Local representatives form the legislature, and the legislature meets every period to determine tariff policy. Local elections are not modeled since members of each district are identical. Let $\mathbb{K}$ denote the set of legislators, one from each district. Preferences for legislator $k$ over tariffs in each period are given by equation (1) and these preferences are the same for each member of district $k$. When choosing tariff policy in period $t$ legislator $k$ therefore maximizes his expected discounted utility given by

$$(1-\delta)E\left[\sum_{t=1}^{\infty}\delta^{t-1}v^k(\tau^t)\right]. \tag{4}$$

where $\tau^t = \{\tau_1^t, \dots, \tau_K^t\} \in \mathbb{T}$ is the vector of trade tariffs for each of the non-numeraire sectors in period $t$.

At the beginning of each period a legislator, $x^t \in \mathbb{K}$, is randomly recognized to make a tariff vector proposal for that period. Legislators are recognized with equal probability in each period. The recognized legislator, $x^t$, makes a tariff proposal, $q^t \in \mathbb{T}$, which is voted on by all legislators, each legislator having a single vote. A simple majority of votes is required for a proposal to be implemented, hence the proposer requires $\frac{K+1}{2}$ legislators (including the proposer) to be in agreement. If the proposal fails to achieve $\frac{K+1}{2}$ legislators' vote, the status quo tariff policy, $\tau^{t-1}$, prevails.

# 4 Markov Perfect Equilibrium

I seek a Markov perfect equilibrium (MPE) of this game. An MPE is a subgame perfect equilibrium in Markov strategies. Markov strategies condition only on the portion of history that is relevant to current period payoffs. I focus on Markov strategies because legislatures are typically large and characterized by periodic turnover hence coordinating on strategies that require memory of complicated histories becomes difficult, and somewhat implausible. To take into account any lack of institutional memory I assume that legislators condition strategies on the simplest history possible, which is the payoff-relevant history. The payoff relevant variables in this model are the status quo tariff policy, $\tau^{t-1}$, and the identity of the proposing legislator, $x^t$. I summarize these payoff relevant variables as the state variable $\omega^t = (\tau^{t-1}, x^t) \in \mathbb{T} \times \mathbb{K}$.

Each legislator's strategy is a pair $(\alpha_k, \sigma_k)$ such that $\alpha_k$ is legislator $k$'s acceptance strategy and $\sigma_k$ is legislator $k$'s mixed proposal strategy, so a strategy profile is given by $(\alpha, \sigma)$. A proposal strategy for legislator $k$, places probability $\sigma_k(q; \omega^t)$, on proposal $q$. Given a proposal, $q^t$, an acceptance strategy for legislator $k$ is a binary function $\alpha_k(q^t; \omega^t)$ such that

$$\alpha_k(\omega^t; q^t) = \begin{cases} 1 & \text{if legislator } k \text{ accepts proposal } q^t, \\ 0 & \text{if legislator } k \text{ rejects proposal } q^t. \end{cases}$$

I seek a notion of symmetry for the legislators' strategies reflecting the fact that any legislator $k$ will be expected to behave in the same manner as legislator $j$ if he was in legislator $j$'s position. More concretely, define the one-to-one operator, $\Phi : \mathbb{K} \to \mathbb{K}$ that represents any permutation of the identity of the legislators. Given a proposed vector of tariffs, $q^t = (q_1^t, \dots, q_K^t)$, and permutation $\Phi(\cdot)$, I denote the resulting permuted vector of proposed tariffs as $q_\Phi^t = (q_{\Phi(1)}^t, \dots, q_{\Phi(K)}^t)$. A permutation of the state variable $\omega^t =$

$(\tau^{t-1}, x^t)$ is therefore denoted $\omega^t_\Phi = (\tau^{t-1}_\Phi, \Phi(x^t))$, and a symmetric strategy profile is given by the following definition.

**Definition 1.** A strategy profile $(\alpha, \sigma)$ is *symmetric* if for any permutation of the identities of legislators, $\Phi : \mathbb{K} \to \mathbb{K}$,

$$\begin{aligned} \alpha_k(\omega^t; q^t) &= \alpha_{\Phi(k)}(\omega^t_\Phi; q^t_\Phi), \text{ and} \\ \sigma_j(\omega^t) &= \sigma_{\Phi(j)}(\omega^t_\Phi). \end{aligned}$$

The dynamic payoff for any legislator $k$, given a strategy profile, $(\alpha, \sigma)$, and a state $\omega^t$ is,

$$V_k(\alpha, \sigma; \omega^t) = \int_{\mathbb{T}} \left\{ (1-\delta) v^k(\tau^t) + \delta E_{x^{t+1}}[V_k(\alpha, \sigma; \omega^{t+1})] \right\} \sigma_{x^t}(q^t; \omega^t) dq^t.$$

For a Markov strategy profile to be a perfect equilibrium it must maximize this dynamic payoff for all legislators, for all possible states and must be a best response to *any* history contingent strategy played by any other legislator. I restrict attention to stage-undominated voting strategies as first motivated by Baron and Kalai (1993). This requires that legislators vote yes to proposals if the proposal makes them strictly better off.[6] I define a symmetric Markov perfect equilibrium in stage-undominated voting strategies formally as follows.

**Definition 2.** A *symmetric Markov Perfect Equilibrium in stage-undominated voting strategies* is a symmetric strategy profile, $(\alpha^*, \sigma^*)$, such that for all $\omega^t \in \mathbb{T} \times \mathbb{K}$, for all $(\hat{\alpha}_k, \hat{\sigma}_k)$, for all $(h^t, q^t)$, and for all $k$,

$$V_k(\alpha^*, \sigma^*; \omega^t) \geq V_k(\hat{\alpha}_k(h^t; q^t), \alpha^*_{-k}, \hat{\sigma}_k(h^t), \sigma^*_{-k}; \omega^t),$$

and $\alpha_k(\omega^t; q^t) = 1$ if

$$\begin{aligned} &(1-\delta) v^k(q^t) + \delta E_{x^{t+1}}[V_k(\alpha^*, \sigma^*; q^t, x^{t+1})] \\ &> (1-\delta) v^k(\tau^{t-1}) + \delta E_{x^{t+1}}[V_k(\alpha^*, \sigma^*; \tau^{t-1}, x^{t+1})], \end{aligned}$$

where $(\hat{\alpha}, \hat{\sigma})$ is a strategy conditioning on any history $h^t$ of states and actions.

The first proposition of the paper states that a symmetric Markov perfect equilibrium in stage-undominated voting strategies (henceforth MPE) exists, in which low applied MFN tariffs is a possible outcome. The *low applied MFN tariff vector* is defined as a tariff vector

[6] This restrictions eliminates unintuitive equilibria in which all legislators reject proposals, hence any outcome can be supported.

on the Pareto frontier that gives equal Pareto weights to a coalition of legislators consisting of all legislators except one.

**Definition 3.** The *low applied MFN tariff vector*, $\tau^{cz} \in \mathbb{T}$, satisfies for a coalition of $K-1$ legislators, $\phi_c = \frac{1}{K-1}$, and for some other legislator, $z$, $\phi_z = 0$.

Lemma 2 characterizes the low applied MFN tariff vector.

**Lemma 2.** *Under the low applied MFN tariff vector, coalition members receive tariff,* $\tau_c = \frac{y}{N(K-1)}$*, for their industry and the remaining legislator's industry receives tariff* $\tau_z = -\frac{y}{N}$*.*

*Proof.* From equation 3, substituting $\phi_c = \frac{1}{K-1}$ gives $\tau_c = \frac{y}{N(K-1)}$, and substituting $\phi_z = 0$ gives $\tau_z = -\frac{y}{N}$. ■

In the case of three legislators, the three possible low applied MFN tariff vectors are illustrated in Figure 2.

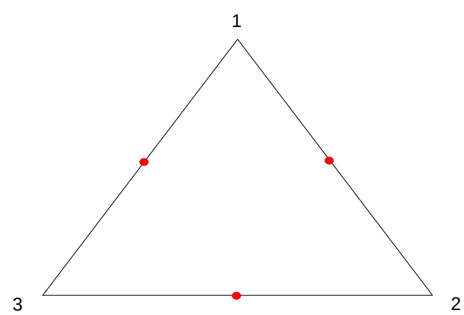


Figure 2: The Low Applied Tariff Class

The low applied tariff vector, $\tau^{cz}$, is motivated by an existing characterization established by Bowen and Zahran (2012). That paper showed that compromise may be achieved in a setting where legislators are bargaining over distributive policy which lies in the $K-1$ dimensional simplex. Compromise in that paper is defined as when $K-1$ legislators distribute benefits equally and it is the first to show how compromise may be achieved in a dynamic legislative game with an endogenous status quo. Trade policy, and in particular, free trade, is by nature a compromise among industries. The result in Bowen and Zahran (2012) is therefore a natural place to start as we seek to understand how free trade (or something close to it) may arise out of a dynamic legislative bargaining game. Note that free trade corresponds to an equal division of benefits, but Bowen and Zahran (2012) show that this is not a possible outcome using the equilibrium strategies. I use features of the characterization in Bowen and Zahran (2012) to prove Proposition 1. Denote $\tau_x$ as the exogenous ceiling on tariffs that can be legislated in an equilibrium. Given our interest in comparative statics on $\tau_x$ we take $\tau_x$ as an exogenous parameter and analyze equilibrium properties as this ceiling varies.

**Proposition 1.** *There exists a $\overline{\tau}_x^*$ and a non-degenerate interval $[\underline{\delta}, \overline{\delta}]$, such that if $\tau_x \in [\frac{y}{N}, \overline{\tau}_x^*]$, $\delta \in [\underline{\delta}, \overline{\delta}]$ and $K \geq 7$, there exists a symmetric MPE in which low applied tariffs may be legislated each period.*

The upper bound on legislated tariffs $\overline{\tau}_x^*$ required in Proposition 1 is a feature of bargaining over trade policy which implies possible externalities. This restriction on the policy space is not required in a purely distributive game, but plays the same role as a restriction on concavity in the distributive game. The proposition indicates that the strategies constitute an equilibrium for any maximum tariff in the range $[\frac{y}{N}, \overline{\tau}_x^*]$, thus Proposition 1 gives existence of a set of equilibria – each maximum tariff corresponds with a different equilibrium. The proof of Proposition 1 is constructive. In the next section I characterize the set of Markov perfect equilibria of this game in which low applied tariffs is a possible outcome.

## 5 Legislative Equilibrium with Low Tariffs

The equilibrium acceptance strategy for any legislator $k$ is $\alpha_k^*$ such that he accepts proposals that give a dynamic payoff that is at least as great as the payoff to the status quo. That is, given proposal $q^t$,

$$\alpha_k^*(\omega^t; q^t) = \begin{cases} 1 \text{ if} & \begin{array}{l} (1-\delta)v^k(q^t) + \delta E_{x^{t+1}}[V_k(\alpha^*, \sigma^*; q^t, x^{t+1})] \geq \\ (1-\delta)v^k(\tau^{t-1}) + \delta E_{x^{t+1}}[V_k(\alpha^*, \sigma^*; \tau^{t-1}, x^{t+1})] \end{array} \\ & \\ 0 \text{ otherwise.} & \end{cases}$$

A proposal strategy, $\sigma_k^*(\omega^t)$, depends on the status quo tariff and the proposing legislator. Under the equilibrium proposal strategies, if the initial tariff vector is the low applied MFN tariff vector (henceforth *low-tariff* vector), the low-tariff vector is the sustained outcome. For initial tariffs close to the low-tariff vector, the proposer will choose between offering the low tariff vector or extracting as much protection for its industry as possible by using a *cherry-picking* strategy. A cherry-picking strategy will lead to a *biased tariff* vector, where the maximum allowable protection is awarded to a single district. Once a biased tariff vector is implemented, the equilibrium proposal is thereafter a biased tariff.

The set of initial tariff policies that lead to low applied tariffs if legislator 1 is the proposer in period 1, $\Gamma_1$, is indicated by the shaded region in figure 3. Symmetric regions hold for each legislator. I am interested in the properties of this region as I allow for administered protection, but first I fully describe the equilibrium strategies and payoffs.

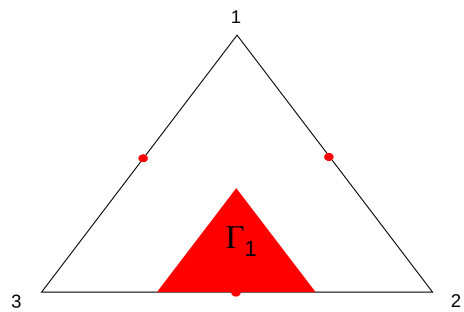


Figure 3: Status quo tariffs that lead to low applied tariffs for legislator 1

Define the partition of tariff vectors $\mathbb{T}_\theta \subset \mathbb{T}$ to be such that a number, $\theta$, of industries receive a tariff that is equal to the loser tariff. That is

$$\mathbb{T}_\theta \equiv \{\tau \in \mathbb{T} : |\{k : \tau_k = \tau_z\}| = \theta\}.$$

The low tariff vector then is an element of the set $\mathbb{T}_1$. Denote the set of low tariff vectors as $\overline{\mathbb{T}}_1 \subset \mathbb{T}_1$.

In general, proposal strategies, $\sigma$ are mixed (hence $\sigma$ represents a probability distribution), but where there is no confusion, $\sigma$ will be used to indicate a pure proposal.

### 5.1 Status quo tariffs in the low tariff class, $\overline{\mathbb{T}}_1$

First consider the low tariff vector, $\tau^{t-1} = \tau^{cz} \in \overline{\mathbb{T}}_1$. The stage payoffs to $\tau^{cz}$ are $v^c(\tau^{cz})$ for coalition members and $v^z(\tau^{cz})$ for the loser. These are

$$\begin{aligned} v^c(\tau^{cz}) &= \tfrac{y^2K^3}{2N^2(K-1)}, \text{ and} \\ v^z(\tau^{cz}) &= \tfrac{y^2K^2(K-2)}{2N^2(K-1).} \end{aligned}$$

Notice $v^c(\tau^{cz}) > v^z(\tau^{cz})$ since $K \geq 7$.

The equilibrium strategy for this set of status quo tariffs is the low tariff proposal, $\sigma^*(\omega^t) = \tau^{cz}$, such that if the proposer's status tariff is not $\tau_z$, then the legislator that had

$\tau_z$ is offered $\tau_z$ again and all other legislators receive $\tau_c$. That is

$$\sigma_k^* = \begin{cases} \tau_z & \text{if } \tau_k^{t-1} = \tau_z \ , \\ \tau_c & \text{otherwise.} \end{cases}$$

If the proposer's status quo tariff is $\tau_z$, then the proposer randomizes over legislators to receive $\tau_z$ and splits the surplus evenly among himself and the remaining legislators. That is

$$\sigma_{x^t}^* = \tau_c,$$

and for $k \neq x^t$,

$$\sigma_k^* = \begin{cases} \tau_z & \text{with probability } \frac{1}{K-1} \ , \\ \tau_c & \text{with probability } \frac{K-2}{K-1} \ . \end{cases}$$

Notice that once a proposal in the low tariff class has been implemented the equilibrium strategies dictate that all subsequent proposals lie in this set.

The recursive dynamic payoffs when proposals are in the low tariff class are $V^c(\tau^{cz})$ for the proposer and coalition members and $V^z(\tau^{cz})$ for the loser. With probability $\frac{K-1}{K}$ each legislator receives the same payoff as it did in the previous period, and with probability $\frac{1}{K}$ the current loser becomes the proposer, and a new loser is randomly selected. These recursive dynamic payoffs are given by

$$\begin{aligned} V^c(\tau^{cz}) &= (1-\delta)v^c(\tau^{cz}) + \tfrac{\delta}{K}\left[(K-1)V^c(\tau^{cz}) + [\tfrac{1}{K-1}V^z(\tau^{cz}) + \tfrac{K-2}{K-1}V^c(\tau^{cz})]\right], \\ V^z(\tau^{cz}) &= (1-\delta)v^z(\tau^{cz}) + \tfrac{\delta}{K}\left[V^c(\tau^{cz}) + (K-1)V^z(\tau^{cz})\right]. \end{aligned}$$

Solving for $V^z(\tau^{cz})$ and $V^c(\tau^{cz})$ gives

$$\begin{aligned} V^c(\tau^{cz}) &= \tfrac{(K-1)[K(1-\delta)+\delta]}{K[(K-1)(1-\delta)+\delta]}v^c(\tau^{cz}) + \tfrac{\delta}{K[(K-1)(1-\delta)+\delta]}v^z(\tau^{cz}) \\ V^z(\tau^{cz}) &= \tfrac{\delta(K-1)}{K[(K-1)(1-\delta)+\delta]}v^c(\tau^{cz}) + \tfrac{K(K+1)(1-\delta)+\delta}{K[(K-1)(1-\delta)+\delta]}v^z(\tau^{cz}). \end{aligned}$$

For incentive compatibility we require $V^c(\tau^{cz}) \geq V^z(\tau^{cz})$ so that legislator $k$ proposes a tariff vector with $\tau_k = \tau_c$. This holds since $v^c(\tau^{cz}) > v^z(\tau^{cz})$.

### 5.2 Status quo tariffs in the biased tariff class, $\mathbb{T}^b$

Denote $\mathbb{T}^b$ as the biased tariff class. For all $\tau^{t-1} \in \mathbb{T}^b$ one legislator has the maximum tariff $\tau_x$ and all others have the *loser* tariff, $\tau_z = -\frac{\tau_x}{K-1}$, hence these are tariff vectors of the form

$$\tau^{xz} = \left(\tau_x, -\tfrac{\tau_x}{K-1}, \ldots, -\tfrac{\tau_x}{K-1}\right).$$

The biased tariff vector gives static payoffs denoted $v^x(\tau^{xz})$ for the proposer and $v^z(\tau^{xz})$ for the losers. These payoffs are

$$\begin{aligned} v^x(\tau^{xz}) &= \tfrac{K[y^2K^2-(\tau_x N+y)^2]}{2N^2(K-1)} + \tfrac{\tau_x y K^2}{N(K-1)}, \\ v^z(\tau^{xz}) &= \tfrac{K[y^2K^2-(\tau_x N+y)^2]}{2N^2(K-1)}. \end{aligned}$$

Notice $v^x(\tau^{xz}) \geq v^z(\tau^{xz})$ if $\tau_x \geq 0$.

When the status quo tariff is in $\mathbb{T}^b$, the equilibrium strategy is for the proposer to take the tariff $\tau_x$, and give all other legislative districts the tariff $\tau_z$. Notice again that once a proposal in the biased tariff class, $\mathbb{T}^b$, has been implemented the equilibrium strategies dictate that all subsequent proposals lie in this set.

When the status quo tariff is in $\mathbb{T}^b$, I can write the dynamic payoffs recursively, denoting $V^x(\tau^{xz})$ for the proposer, and $V^z(\tau^{xz})$ for the losing industries. With probability $\frac{1}{K}$ each legislator may be proposer in the next period, otherwise they receive the tariff $-\frac{\tau_x}{K-1}$. These dynamic payoffs are given by

$$\begin{aligned} V^x(\tau^{xz}) = &\ (1-\delta)v^x(\tau^{xz}) + \delta V^b, \\ V^z(\tau^{xz}) = &\ (1-\delta)v^z(\tau^{xz}) + \delta V^b \end{aligned}$$

Where $V^b = \frac{1}{K}\left[V^x(\tau^{xz}) + (K-1)V^z(\tau^{xz})\right]$. Solving for $V^x(\tau^{xz})$ and $V^z(\tau^{xz})$ gives

$$V^x(\tau^{xz}) = \left(1 - \tfrac{\delta(K-1)}{K}\right) v^x(\tau^{xz}) + \tfrac{\delta(K-1)}{K} v^z(\tau^{xz}), \tag{5}$$

$$V^z(\tau^{xz}) = \tfrac{\delta}{K} v^x(\tau^{xz}) + \left(1 - \tfrac{\delta}{K}\right) v^z(\tau^{xz})\ . \tag{6}$$

Incentive compatibility requires that $V^x(\tau^{xz}) \geq V^z(\tau^{xz})$ so that the proposer prefers to take the tariff $\tau_x$ rather than $\tau_z$. This is true as long as $\tau_x \geq 0$ which ensures $v^x(\tau^{xz}) \geq v^z(\tau^{xz})$. One natural implication is that in the biased class loser industries are subsidized, while the proposing legislator receives tariffs for his district since all tariffs sum to zero.

Again for incentive compatibility we require $V^x(\tau^{xz}) \geq V^c(\tau^{cz})$, so there is no incentive for the proposer to deviate to low tariffs. This is guaranteed if $\tau_x \geq \frac{y}{N}$ and the discount factor is not too large.

**Lemma 3.** *If $\tau_x \geq \frac{y}{N}$, and $\delta \leq \overline{\delta}_1$, then $V^x(\tau^{xz}) \geq V^c(\tau^{cz})$, where $\overline{\delta}_1$ is given implicitly* *by*

$$(1-\overline{\delta}_1)v^x(\tau^{xz})+\overline{\delta}_1 V^b = V^c(\tau^{cz}).$$

The proof of Lemma 3, and henceforth all omitted proofs, are in the Appendix. The intuition for Lemma 3 is that there is some concavity in stage payoffs, hence if tariffs in the biased class are "biased enough" legislators prefer to smooth consumption by having a more even tariff vector over time. When $\tau_x \geq \frac{y}{N}$ this smoothing incentive is present. What prevents this from happening for some status quo tariff vectors is that legislators who are impatient enough see an immediate opportunity to obtain high protection for their industry. When $\delta$ is sufficiently low, legislators prefer to take high protection today with the possibility of no protection for their industry in the future when another legislator has agenda setting power. Hence impatience dominates the smoothing incentive when $\delta \leq \overline{\delta}_1$.

Given we have $V^x(\tau^{xz}) \geq V^c(\tau^{cz})$ what incentive is there to remain in the compromise? This incentive is guaranteed by potential coalition members, each of whom has a payoff of $V^c(\tau^{cz})$ under the low-tariff proposal, but would receive $V^z(\tau^{xz})$ in the biased class. These legislators will not accept a biased tariff if it is biased enough.

**Lemma 4.** *If* $\tau_x \geq \frac{y}{N}$, $V^c(\tau^{cz}) \geq V^z(\tau^{xz})$.

### 5.3 Cherry-picking status quo tariffs, $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$

Now consider status quo tariffs of the form

$$\tilde{\tau} = (\underbrace{-\tfrac{y}{N},\ldots,-\tfrac{y}{N}}_{\frac{K-1}{2}},\tilde{\tau}_{\frac{K+1}{2}},\ldots,\tilde{\tau}_K),$$

and without loss of generality assume $-\frac{y}{N} \leq \tilde{\tau}_{\frac{K+1}{2}} \leq \ldots \leq \tilde{\tau}_K$. The set of all such tariffs is the set $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$ and we can call such tariffs, *cherry-picking* tariffs. We define strategies for status quos in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$.

In equilibrium legislators $k = \frac{K+1}{2},\ldots,K$ propose the biased tariff. We show below that this is accepted by a minimum winning coalition for which $\tilde{\tau}_j = -\frac{y}{N}$ if tariffs in the biased class are "not too biased". That is for $\tau_x$ not too high, this incentive constraint is satisfied. To complete the incentive analysis for legislators receiving $-\frac{y}{N}$ under the status quo we must write down proposal strategies for all legislators in order to write down continuation payoffs.

Now consider that the status quo is $\tilde{\tau}$ but a legislator with status quo tariff $\tilde{\tau}_j = -\frac{y}{N}$ is the proposer.[7] In this case it is sometimes optimal for the proposer to randomize between coalition partners. To understand this, suppose potential coalition partners have the equal static payoff under the status quo and the proposer includes legislator $j$ in the coalition with probability one, then legislator $j$'s dynamic payoff exceeds the dynamic payoff to all other coalition partners, hence the proposer would have an incentive to deviate to having these legislators in the coalition. When potential coalition partners payoffs are close enough the proposer will also have an incentive to deviate if a single legislator is included in the coalition with probability one. To avoid such a deviation, the equilibrium strategies are a probability distribution over members of the coalition. This legislator will propose

$$\tilde{\tau}(b^*) = (-\tfrac{y}{N}, \ldots, -\tfrac{y}{N}, \tau(b^*), \tfrac{y(K-2)}{N} - \tau(b^*)),$$

where if $b^* > 0$ legislators $k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\}$ will receive tariff $\tau(b^*)$, with probability $\mu_k(b^*)$ and the proposer receives the tariff $\frac{y(K-2)}{N} - \tau(b^*)$. If $b^* = 0$, the biased tariff is proposed.The tariff $\tau(b^*)$ and probabilities $\mu_k(b^*)$ are derived in the Appendix.

***Deriving the maximum tariff***

For the proposer to give a coalition member $\tau(b^*)$ we require $\tau(b^*) \leq 1 - \tau(b^*)$ which implies $\tau(b^*) \leq \frac{y(K-2)}{2N}$. Otherwise the proposer would prefer to take $\tau(b^*)$ instead of $\frac{y(K-2)}{N} - \tau(b^*)$. This is guaranteed by an upper bound on $\tau_x$.

**Lemma 5.** *For $\tau_x \leq \overline{\tau}_1 \equiv \frac{y}{N}\left(\left[\frac{K^2(K-3)}{\delta(K+1)N^2} - \frac{K(K-3)}{2N^2}\right]^{\frac{1}{2}} - 1\right)$, $\tau(b^*) \leq \frac{y(K-2)}{2N}$ and hence the proposer has an incentive to give $\tau(b^*)$ to a coalition member and extract the remaining surplus, when the status quo tariffs are in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$ and the proposer's status quo tariff is $-\frac{y}{N}$.*

We also require that when the status quo is a cherry-picking tariff vector, legislators with status quo tariff $-\frac{y}{N}$ must be willing to accept the biased tariff vector receiving a dynamic payoff of $V^z(\tau^{xz})$. An upper bound on $\tau_x$ ensures this holds.[8]

**Lemma 6.** *If $\tau_x \leq \overline{\tau}^* \equiv \frac{y}{N}\left(\left[\frac{K(3K-1)}{K+1}\right]^{\frac{1}{2}} - 1\right)$ the dynamic payoff to the cherry-picking tariff vector when $\tilde{\tau}_j = -\frac{y}{N}$ is greater than $V^z(\tau^{xz})$.*

[7] The equilibrium construction for status quo tariffs in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$ is similar to Kalandrakis (2010) but in the case of trade policy where there are negative externalities generated by tariffs on other goods, incentive compatibility requires an upper bound on $\tau_x$. In a purely distributive game payoffs are required to be "not too concave", and an upper bound on the maximum tariff plays a similar role.

[8] This restriction on the maximum tariff plays the role of the concavity restriction in Bowen and Zahran (2012) and Kalandrakis (2004).

We can show that $\overline{\tau}^* \leq \overline{\tau}_1$ hence $\overline{\tau}_1$ is not binding. Finally, for legislator $j$ receiving tariff $-\frac{y}{N}$ we require $v^j(\tilde{\tau}(b^*)) \leq v^z(\tau^{xz})$ so that legislator $j$ accepts the biased tariff. This also requires an upper bound on $\tau_x$.

**Lemma 7.** *If $\tau_x \leq \overline{\tau}_2 \equiv \frac{y}{N}\left(\left[\frac{K(K-1)}{2}\right]^{\frac{1}{2}} - 1\right)$ then $v^j(\tilde{\tau}(b)) \leq v^z(\tau^{xz})$ when $\tilde{\tau}_j = -\frac{y}{N}$ and $\tilde{\tau}(b) = (-\frac{y}{N}, \ldots, -\frac{y}{N}, \tau(b), \frac{y(K-2)}{N} - \tau(b))$.*

It is straightforward to show that for $K \geq 6$ we have $\overline{\tau}^* < \overline{\tau}_2$ so $\overline{\tau}_2$ is not binding.

***Deriving the feasible range of discount factors***

The expected dynamic payoffs conditional on the status quo being a cherry-picking tariff vector in $\mathbb{T}_{\theta \leq \frac{K-1}{2}}$ and the proposer's status quo tariff is $-\frac{y}{N}$ are

$$U_k(\tilde{\tau}; \alpha^*, \sigma^*) = \begin{cases} (1-\delta)v^x(\tilde{\tau}(b^*)) + \delta V^b & \text{for } k = x^t \\ (1-\delta)[v^k(\tilde{\tau}(b^*))\mu_k + v^z(\tilde{\tau}(b^*))(1-\mu_k)] + \delta V^b & \text{for } k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\} \\ (1-\delta)v^z(\tilde{\tau}(b^*)) + \delta V^b & \text{otherwise.} \end{cases}$$

Incentive compatibility requires that the proposer's payoff to the cherry-picking tariff vector be higher than the payoff to the compromise. This is guaranteed by an upper bound on the discount factor.

**Lemma 8.** *If $\delta \leq \overline{\delta}^*$ and $\tau_x \geq \frac{y}{N}$ then $(1-\delta)v^x(\tilde{\tau}(b^*)) + \delta V^b \geq V^c(\tau^{cz})$, where $\overline{\delta}^*$ is given implicitly by*

$$(1-\overline{\delta}^*)\tfrac{y^2K^2(K-3)}{4N^2(K-1)} + \overline{\delta}^* V^b = V^c(\tau^{cz}). \tag{7}$$

Note that given $\frac{y^2K^2(K-3)}{4N^2(K-1)} \leq v^x(\tau^{xz})$, then $\overline{\delta}^* \leq \overline{\delta}_1$ and $\overline{\delta}_1$ is not binding. Note also that $\frac{\partial V^b}{\partial \tau_x} = -\frac{K\tau_x}{K-1} < 0$, so the left side of condition 7 is strictly decreasing in $\tau_x$. This implies that $\overline{\delta}^*$ is decreasing in $\tau_x$. The intuition is that a higher $\tau_x$ makes payoffs in the biased class less smooth, hence lowers the expected payoff. To offset the decrease in continuation payoff, less patience is required to put more weight on the current payoff.

For status quos in the low tariff class, incentive compatibility requires that $V^c(\tau^{cz}) \geq V^b(\tilde{\tau})$ for the best cherry-picking tariff that would be acceptable to a coalition. This is guaranteed by the lower bound on the discount factor.

**Lemma 9.** *If $\delta \geq \underline{\delta}$ then $V^c(\tau^{cz}) \geq V^x(\tilde{\tau})$, where $\underline{\delta}$ is given implicitly by*

$$(1-\underline{\delta})\tfrac{y^2K^2(K+1)}{2N^2(K-1)} + \underline{\delta} V^b = V^c(\tau^{cz}). \tag{8}$$

The intuition for the lower bound on the discount factor is that legislators require sufficient patience to place enough weight on the high continuation payoff received in the low-tariff class versus the biased tariff class. From similar arguments as before, we can show that $\underline{\delta}$ is decreasing in $\tau_x$ and increase in $\tau_x$ implies less smoothing in the biased tariff class, hence a lower dynamic payoff to the low-tariff class.[9] Lemmas 8 and 9 give an intermediate range of discount factors allowable for the strategies to constitute an equilibrium. It remains to show that this interval is non-degenerate.[10]

**Lemma 10.** *A non-degenerate interval* $[\underline{\delta}, \overline{\delta}^*]$ *exists for* $K \geq 7$.

I describe why a non-degenerate range exists for $K$ large enough. The constraint for $\overline{\delta}^*$ ensures that beginning from a cherry-picking status quo, a legislator will prefer a proposal where one legislator is cherry-picked (receiving $\frac{1}{2}$ of the surplus in the current period and $V^b$ in continuation) to the low-tariff. The constraint for $\underline{\delta}$ ensures that starting from a low-tariff status quo legislators prefer the low-tariff proposal to one in which a minimum-winning coalition is cherry-picked. Since all but a single legislator receives the tariff $\tau_c$ under the low-tariff status quo, at least $\frac{K-1}{2}$ legislators must be cherry-picked starting from the low-tariff class and the proposer receives $V^b$ in continuation. Dividing the surplus among $\frac{K-1}{2}$ legislators results in a strictly lower static payoff than sharing the surplus with 1 legislator if $\frac{1}{2} > \frac{2}{K-1}$ which implies $K \geq 7$ (since $K$ is odd).

Another upper bound $\overline{\delta}_2 > \underline{\delta}$ is derived in the Appendix. This upper bound prevents legislators from deviating from the low-tariff class to an alternate tariff vector that leads back to the low-tariff class with some probability. The upper bound stated in Proposition 1 is given by $\overline{\delta} = \min\{\overline{\delta}^*, \overline{\delta}_2\}$.[11]

### 5.4 Interior status-quo tariffs, $\mathbb{T}_{\theta < \frac{K-1}{2}}$

Call the set $\mathbb{T}_{\theta < \frac{K-1}{2}} \setminus \mathbb{T}^b$ *interior* status quo tariffs. For a status quo tariff, $\tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}} \setminus \mathbb{T}^b$, if the proposer cannot find a minimum-winning coalition to accept $\tau \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}$, that does better than $\tau^{cz}$ for the proposer, the compromise is proposed. We define these strategies below formally.

[9] Since the bound $\tau_x$ plays a similar role to concavity in Bowen and Zahran (2012) the comparative statics are similar to the comparative statics with respect to concavity in Bowen and Zahran Proposition 4.

[10] Lemma 10 indicates that the range of admissible discount factors is non degenerate for $K \geq 7$. This is the same lower bound on the number of legislators required in Bowen and Zahran (2012) and is feature of the equilibrium construction.

[11] Bowen and Zahran (2012) shows that the range on the discount factor increases as the number of legislators increases.

Let $C_k$ be the set of legislators that are a part of legislator $j$'s coalition, such that $|C_k| = \frac{K-1}{2}$. Members of $C_k$ will be offered a *cherry-picking* tariff vector $\tilde{\tau} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}$ that makes them at least indifferent between the status quo tariff vector $\tau^{t-1}$ and the cherry picking tariff vector $\tilde{\tau}$. The dynamic payoffs to a cherry-picking tariff vector in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$ are

$$U_k(\tilde{\tau} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}; \alpha^*, \sigma^*) = \begin{cases} (1-\delta)v^k(\tilde{\tau}) + \delta V_k^{b'} & \text{for } k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\} \\ (1-\delta)v^z(\tilde{\tau}) + \delta V_z^{b'} & \text{otherwise,} \end{cases}$$

where $v^z(\tilde{\tau})$ is the static payoff to a legislator receiving tariff $-\frac{y}{N}$, $v^k(\tilde{\tau})$ is the payoff to a legislators $k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\}$

$$\begin{aligned} V_k^{b'} &= \tfrac{1}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz}) + \tfrac{K-1}{2}V_k(\tilde{\tau}(b^*))] \\ V_z^{b'} &= \tfrac{1}{K}[\tfrac{K+3}{2}V^z(\tau^{xz}) + \tfrac{K-1}{2}V_k(\tilde{\tau}(b^*))]. \end{aligned}$$

Where $V_k(\tilde{\tau}(b^*)) = \mu_k(b)V^b(\tilde{\tau}(b)) + (1-\mu_k(b))V^z(\tilde{\tau}(b))$, the expected payoff to legislator $k$ conditional on legislator $j$ with $\tilde{\tau}_j = -\frac{y}{N}$ being selected as proposer.

I characterize $\tilde{\tau}$ for a given status quo tariff $\tau^{t-1}$. As before for some interior status quo allocations it is optimal for the proposer to randomize between coalition partners. Further, for some status quo allocations it is optimal for the proposer to randomize between offering a cherry-picking allocation, and offering the compromise. Denote the set of all permutations of cherry-picking proposals where legislator $k$ is the proposer, as $\mathbf{P}(\tilde{\tau}^{k*})$. The equilibrium strategy is a probability distribution $\mu^{k*}(\cdot)$ over all $\tau \in \mathbf{P}(\tilde{\tau}^{k*})$, and all permutations of $\tau^{cz}$. Given a status quo tariff vector, $\tau^{t-1} = (\tau_1^{t-1}, \ldots, \tau_K^{t-1})$, the vectors $\tilde{\tau}^{k*}$ and the distributions $\mu^{k*}(\cdot)$ are derived in the Appendix.

We can now formally define the set $\Gamma_k$ to be the set of status quo tariffs from which legislator $k$ will choose low tariffs. This will be where $\mu^{k*}(\tau^{cz}) = 1$ and the set $\overline{\mathbb{T}}_1$. So

$$\Gamma_k = \left\{\tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}} : \mu^{k*}(\tau^{cz}) = 1\right\} \cup \overline{\mathbb{T}}_1.$$

and

$$\Gamma = \left\{\tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}} : \mu^{k*}(\tau^{cz}) > 0 \text{ for some } k\right\} \cup \overline{\mathbb{T}}_1.$$

Note that $\Gamma_k \subset \Gamma \subset \mathbb{T}_{\theta < \frac{K-1}{2}}$.

The equilibrium proposal strategies can be summarized as

$$\sigma_k^*(\omega^t) = \begin{cases} \tau^{cz} & \text{if } \tau^{t-1} \in \Gamma_k \\ \tilde{\tau} & \text{if } \tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}} \setminus (\Gamma_k \cup \mathbb{T}^b) \\ \tilde{\tau}(b^*) & \text{if } \tau^{t-1} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}} \\ \tau^{xz} & \text{if } \tau^{t-1} \in \mathbb{T}^b. \end{cases}$$

Starting from some status quo tariff vector that is neither low tariffs, biased tariffs, nor cherry-picking tariff vectors the equilibrium dynamics may lead either towards low tariffs, $\tau^{cz}$, or the biased tariff class, $\mathbb{T}^b$, where the proposer benefits from a high level of protection on his industry, and all other industries are subsidized. Where the equilibrium dynamics leads to depends on whether the initial tariff vector falls in the set $\Gamma_k$. These dynamics are illustrated below in figure 4.

$$\begin{tikzcd} \overline{\mathbf{T}}_1 \arrow[loop left] & \mathbf{T}_{\theta<\frac{K-1}{2}} \arrow[l] \arrow[r] & \mathbf{T}_{\theta\geq\frac{K-1}{2}} \arrow[loop above] \arrow[r] & \mathbf{T}^b \arrow[loop right] \end{tikzcd}$$

Figure 4: Equilibrium Dynamics

A complete analysis of incentives remains to complete the proof of Proposition 1. This can be found in the Appendix.

# 6 Tariff Bindings

A tariff binding is a ceiling on tariffs that exogenously lowers the maximum tariff that can be legislated $\tau_x$. To determine the effect of tariff bindings it suffices to examine the impact of changes in $\tau_x$ on the boundaries of $\Gamma$, the region of initial tariff vectors that lead to the low tariff class. Starting from an allocation that is interior, that is if $\tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}}$, for a proposer to have an incentive to propose low tariffs it must be the case that

$$V^c(\tau^{cz}) \geq (1-\delta) v^x(\tilde{\tau}) + \delta V_x^{b\prime}. \tag{9}$$

The cherry-picking proposal $\tilde{\tau}$ is a function of the status quo tariff $\tau^{t-1}$ so the cherry-picking payoff $v^x\left(\tilde{\tau}\right)$ is implicitly a function of the status quo tariff vector of coalition members. The next lemma shows that inequality (9) implies a lower bound on the status quo tariff of a coalition member.

**Lemma 11.** *The proposer's cherry-picking payoff $v^x(\tilde{\tau})$ is a decreasing function of a coalition member's status quo tariff $\tau_k^{t-1}$.*

For the three-legislator case, considering that legislator 1 is the proposer, then either legislators 2 or 3 will be in the coalition. The restriction that $V^c(\tau^{cz}) \geq (1-\delta)v^x(\tilde{\tau}) + \delta V_x^{b\prime}$ reduces to the lower bounds on legislator 2 and 3's status quo tariffs illustrated in Figure 5. The darker shaded region gives the intersection of these two, and is the set of allocations from which $\Gamma_1$ is derived.

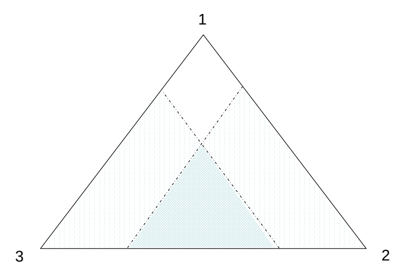


Figure 5: Acceptors' Lower Bounds

To show how this region changes with $\tau_x$, first Lemma 12 says how the continuation payoff to the cherry-picking tariff $V_k^{b\prime}$ behaves as $\tau_x$ changes.

**Lemma 12.** *The continuation payoff from a cherry-picking tariff $V_k^{b\prime}$, is a decreasing function of the maximum tariff, $\tau_x$.*

The intuition for Lemma 12 is simple. The expected payoff in the biased outcome $V^b$ is a weighted sum of the high payoff when the legislator is the proposer, and the low payoff when the legislator is not a proposer. With tariff bindings, the negative externalities imposed on non-proposing legislators by a high tariff is reduced. Since legislators are more likely to be non-proposers, in the biased outcome, they benefit more from the reduced externality, than they lose when they are the proposer.

**Lemma 13.** *The coalition member's cherry-picking tariff, $\tilde{\tau}_k$, is an increasing function of the maximum tariff, $\tau_x$.*

The intuition for this result is also quite straight forward. The coalition member's dynamic cherry-picking payoff is a sum of the current period cherry-picking payoff and the continuation payoff to the cherry-picking proposal, $V_k^{b\prime}$. Since $V_k^{b\prime}$ is decreasing in the maximum tariff (Lemma 12), an increase in the maximum tariff will increase the $v^k(\tilde{\tau})$ that is required to equate $V^k(\tau^{t-1})$ and $V^k(\tilde{\tau})$. Since $v^k(\tilde{\tau})$ is increasing in the coalition member's tariff, $\tilde{\tau}_k$, (for the range of tariffs considered), this results in an increase in the $\tilde{\tau}_k$ required to make the coalition member indifferent between the status quo and the cherry-picking proposal.

Proposition 2 tells us what happens to the region of initial payoffs that allows for the low levels of protection as $\tau_x$ decreases.

**Proposition 2.** *If tariffs are bound the set of tariffs leading to the low-tariff outcome is reduced.*

Proposition 2 is illustrated below. Essentially, the region of initial payoffs that allows the low tariff outcome, shrinks with tariff bindings. The intuition as follows: With tariff bindings, the expected payoff to the biased outcome is increased because of the reduced externality to non-proposing legislators. Hence the incentive to implement biased policies is increased. This results in the reduction of the set of tariffs that leads to low tariffs.

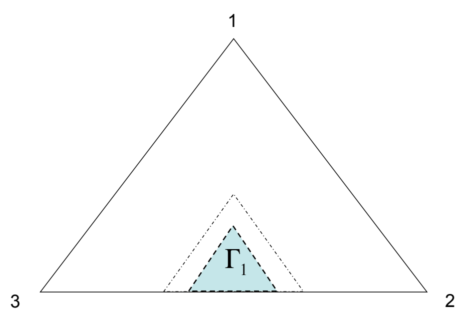


Figure 6: Effect of Tariff Bindings

# 7 Administered Protection

Under administered protection, all industries are allowed some minimum level of protection. This exogenously raises the minimum tariff that can be a part of an equilibrium.[12] To determine the effect of administered protection it suffices to examine the impact of increases in $\tau_z$ on the boundaries of the intersection of $\Gamma_j$. I consider a low-tariff proposal of the form $(-\frac{\tau_z}{K-1}, \ldots, -\frac{\tau_z}{K-1}, \tau_z)$, and a biased tariff vector of the form $(\tau_z, \ldots, \tau_z, -\tau_z(K-1))$.[13]

[12] This can also be modeled as industries being allowed a tariff strictly higher than the maximum tariff with some exogenous, but small probability, hence *increasing* the expected maximum tariff. From the previous analysis, increasing the expected maximum tariff would increase the region of initial tariffs leading to low protection hence the analysis is robust to this interpretation.

[13] Raising the minimum tariff changes the dynamic payoff in the low-tariff class and the biased tariff class, hence this affects the admissible range of discount factors and the maximum tariff allowable in equilibrium. Since all dynamic payoffs are continuous in the minimum tariff, for a small change in the minimum tariff, there is a feasible range of discount factors and maximum tariff such that the strategies in Section 5 constitute an equilibrium and the dynamic payoffs are as calculated. In particular, incentive compatibility requires $V^c(\tau^{cz}) \geq V^z(\tau^{cz})$, which requires $\tau_z \leq 0$.

Proposition 3 tells us what happens to the region of initial payoffs that guarantees low levels of protection for small increases in $\tau_z$.

Lemmas 14-16 provide useful results to prove Proposition 3.

**Lemma 14.** *The proposer's cherry-picking payoff, $v^x(\tilde{\tau})$, is a decreasing function of the minimum tariff, $\tau_z$.*

The intuition for Lemma 14 is that as the minimum tariff is raised, coalition members have to be compensated more since the status quo payoff is raised when the status quo payoff is the minimum tariff.

**Lemma 15.** *The continuation payoff to a cherry-picking proposal, $V^{b\prime}$, is an increasing function of the minimum tariff, $\tau_z$.*

The intuition for Lemma 15 is the same as the intuition for $\tau_x$. Increasing $\tau_z$ smoothes out payoffs in the biased tariff class.

**Lemma 16.** *The payoff to a coalition member in the low tariff class, $V^c(\tau^{cz})$, is an increasing function of the minimum tariff, $\tau_z$.*

The intuition for Lemma 16 is similar to Lemma 15. Increasing the minimum tariff smoothes out the payoff in the low-tariff class.

**Proposition 3.** *If a small amount of administered protection is allowed the set of initial tariffs that lead to a low tariff outcome expands.*

The intuition is as follows. In order to achieve a biased outcome, legislators will cherry-pick minimum winning coalitions and freeze out the remaining legislators by reducing tariffs on their industries. Placing a floor on tariffs raises the cost of freezing out legislators, hence decreases the incentive to go to the biased outcome. This results in the expansion of the set of tariffs that leads to low tariffs as illustrated in Figure 7.

# 8 Welfare

A natural question is if tariff bindings or administered protection improve welfare. In this trade policy setting I have considered only tariff vectors that are on the Pareto frontier, hence all outcomes satisfy static Pareto efficiency. All long-run outcomes satisfy dynamic Pareto efficiency in these sense that a minimum-winning coalition cannot agree to a new policy awarding each member of the minimum-winning coalition a higher dynamic payoff.[14]

[14]Dynamic Pareto efficiency has been shown to be a feature of a model with an endogenous status quo in Bowen, Chen and Eraslan (2013).

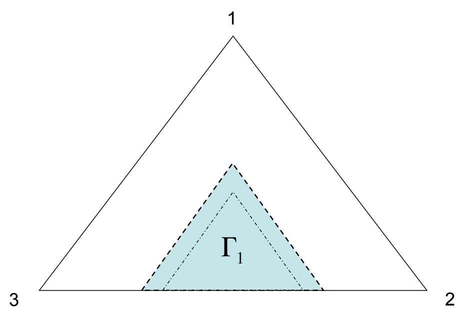


Figure 7: Effect of Administered Protection

I discuss welfare using a utilitarian notion of welfare. I will focus on the expected long-run total welfare, and show that tariff bindings have an ambiguous effect on expected long-run total welfare, but administered protection has a positive effect.

Denote $\bar{U}(\tau^{cz})$ as the sum over legislative districts of the average discounted dynamic payoffs in the low-tariff class, and $\bar{U}(\tau^{xz})$ as the sum over legislative districts of the average discounted dynamic payoffs in the biased tariff class. These are

$$\begin{aligned}\bar{U}(\tau^{cz}) &\equiv (K-1)V^{c}(\tau^{cz}) + V^{z}(\tau^{cz}) \\ \bar{U}(\tau^{xz}) &\equiv V^{x}(\tau^{xz}) + (K-1)V^{z}(\tau^{xz}).\end{aligned}$$

Assume a uniform distribution over initial status quos. The probability that the long-run tariff is in the low-tariff class is given by the probability that the initial status quo is in $\Gamma_k$, where $k$ is the period 1 proposer. Denote this probability as $\gamma$. Then the expected long-run total welfare is given $\bar{U} \equiv \gamma \bar{U}(\tau^{cz}) + (1-\gamma)\bar{U}(\tau^{xz})$.

With tariff bindings the total average discounted dynamic payoffs in the low-tariff class and the biased tariff class are respectively

$$\begin{aligned}\bar{U}(\tau^{cz}) &= \tfrac{y^2 K^2 (K^2-2)}{2N^2(K-1)} \\ \bar{U}(\tau^{xz}) &= \tfrac{K^2(-\tau_x^2 N^2 + y^2(K^2-1))}{2N^2(K-1)}.\end{aligned}$$

It is straightforward to show $\bar{U}(\tau^{cz}) \geq \bar{U}(\tau^{xz})$ since $\tau_x \geq \frac{y}{N}$. It is also straightforward to show that $\bar{U}(\tau^{xz})$ is decreasing in $\tau_x$. Then the change in the expected long-run total welfare for a change in $\tau_x$ is

$$\tfrac{\partial \bar{U}}{\partial \tau_x} = \tfrac{\partial \gamma}{\partial \tau_x}[\bar{U}(\tau^{cz}) - \bar{U}(\tau^{xz})] + (1-\gamma)\tfrac{\partial \bar{U}(\tau^{xz})}{\partial \tau_x}.$$

The change in expected long-run welfare can be decomposed into the change in the probability of being in the low-tariff class in the long-run (the first term), which is negative, and the change in long-run payoff in the biased tariff class (the second term), which is positive. Overall, the effect is ambiguous.

With administered protection the low-tariff proposal is of the form $(-\frac{\tau_z}{K-1}, \ldots, -\frac{\tau_z}{K-1}, \tau_z)$, and a biased tariff vector is of the form $(\tau_z, \ldots, \tau_z, -\tau_z(K-1))$. The total average discounted dynamic payoffs in the low-tariff class and biased tariff class in terms of $\tau_z$ are respectively

$$\begin{aligned}
\bar{U}(\tau^{cz}) &= \frac{K^2(-\tau_z^2 N^2 + y^2(K^2-1))}{2N^2(K-1)} \\
\bar{U}(\tau^{xz}) &= \frac{K^2[-\tau_z^2 N^2(K-1) + y^2(K+1)]}{2N^2}.
\end{aligned}$$

As before $\bar{U}(\tau^{cz}) \geq \bar{U}(\tau^{xz})$, and we can show that $\bar{U}(\tau^{cz})$ and $\bar{U}(\tau^{xz})$ are both increasing in $\tau_z$. Then the change in the expected long-run total welfare for a change in $\tau_z$ is

$$\frac{\partial \bar{U}}{\partial \tau_z} = \frac{\partial \gamma}{\partial \tau_z}[\bar{U}(\tau^{cz}) - \bar{U}(\tau^{xz})] + \gamma \frac{\partial \bar{U}(\tau^{cz})}{\partial \tau_z} + (1-\gamma)\frac{\partial \bar{U}(\tau^{xz})}{\partial \tau_z}.$$

The probability of being in the low-tariff class is increasing with administered protection, and the expected long-run payoff in the biased and the low tariff classes are increasing with administered protection. Administered protection thus increases expected long-run total welfare.

The welfare result on administered protection in this section must be interpreted with caution as the analysis is based on modeling administered protection as a floor on tariffs. If administered protection is modeled as an exogenous probability of receiving a very high tariff, the impact on welfare would be ambiguous as in the case of tariff bindings.

These welfare calculations serve to highlight an important trade-off when constraints to trade policy are considered – increasing the probability of a low-tariff outcome may decrease the expected payoff in a biased tariff outcome (which occurs with positive probability). In reality administered protection and tariff bindings co-exist, so one may counteract the negative effect of the other. It is an empirical question which effect dominates, but this may help explain why some developing countries adopted anti-dumping laws after they agreed to bind their tariffs in the Uruguay Round.

## 9 Conclusion

One of the main objectives of the WTO is to facilitate the reduction of trade barriers. In the WTO's words it is "an organization for liberalizing trade".[15] However, each country sets its own trade policy through some domestic process, usually, through some legislative process. In this paper I first examine the outcome of tariffs determined by a legislative process and then look at the impact of two of the central components of WTO agreements: tariff bindings and administered protection, on tariffs that are enacted legislatively.

To examine the impact of these policies I develop a dynamic model of trade policy determination through a legislative process and ask, first, under what circumstances will the legislative process result in low applied MFN tariffs. What I find is that tariff determination is path dependent. If initial conditions are such that tariffs are uniformly low, a low applied tariff outcome will result. However if initial tariffs are biased, the outcome may be a cycle of biased tariffs. This intuition is reflected in the history of the United States legislature. One of the first acts of the newly established Congress was to legislate protective tariffs, because, as Taussig (1910) put it, "...several of the States, especially Massachusetts and Pennsylvania, had imposed protective duties before 1789; and they were desirous of maintaining the aid then given to some of their industries." This cycle of protectionism remained in the US until Congress enacted the Reciprocal Trade Act in 1934 to give the President authority to cut tariffs. But not all countries have given their executive such power, hence tariffs are still determined by a legislative process, albeit constrained by international agreements. One notable example is India, which liberalized trade policy significantly beginning in the 1990s but still maintains considerable "binding overhang" – where tariff bindings are set well above applied levels [WTO (2011)].

To look at the effect of tariff bindings and administered protection on the legislative outcome, I consider how a ceiling on legislated tariffs affects the set of initial conditions that lead to a low protection outcome. The somewhat surprising answer is that tariff bindings shrink the set of initial conditions that leads to the low protection outcome, whereas administered protection expands the set of initial tariffs that leads to the low protection outcome. So, loosely speaking, tariff bindings lead to a lower likelihood of a low applied MFN tariff outcome, while administered protection leads to a higher likelihood of a low applied MFN tariff outcome.

Both these results contradict the traditional wisdom. Tariff bindings are a central element of the GATT put in place in 1947, while administered protection is generally

[15] http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact1_e.htm

regarded as opposing the goals of the WTO. This paper suggests that in some instances less restrictive tariff bindings may give countries the necessary "policy space" to allow the domestic process to arrive at low applied tariffs, whereas administered protection makes it more costly to implement biased policies. This idea of policy space has been typically espoused by developing countries, and this paper may provide one explanation for the phenomenon.

The results in this paper are derived using properties of a particular equilibrium in a model that potentially delivers many equilibria. Baron and Bowen (2013) characterize a class of simple coalition equilibria in the purely distributive setting.[16] It is an open question how these features of the WTO affect properties of other equilibria in this model with a public good, and in particular if these properties are robust in coalition equilibria. This will facilitate considering voting rules other than simple majority, and will facilitate welfare comparisons in the Pareto sense, since Pareto inefficient policies may be characterized. Finally, this paper assumes legislatures set trade policy directly, but in many developed countries legislatures choose to delegate trade policy to an executive. A natural questions is "what are the incentives of the legislature to delegate policy-making to an executive?" I leave this and other questions for future work.

[16] Richter (2013) and Anesi and Seidmann (2012) also characterize equilibria with compromise in a purely distributive setting.

# Appendix

## Proofs for the biased tariff class

### Proof of Lemma 3

Define $\alpha(\tau_x, \delta) \equiv V^x(\tau^{xz}) - V^c(\tau^{cz})$. This is

$$\alpha(\tau_x, \delta) = -\frac{\tau_x^2 K}{2(K-1)} + \frac{\tau_x K y(1-\delta)}{N} - \frac{Ky^2[K(1-\delta)-1]}{2N^2(K-1)[(K-1)(1-\delta)+\delta]}. \tag{10}$$

$\frac{\partial^2\alpha}{\partial\delta^2} = \frac{2(K-2)y^2K}{N^2[(K-1)(1-\delta)+\delta]^3} > 0$, hence $\frac{\partial\alpha}{\partial\delta}$ is maximized at $\delta = 1$. This gives $\frac{\partial\alpha}{\partial\delta}|_{\delta=1} = -\frac{(\tau_x N - y)yK}{N^2}$, so for $\tau_x \geq \frac{y}{N}$ we have $\frac{\partial\alpha}{\partial\delta} \leq 0$. Then for $\tau_x \geq 0$ and $\delta \leq \overline{\delta}_1$, $V^x(\tau^{xz}) \geq V^c(\tau^{cz})$, where $\overline{\delta}_1$ is given implicitly by $\alpha(\tau_x, \overline{\delta}_1) = 0$. ■

### Proof of Lemma 4

Define $\beta \equiv V^c(\tau^{cz}) - V^z(\tau^{xz})$. It is straightforward to show $\frac{\partial\beta}{\partial\tau_x} = \frac{[y(1-\delta)+\tau_x N]K}{N(K-1)} > 0$. Evaluating $\beta$ at $\tau_x = \frac{y}{N}$ gives $\beta = \frac{Ky^2(1-\delta)[K(1-\delta)+K-2(1-\delta)]}{(K-1)N^2[K(1-\delta)+2\delta-1]} \geq 0$, hence $\beta \geq 0$ for all $\tau_x \geq \frac{y}{N}$. ■

## Proofs for cherry-picking tariff vectors

### Derivation of $\tau(b^*)$ and $\mu_k(b^*)$

Define the probabilities $\mu_k(b)$ and the integer $b \leq \frac{K-1}{2}$ such that legislators $k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b\}$ are indifferent between the status quo and the tariff vector $\tau = (-\frac{y}{N}, \ldots, -\frac{y}{N}, \tau(b), \frac{y(K-2)}{N} - \tau(b))$. With probabilities $\mu_k(b)$, the dynamic payoff to legislator $k$ under the status tariff is

$$\begin{aligned} V_k(\tilde{\tau}) = (1-\delta)v^k(\tilde{\tau}) \quad + \quad & \tfrac{\delta}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz}) \\ & + \tfrac{K-1}{2}[\mu_k(b)V^b(\tilde{\tau}(b)) + (1-\mu_k(b))V^z(\tilde{\tau}(b))]], \end{aligned} \tag{11}$$

where $V^b(\tilde{\tau}(b)) = (1-\delta)v^b(\tilde{\tau}(b)) + \delta V^b$ is the dynamic payoff to receiving $\tau(b)$, and $V^z(\tilde{\tau}(b)) = (1-\delta)v^z(\tilde{\tau}(b)) + \delta V^b$ is the dynamic payoff to receiving $-\frac{y}{N}$. Hence $\tau(b)$ solves $V_k(\tilde{\tau}) = V^b(\tilde{\tau}(b))$ for $k = \frac{K+1}{2}, \ldots, \frac{K-1}{2} + b$. Summing all the expressions for $V_k(\tilde{\tau})$ for $b$ legislators and setting this sum equal $bV^b(\tilde{\tau}(b))$ gives the following equation which determines $\tau(b)$,

$$bV^b(\tilde{\tau}(b)) = (1-\delta)\sum_{k=\frac{K+1}{2}}^{\frac{K-1}{2}+b} v^k(\tilde{\tau}) \quad + \quad \tfrac{\delta b}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz})]$$
$$+\tfrac{\delta(K-1)}{2K}[V^b(\tilde{\tau}(b)) + (b-1)V^z(\tilde{\tau}(b))]. \qquad (12)$$

Denote

$$\begin{aligned} f(\tau_x, \tau(b)) \quad &= \quad (1-\delta)\sum_{k=\frac{K+1}{2}}^{\frac{K-1}{2}+b} v^k(\tilde{\tau}) + \tfrac{\delta b}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz})] \\ &\quad +\tfrac{\delta(K-1)-2Kb}{2K}V^b(\tilde{\tau}(b)) + \tfrac{\delta(K-1)(b-1)}{2K}V^z(\tilde{\tau}(b)). \end{aligned}$$

Then $f(\tau_x, \tau(b)) = 0$ implicitly defines $\tau(b)$. In equilibrium $b^*$ is given by

$$b^* = \begin{cases} 0 & \text{if } v^{\frac{K+1}{2}}(\tilde{\tau}) \leq v^z(\tau^{xz}) \\ \left.\begin{matrix} \min b \in \{1, \ldots, \frac{K-3}{2}\} \quad \text{s.t. } \tau(b) \leq \tau(b+1) \\ \frac{K-1}{2} \qquad\qquad\qquad \text{otherwise} \end{matrix}\right\} & \text{if } v^{\frac{K+1}{2}}(\tilde{\tau}) > v^z(\tau^{xz}). \end{cases} \qquad (13)$$

We can show that $b^*$ is unique. If $v^{\frac{K+1}{2}}(\tilde{\tau}) \leq v^z(\tau^{xz})$ then $b^*$ is uniquely zero. If $v^{\frac{K+1}{2}}(\tilde{\tau}) > v^z(\tau^{xz})$ then $b^*$ is either $\min b \in \{1, \ldots, \frac{K-3}{2}\}$ s.t. $\tau(b) \leq \tau(b+1)$ which is unique if it exists, and if it does not exist, $b^*$ is uniquely $\frac{K-1}{2}$.

The probabilities $\mu_k(b^*)$ are such that $V_k(\tilde{\tau}) = V^b(\tilde{\tau}(b^*))$, where $V_k(\tilde{\tau})$ is given in (11).

**Proof of Lemma 5**

We seek the upper bound on $\tau_x$ such that $\tau(b^*) \leq \frac{y(K-2)}{2N}$. We provide this upper bound for any $b$. First see that $\frac{\partial f}{\partial \tau_x} = \frac{\delta b(1-\delta)(y+\tau_x N)}{2N} > 0$. Then by the implicit function theorem we can verify that $\tau(b)$ is increasing in $\tau_x$. The upper bound on $\sum_{k=\frac{K+1}{2}}^{\frac{K-1}{2}+b} v^k(\tilde{\tau})$ is achieved when legislators $k = \frac{K+1}{2}, \ldots, K$ each share the surplus equally with tariff $\tilde{\tau}_k = \frac{y(K-1)}{N(K+1)}$. This gives each potential coalition legislator the payoff $v^k(\tilde{\tau}) = \frac{K^2y^2(K+3)}{2N^2(K+1)}$. We substitute this value into $f(\tau_x, \tau(b))$ and setting $f(\tau_x, \tau(b)) = 0$ we can solve for $\tau(b)$. After some algebra we can show $\tau(b) \leq \frac{y(K-2)}{2N}$ if

$$\tau_x \leq \tfrac{y}{N}\left(\left[\tfrac{K(K+1)}{2N^2} + \tfrac{K^2(K-3)}{\delta(K+1)N^2} - \tfrac{(K-1)K}{bN^2}\right]^{\frac{1}{2}} - 1\right). \qquad (14)$$

The right hand side of (14) is increasing in $b$, hence setting $b=1$ we have

$$\tau_x \leq \overline{\tau}_1 = \tfrac{y}{N}\left(\left[\tfrac{K^2(K-3)}{\delta(K+1)N^2} - \tfrac{K(K-3)}{2N^2}\right]^{\frac{1}{2}} - 1\right). \blacksquare$$

**Proof of Lemma 6**

The dynamic payoffs to a cherry-picking tariff vector in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$ are

$$U_k(\tilde{\tau} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}; \alpha^*, \sigma^*) = \begin{cases} (1-\delta)v^k(\tilde{\tau}) + \delta V_k^{b'} & \text{for } k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\} \\ (1-\delta)v^z(\tilde{\tau}) + \delta V_z^{b'} & \text{otherwise,} \end{cases}$$

where $v^z(\tilde{\tau})$ is the static payoff to a legislator receiving tariff $-\frac{y}{N}$, $v^k(\tilde{\tau})$ is the payoff to a legislators $k \in \{\frac{K+1}{2}, \ldots, \frac{K-1}{2} + b^*\}$

$$\begin{aligned} V_k^{b'} &= \tfrac{1}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz}) + \tfrac{K-1}{2}V_k(\tilde{\tau}(b^*))] \\ V_z^{b'} &= \tfrac{1}{K}[\tfrac{K+3}{2}V^z(\tau^{xz}) + \tfrac{K-1}{2}V_k(\tilde{\tau}(b^*))]. \end{aligned}$$

Where $V_k(\tilde{\tau}(b^*)) = \mu_k(b)V^b(\tilde{\tau}(b)) + (1-\mu_k(b))V^z(\tilde{\tau}(b))$, the expected payoff to legislator $k$ conditional on legislator $j$ with $\tilde{\tau}_j = -\frac{y}{N}$ being selected as proposer.

When $\tilde{\tau}_k = -\frac{y}{N}$ we have $V_k(\tilde{\tau}; \sigma^*, \alpha^*) = \frac{K-3}{K-1}[(1-\delta)v^z(\tilde{\tau}(b^*)) + \delta V^b] + \frac{2}{K-1}[(1-\delta)v^x(\tilde{\tau}(b^*)) + \delta V^b] = (1-\delta)[\frac{K-3}{K-1}v^z(\tilde{\tau}(b^*)) + \frac{2}{K-1}v^x(\tilde{\tau}(b^*))] + \delta V^b$. This is increasing in $\tilde{\tau}(b^*)$ since legislator $k$ is with higher probability receiving $-\frac{y}{N}$ under the proposal with $\tilde{\tau}(b^*)$, and increasing $\tilde{\tau}(b^*)$ decreases the externality. We know that $\tilde{\tau}(b^*) \leq \frac{y(K-2)}{2N}$ so we substitute this value of $\tilde{\tau}(b^*)$ into $V^{b'}$.

Since legislator's payoffs are higher for more equal allocations, $v^j(\tilde{\tau})$ is maximized for $\tilde{\tau} = (-\frac{y}{N}, \ldots, -\frac{y}{N}, \frac{y(K-1)}{N(K+1)}, \ldots, \frac{y(K-1)}{N(K+1)})$, which gives static payoff $v^j(\tilde{\tau}) = \frac{y^2K^2(K-1)}{2N^2(K+1)}$ if $\tilde{\tau}_j = -\frac{y}{N}$. Then $(1-\delta)v^j(\tilde{\tau}) + \delta V_z^{b'} \leq V^z(\tau^{xz})$ if $\tau_x \leq \frac{y}{N}\left(\left[\frac{K(3K-1)}{K+1}\right]^{\frac{1}{2}} - 1\right) = \overline{\tau}^*$. $\blacksquare$

**Proof of Lemma 7**

$v^j(\tilde{\tau}(b)) \leq v^z(\tau^{xz})$ is most difficult to satisfy when $\tau(b) = \frac{y(K-2)}{2N}$. When $\tau(b) = \frac{y(K-2)}{2N}$, $v^j = \frac{K^2y^2}{N^2}$. This is less than $v^z(\tau^{xz})$ if $\tau_x \leq \frac{y}{N}\left(\left[\frac{K(K-1)}{2}\right]^{\frac{1}{2}} - 1\right) = \overline{\tau}_2$. $\blacksquare$

**Proof of Lemma 8**

It can be verified that $v^c(\tau^{cz}) < v^x(\tilde{\tau}(b^*)) = \frac{y^2K^2(K-3)}{4N^2(K-1)}$ when $\tau(b^*) = \frac{y(K-2)}{2N}$ and for $\tau_x \geq \frac{y}{N}$

$$V^b \leq \frac{1}{K(K-1)}\left[((K-1)^2 + (K-2))V^c(\tau^{cz}) + V^z(\tau^{cz})\right].$$

The right hand side of the above expression is the continuation payoff when the status quo is in the low tariff class. Hence for $\delta$ small enough the result holds. $\overline{\delta}^*$ is such that $(1-\overline{\delta}^*)v^x(\tilde{\tau}(b^*)) + \overline{\delta}^* V^b \geq V^c(\tau^{cz})$. ■

**Proof of Lemma 9**

It can be verified that $V^z(\tau^{cz}) \leq V^z(\tilde{\tau})$ hence a coalition will consist of $\frac{K-3}{2}$ legislators. The highest allocation the proposer can give to these coalition members involves sharing the surplus equally. That is giving the tariff $\frac{y(K+1)}{N(K-1)}$ to $\frac{K-1}{2}$ legislators (including the proposer). The cherry-picking tariff implies a continuation payoff of $V^b$ and a current period payoff of $\frac{y^2K^2(K+1)}{2N^2(K-1)}$. Once again it can be verified that $\frac{y^2K^2(K+1)}{2N^2(K-1)} \leq v^c(\tau^{cz})$ and from before the continuation payoff in the low tariff class is higher than the continuation payoff $V^b$, hence for $\delta$ large enough we have $V^c(\tau^{cz}) \geq V^x(\tilde{\tau})$. The lower bound on the discount factor is given by $(1-\underline{\delta})v^x(\tilde{\tau}) + \underline{\delta}V^b = V^c(\tau^{cz})$.■

**Proof of Lemma 10**

Together the conditions for $\underline{\delta}$ and $\overline{\delta}^*$ imply

$$(1-\delta)\frac{y^2K^2(K+1)}{2N^2(K-1)} + \delta V^b \leq V^c(\tau^{cz}) \leq (1-\delta)\frac{y^2K^2(K-3)}{4N^2(K-1)} + \delta V^b$$

For $K \geq 7$ the left-hand side is strictly less than the right hand side implying $\underline{\delta} < \overline{\delta}^*$. ■

## Derivation of $\mu^{k*}(\cdot)$ and $\tilde{\tau}^{k*}$

This derivation is similar to Bowen and Zahran (2012) but adapted to trade policy which implies externalities. Denote an arbitrary vector of cherry-picking proposals for legislator $k$ as $\tilde{\tau}_k$, and, as before, let the set $\mathbf{P}(\tilde{\tau}_k)$ be all permutations of these proposals. Now denote for legislator $k$ an arbitrary probability distribution over cherry-picking proposals in $\mathbf{P}(\tilde{\tau}_k)$ and over low tariffs $\tau^{cz}$ as $\mu^k(\cdot)$, and let $\mu = (\mu^1(\cdot), \ldots, \mu^K(\cdot))$. Finally, denote the matrix of cherry-picking proposals for legislators $k = 1, \ldots, K$ as $\tilde{\tau}^{\mathbf{m}} = (\tilde{\tau}^1, \ldots, \tilde{\tau}^K)$.

Let $V_j(\tilde{\tau}^{\mathbf{m}}, \mu)$ be the expected continuation payoff for legislator $j$ given cherry-picking tariffs, $\tilde{\tau}^{\mathbf{m}}$, and probability distributions, $\mu$. This is

$$V_j(\tilde{\tau}^{\mathbf{m}}, \mu) = \frac{1}{K} \sum_{k=1}^{K} \left[ \sum_{\tilde{\tau} \in \mathbf{P}(\tilde{\tau}_k)} U_j(\tilde{\tau} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}; \alpha^*, \sigma^*) \mu^k(\tilde{\tau}) + V^c(\tau^{cz}) \mu^k(\tau^{cz} : \tau_j = \tau_c) \right.$$
$$\left. + V^z(\tau^{cz}) \mu^k(\tau^{cz} : \tau_j = \tau_z) \right].$$

Hence given a status quo, an arbitrary vector of demands, and probability distributions, the dynamic payoff to the status quo is

$$U_j(\tau^{t-1}; \tilde{\tau}^{\mathbf{m}}, \mu) = (1-\delta) v^j(\tau^{t-1}) + \delta V_j(\tilde{\tau}^{\mathbf{m}}, \mu). \tag{15}$$

For the pair $(\tilde{\tau}^{\mathbf{m}}, \mu)$ define the tariff vector $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu)$ as

$$\begin{aligned} \hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu) = \quad & \arg\max\nolimits_{\tilde{\tau} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}} (1-\delta) v^k(\tilde{\tau}) + \delta V_k^{b'} \\ & \text{s.t.} (1-\delta) v^j(\tilde{\tau}) + \delta V_j^{b'} \geq U_j(\tau^{t-1}; \tilde{\tau}^{\mathbf{m}}, \mu) \text{ for } j \in C_k \\ & \text{ where } C_k \subset \{1, \ldots, K\}/\{k\} \text{ and } |C_k| = \tfrac{K-1}{2}. \end{aligned}$$

If such a maximizer exists it must be unique since we can show that $(1-\delta)v^j(\tilde{\tau}) + \delta V_j^{b'}$ is strictly monotone increasing or decreasing in all its arguments. If no such maximizer exists, set $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu) = \tau^{xz}$ with $\hat{\tau}_k^k = \tau_z$, that is $k$ receives the worst payoff. So $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu)$ always has a unique value. Now let us pick a new set of cherry-picking tariffs and distributions, $(\tilde{\tau}^{k\prime}, \mu^{k\prime}) = \mathbf{B}_k(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1})$ where

$$\begin{aligned} \mathbf{B}_k(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1}) = \{(\tilde{\tau}^{k\prime}, \mu^{k\prime}) : \mu^{k\prime} = & \quad \arg\max\nolimits_{\mu^k} U_k(\tilde{\tau}^{\mathbf{m}}, \mu^k, \mu^{-k}) \\ \tau^{k\prime} = & \quad \hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu^{k\prime}, \mu^{-k})\}. \end{aligned}$$

$\mathbf{B}_k(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1})$ is a singleton since $U_k(\tau^{t-1}; \tilde{\tau}^{\mathbf{m}}, \mu^k, \mu^{-k})$ is linear in $\mu^k$ and we argued before $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}, \mu^{k\prime}, \mu^{-k})$ is unique given a $\mu^{k\prime}$.

Define

$$\mathbf{B}(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1}) = \times_{k=1}^{K} \mathbf{B}_k(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1}).$$

**Lemma 17.** *The map $\mathbf{B}(\tilde{\tau}^{\mathbf{m}}, \mu; \tau^{t-1})$ has a fixed point $(\tilde{\tau}^{\mathbf{m}*}, \mu^*)$ such that $(\tilde{\tau}^{\mathbf{m}*}, \mu^*) \in \mathbf{B}(\tilde{\tau}^{\mathbf{m}*}, \mu^*; \tau^{t-1})$.*

*Proof.* To prove the map $\mathbf{B}$ has a fixed point I will employ Brouwer's Fixed Point Theorem. The space of $\tilde{\tau}^{\mathbf{m}}$ and $\mu$ are $[-\frac{y}{N}, \tau_x]^{K^2}$ and $[0,1]^{[({}^K P_{\frac{K-1}{2}}) + K](K)}$ respectively. These spaces are non-empty, compact, convex and continuous. The correspondence $\mathbf{B}$ is non-empty since

$U_k(\tau^{t-1};\tilde{\tau}^{\mathbf{m}},\mu^k,\mu^{-k})$ is linear in $\mu^k$ so a maximizer always exists and we ensured $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}},\mu)$ always has a value. The map $\mathbf{B}$ is single-valued since each $\mathbf{B}_k$ is single-valued as argued above, hence $\mathbf{B}$ is a function. I show that $\mathbf{B}$ is continuous. By way of contradiction, suppose $\mathbf{B}$ is not continuous, then there exists a $(\tilde{\tau}^{\mathbf{m}},\mu)$ and a sequence $\{(\tilde{\tau}^{\mathbf{m}}_n,\mu_n)\}_{n=1}^{\infty}$ with $\lim_{n\to\infty}(\tilde{\tau}^{\mathbf{m}}_n,\mu_n)=(\tilde{\tau}^{\mathbf{m}},\mu)$ such that $\lim_{n\to\infty}\mathbf{B}(\tilde{\tau}^{\mathbf{m}}_n,\mu_n;\tau^{t-1})\neq\mathbf{B}(\tilde{\tau}^{\mathbf{m}},\mu;\tau^{t-1})$. This implies either

$$\begin{aligned}\lim_{n\to\infty}\arg\max_{\mu^k}U_k(\tilde{\tau}^{\mathbf{m}}_n,\mu^k,\mu^{-k}_n) &\neq \mu^{k\prime} \text{ or}\\ \lim_{n\to\infty}\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}}_n,\mu^{k\prime},\mu^{-k}_n) &\neq \tau^{k\prime},\end{aligned}$$

for some $k$. We can show that $U_k(\tau^{t-1};\tilde{\tau}^{\mathbf{m}},\mu^k,\mu^{-k})$ is jointly continuous in all its arguments and $\mu^k$ is on a continuous, compact, set hence by Theorem of the Maximum $\mu^{k\prime}$ is a continuous function of $\tilde{\tau}^{\mathbf{m}}$ and $\mu^{-k}$ which violates the first statement. Similarly, it can be shown that $(1-\delta)v^k(\tilde{\tau})+\delta V^{b\prime}_k$ is continuous in $\tilde{\tau}$ and we showed earlier that $(\tilde{\tau}^{\mathbf{m}},\mu)$ is drawn from a continuous, compact set, hence by Theorem of the Maximum $\hat{\tau}^k(\tilde{\tau}^{\mathbf{m}},\mu)$ is continuous which violates the second statement. This gives a contradiction. ■

### Complete incentives

A complete incentives analysis ensures that for each set indicated in figure 4 there is no incentive to transition to any other set than what the equilibrium strategies dictate. So we proceed by considering status quo tariffs in each set.

$\tau^{t-1}\in\mathbb{T}^b$

The equilibrium strategies dictate the biased proposal. Consider the incentives of legislators to accept. At least $\frac{K-1}{2}$ have a status quo payoff of $V^z(\tau^{xz})$ hence will accept the tariff $\tau^{xz}$. Consider the proposing legislator's incentives to make another proposal. Under the equilibrium proposal the proposer receives $V^x(\tau^{xz})$. Since $\tau_x\geq\frac{y}{N}>0$ then $v^x(\tau^{xz})>v^z(\tau^{xz})$ hence the proposer does not want to propose $\tau^{xz}$ giving himself the tariff $\tau_z$. By Lemma 3 the proposer does not want to propose $\tau^{cz}$ for $\delta\leq\overline{\delta}^*\leq\overline{\delta}_1$. The proposer will not prefer a tariff vector in $\mathbb{T}_{\theta>\frac{K-1}{2}}$ since $1\geq 1-\tau(b^*)$ and the proposer's statictc tariff is increasing in his tariff. The continuation payoff is the same in both cases. If $\mathbb{T}_{\theta=\frac{K-1}{2}}$ the proposer's static payoff is strictly lower than $v^x(\tau^{xz})$ by the arguments above, and the proposer's dynamic payoff is no greater than $V^b$, so the proposer has no incentive to propose. If the proposer deviates to $\hat{\tau} \in \mathbb{T}_{\theta < \frac{K-1}{2}} \setminus \Gamma$ the payoff is

$$V(\hat{\tau} \in \mathbb{T}_{\theta < \frac{K-1}{2}} \setminus \Gamma) \quad = \quad v^k(\tau) + \delta E[(1-\delta)v^k(\tilde{\tau}) + \delta V_k^{b'}].$$

with $V_k^{b'} = \frac{1}{K}[V^x(\tau^{xz}) + \frac{K-1}{2}V^z(\tau^{xz}) + \frac{K-1}{2}V_k(\tilde{\tau}(b^*))]$. The static payoff cannot be greater than $v^x(\tau^{xz})$ and the dynamic payoff is no greater than $V^b$, so this is not a profitable deviation. We will show below that all allocations in $\Gamma_k$ have a dynamic payoff less than $V^c(\tau^{cz})$. Hence by Lemma 3 we have $V(\tau \in \Gamma_k) \leq V^c(\tau^{cz}) \leq V^x(\tau^{cz})$ and the proposer does not wish to propose an allocation in $\Gamma_k$ for any $k$.

$\tau^{t-1} \in \mathbb{T}_{\theta \geq \frac{K-1}{2}}$

If legislators propose $\tau^{xz}$ the analysis above show there is no incentive to deviate. If legislators propose $\tau(b^*)$, Lemma 6 shows that this is accepted by a minimum winning coalition for which $\tilde{\tau}_j = -\frac{y}{N}$ if $\tau_x$ is not too high. For legislator $j$ receiving tariff $-\frac{y}{N}$ we require $v^j(\tilde{\tau}(b^*)) \leq v^z(\tau^{xz})$. We show this is true with an upper bound on $\tau_x$ in Lemma 7. Lemma 5 shows that $\tilde{\tau}(b^*) \leq 1 - \tilde{\tau}(b^*)$ so the proposer cannot improve his static payoff with any proposal in $\mathbb{T}_{\theta \leq K-1}$, and as demonstrated above, the dynamic payoff for any proposal not in $\Gamma$ is less than $V^b$ so the proposer has no incentive to propose anything in $\mathbb{T}_{\theta \leq K-1} \setminus \Gamma$. A proposal in $\mathbb{T}^b$ will not be accepted by a minimum winning coalition. By Lemma 8, for $\tau_x \geq \frac{y}{N}$ and $\delta \leq \overline{\delta}^*$ we have $v^x(\tilde{\tau}(b^*)) + \delta V^b \geq V^c(\tau^{cz})$ so no payoff is $\Gamma$ is preferred to the equilibrium payoff.

$\tau^{t-1} \in \mathbb{T}_{\theta < \frac{K-1}{2}} \setminus \Gamma_k$

By construction the proposer will not have an incentive to propose another cherry-picking tariff vector (including the biased tariff), or go to compromise.

$\tau^{t-1} \in \Gamma_k$

First consider $\tau^{t-1} = \tau^{cz}$. A minimum winning coalition will receive the same payoff as under the status quo hence the proposal will be accepted. Since $\tau_c > \tau_z$ we have $V^c(\tau^{cz}) \geq V^z(\tau^{cz})$ hence the proposer will not propose to give himself $-\frac{y}{N}$. By Lemma 4 if $\tau_x \geq \frac{y}{N}$ a minimum winning coalition will reject a biased tariff proposal. By Lemma 9 for $\delta \geq \underline{\delta}$ the proposer will not have an incentive to propose anything in $\mathbb{T}_{\theta \geq \frac{K-1}{2}}$. Consider $\tau^{t-1} \in \Gamma_k \setminus \{\tau^{cz}\}$. The next Lemma shows that for discount factors small enough the proposer has no incentive to propose such an allocation.

**Lemma 18.** *There exists a $\overline{\delta}_2 > \underline{\delta}$ such that for all $\delta \leq \overline{\delta}_2$, if $\tau^{t-1} = \tau^{cz}$ with legislator $k$ receiving $\tau^c$, legislators $k$ does not have an incentive to propose a deviation $\tau^t \in \Gamma_k \setminus \{\tau^{cz}\}$.*

*Proof.* By construction the tariff vectors $\tau^t \in \Gamma_k \setminus \{\tau^{cz}\}$ are such that $V_k(\tilde{\tau}) \leq V^c(\tau^{cz})$ so the low-tariff vector is preferred to cherry-picking. This implies the continuation payoff is at most $V^c(\tau^{cz})$. We require $U_k(\tau^{t-1}) = (1-\delta)v^k(\tau^{t-1}) + \delta V^c(\tau^{cz}) \leq V^c(\tau^{cz}) \Rightarrow v^k(\tau^{t-1}) \leq V^c(\tau^{cz})$. It is straightforward to show that the derivative of $V^c(\tau^{cz})$ with respect to $\delta$ is negative. Further, by arguments similar to Bowen and Zahran (2012), the maximum value of $v^k(\tau^{t-1})$ such that $\tau^{t-1} \in \Gamma_k$ is increasing in $\delta$. So there exists a bound $\overline{\delta}_2$ such that for all $\delta \leq \overline{\delta}_2$ the condition holds. The proof that $\underline{\delta} < \overline{\delta}_2$ holds by similar arguments as in Bowen and Zahran (2012). ■

## 9.1 Tariff Bindings

### Proof of Lemma 11

The following Lemmas are used in this proof.

**Lemma 19.** *The proposer's single period cherry-picking payoff, $v^x(\tilde{\tau})$, is a decreasing function of a coalition member's cherry-picking tariff, $\tilde{\tau}_k$.*

*Proof:* The cherry-picking proposal is such that it gives coalition members the same dynamic payoff as the status quo tariff vector, $\tau^{t-1}$. For simplicity, assume that the status quo tariff vector gives the same tariff to all members of the coalition, hence the cherry-picking tariff will also give the same tariff to all coalition members $\tilde{\tau}_k$. The proposer's cherry-picking payoff is given by

$$v^x(\tilde{\tau}) = \tilde{\tau}_x\left[\tfrac{y}{N}(K-1) - \tfrac{\tilde{\tau}_x}{2}\right] - \left(\tfrac{K}{2}-1\right)\tilde{\tau}_k\left[\tfrac{\tilde{\tau}_k}{2} + \tfrac{y}{N}\right] - \tfrac{K}{2}\tau_z\left[\tfrac{\tau_z}{2} + \tfrac{y}{N}\right] + \lambda$$

where the proposer's tariff is $\tilde{\tau}_x = \frac{K}{2}(-\tau_z) - \left(\frac{K}{2}-1\right)\tilde{\tau}_k$. Differentiating with respect to the coalition member's cherry-picking tariff $\tilde{\tau}_k$ I have

$$\tfrac{\partial v^x(\tilde{\tau})}{\partial \tilde{\tau}_k} = -\tfrac{(K-2)K[2y+N(\tau_z+\tilde{\tau}_k)]}{4N}.$$

This is negative since a coalition member's cherry-picking tariff is at least as great as the loser tariff. ■

**Lemma 20.** *The coalition member's cherry-picking tariff, $\tilde{\tau}_k$, is an increasing function of a coalition member's status quo tariff, $\tau_k^{t-1}$.*

*Proof:* Denote the dynamic payoff to each member of the coalition under status quo tariff $\tau^{t-1}$ as $V^k(\tau^{t-1})$. This is given by

$$V^k(\tau^{t-1}) = (1-\delta)v^k(\tau^{t-1}) + \tfrac{\delta}{K}[V^x(\tilde{\tau}) + (K-1)V^k(\tilde{\tau})].\ ^{17} \tag{16}$$

Since $\tilde{\tau}$ is obtained from equality of $V^k(\tau^{t-1})$ and $V^k(\tilde{\tau})$, this simplifies to

$$V^k(\tau^{t-1}) = \tfrac{(1-\delta)K}{K-\delta(K-1)}v^k(\tau^{t-1}) + \tfrac{\delta}{K-\delta(K-1)}V^x(\tilde{\tau}). \tag{17}$$

The cherry-picking tariff $\tilde{\tau}$ is defined implicitly by $V^k(\tau^{t-1}) = V^k(\tilde{\tau})$.[18] Define the function $H(\tau_k^{t-1}, \tilde{\tau}_k) = V^k(\tau^{t-1}) - V^k(\tilde{\tau})$. Then by the implicit function theorem

$$\tfrac{d\tilde{\tau}_k}{d\tau_k^{t-1}} = -\tfrac{\partial H}{\partial \tau_k^{t-1}} \Big/ \tfrac{\partial H}{\partial \tilde{\tau}_k}.$$

This simplifies to

$$\tfrac{d\tilde{\tau}_k}{d\tau_k^{t-1}} = \tfrac{2[(K+2)y-(K-2)N\tau_k^{t-1}]}{K[2y(2-\delta)-(1-\delta)(K-2)N(\tau_z+\tilde{\tau}_k)]}.$$

The numerator is positive because a coalition member will not have a status quo tariff larger than $\frac{y}{N}$. This would imply that he was receiving a large share of the surplus in the previous period, hence would not be the cheapest coalition member. The denominator is positive also for the same reason.■

By the chain rule

$$\tfrac{\partial v^x(\tilde{\tau})}{\partial \tau_k^{t-1}} = \tfrac{\partial v^x(\tilde{\tau})}{\partial \tilde{\tau}_k}\tfrac{\partial \tilde{\tau}_k}{\partial \tau_k^{t-1}}.$$

By Lemmas 19 and 20 this product is negative.■

**Proof of Lemma 12**

The continuation payoff to the cherrry-picking proposal is given by

$$V_k^{b'} \quad = \quad \tfrac{1}{K}[V^x(\tau^{xz}) + \tfrac{K-1}{2}V^z(\tau^{xz}) + \tfrac{K-1}{2}V_k(\tilde{\tau}(b^*))]$$

Assuming the change in the cherry-picking tariff $\tilde{\tau}(b^*)$ is small gives $\frac{\partial V_k^{b'}}{\partial \tau_x} = -\frac{\tau_x}{K-1} < 0$. ■

[17] Here $v^k\left(\tau^{t-1}\right) = \tau_k^{t-1}\frac{yK}{N} - \left(\frac{K}{2}-1\right)\tau_k^{t-1}\left[\frac{\tau_k^{t-1}}{2} + \frac{y}{N}\right] - \sum_{j\neq k}\tau_j^{t-1}\left[\frac{\tau_j^{t-1}}{2} + \frac{y}{N}\right] + \lambda$.

[18] Where $v^k(\tilde{\tau}) = \tilde{\tau}_k\frac{yK}{N} - \tilde{\tau}_{x^t}\left[\frac{\tilde{\tau}_{x^t}}{2} + \frac{y}{N}\right] - \left(\frac{K}{2}-1\right)\tilde{\tau}_k\left[\frac{\tilde{\tau}_k}{2} + \frac{y}{N}\right] - \frac{K}{2}\tau_z\left[\frac{\tau_z}{2} + \frac{y}{N}\right] + \lambda$. The impact on continuation payoffs is small since the state is absorbed in the biased class.

**Proof of Lemma 13**

The cherry-picking tariff is defined by equating a coalition member's status quo payoff to the coalition member's payoff under the cherry-picking proposal. Hence I can define the function $H(\tau_x, \tilde{\tau}_k) = V^k(\tau^{t-1}) - V^k(\tilde{\tau}) = 0$. By the implicit function theorem

$$\frac{d\tilde{\tau}_k}{d\tau_x} = -\frac{\partial H}{\partial \tau_x} / \frac{\partial H}{\partial \tilde{\tau}_k}.$$

This simplifies to

$$\frac{d\tilde{\tau}_k}{d\tau_x} = \frac{4\delta N \tau_x}{K[2y(2-\delta)-(1-\delta)(K-2)N(\tau_z+\tilde{\tau}_k)]}.$$

The denominator is positive because a coalition member's cherry-picking tariff, $\tilde{\tau}_k$, will not exceed $\frac{y}{N}$, hence the result is proved. ■

**Proof of Proposition 2**

The lower bound on the acceptor's status quo tariff is derived from the condition $V^c(\tau^{cz}) \geq V^x(\tilde{\tau})$. Denote the lower bound as $(\tau^{t-1})^*$ so this is defined by, $V^c(\tau^{cz}) = V^x(\tilde{\tau})$. By the implicit function theorem, I can define the function $M((\tau_k^{t-1})^*, \tau_x) = V^x(\tilde{\tau}) - V^c(\tau^{cz})$, and

$$\frac{d(\tau_k^{t-1})^*}{d\tau_x} = -\frac{\partial M}{\partial \tau_x} / \frac{\partial M}{\partial (\tau_k^{t-1})^*}.$$

The function $M((\tau_k^{t-1})^*, \tau_x)$ can be rewritten as $M((\tau_k^{t-1})^*, \tau_x) = (1-\delta)v^x(\tilde{\tau}) + \delta V^{b\prime} - V^c(\tau^{cz})$, so

$$\frac{\partial M}{\partial \tau_x} = (1-\delta)\frac{\partial v^x(\tilde{\tau})}{\partial \tilde{\tau}_k}\frac{\partial \tilde{\tau}_k}{\partial \tau_x} + \delta\frac{\partial V^{b\prime}}{\partial \tau_x}.$$

From Lemma 19 $\frac{\partial v^x(\tilde{\tau})}{\partial \tilde{\tau}_k}$ is negative, from Lemma 13 $\frac{\partial \tilde{\tau}_k}{\partial \tau_x}$ is positive and from Lemma 12 $\frac{\partial V^{b\prime}}{\partial \tau_x}$ is negative. Hence $\frac{\partial M}{\partial \tau_x}$ is negative. Further

$$\frac{\partial M}{\partial (\tau_k^{t-1})^*} = (1-\delta)\frac{\partial v^x(\tau^{xz})}{\partial (\tau_k^{t-1})^*}.$$

From Lemma 11, $\frac{\partial v^x(\tau^{xz})}{\partial (\tau_k^{t-1})^*}$ is negative, hence $\frac{\partial M}{\partial (\tau_k^{t-1})^*}$ is also negative. Hence the lower bound on the coalition member's status quo tariff increases with the maximum tariff $\tau_x$. ■

## Administered Protection

### Proof of Lemma 14

The minimum tariff enters directly in the cherry picking proposal, so the total derivative with respect to the minimum tariff is

$$\frac{dv^x(\tilde{\tau})}{d\tau_z} = \frac{\partial v^x(\tilde{\tau})}{\partial \tilde{\tau}_k}\frac{\partial \tilde{\tau}_k}{\partial \tau_z} + \frac{\partial v^x(\tilde{\tau})}{\partial \tau_z}.$$

This is equivalent to

$$\frac{dv^x(\tilde{\tau})}{d\tau_z} = -\frac{N^2\delta(K-1)(K-2)\tau_z(\tilde{\tau}_k+\tau_z)+2y[N(K(K-2\delta)+2\delta)\tau_z+yK^2(1-\delta)+\delta y]}{NK[2y(2-\delta)-(1-\delta)(K-2)N(\tau_z+\tilde{\tau}_k)]}.$$

The numerator and denominator of the expression are both positive, so the expression is negative. ■

### Proof of Lemma 15

The continuation payoff from a cherry-picking proposal is $V^{b\prime}$. Assuming the change in $\tilde{\tau}(b^*)$ is small, and differentiating this with respect to $\tau_z$ gives

$$\frac{dV^{b\prime}}{d\tau_z} = -K(K-1)\tau_z > 0.■$$

### Proof of Lemm 16

The payoff from a low-tariff proposal is $V^c(\tau^{cz})$. Differentiating this with respect to $\tau_z$ gives

$$\frac{dV^c(\tau^{cz})}{d\tau_z} = -\frac{\tau_z K}{K-1} - \frac{yK(1-\delta)}{N[(K-1)(1-\delta)+\delta]}.$$

This derivative is increasing in $\tau_z$. Since $\tau_z$ at least $-\frac{y}{N}$ and $\frac{K}{K-1} > \frac{K(1-\delta)}{[(K-1)(1-\delta)+\delta]}$ for $\delta > 0$, then $\frac{dV^c(\tau^{cz})}{d\tau_z}$ is positive for all feasible values of $\tau_z$.■

### Proof of Proposition 3

From before I have the function $M((\tau_k^{t-1})^*, \tau_z) = V^x(\tilde{\tau}) - V^c(\tau^{cz})$, that defines the boundary tariff, hence but the implicit function theorem

$$\frac{d(\tau_k^{t-1})^*}{d\tau_z} = -\frac{\partial M}{\partial \tau_z}/\frac{\partial M}{\partial (\tau_k^{t-1})^*}.$$

The partial derivative of $M$ with respect to the minimum tariff is

$$\frac{\partial M}{\partial \tau_z} = (1-\delta)\frac{\partial v^x(\tilde{\tau})}{\partial \tau_z} + \delta\frac{\partial V^{b\prime}}{\partial \tau_z} - \frac{\partial V^c(\tau^{cz})}{\partial \tau_z}.$$

From Lemma 15 $\frac{\partial v^x(\tilde{\tau})}{\partial \tau_z}$ is negative, from from Lemma 16 $\frac{\partial V^{b\prime}}{\partial \tau_z}$ is positive, and from Lemma 16 $\frac{\partial V^c(\tau^{cz})}{\partial \tau_z}$ is positive. It is straightforward to show the expected payoff in the low tariff class, $V(\tau^{cz})$, is an increasing function of the minimum tariff, $\tau_z$. Differentiating $V(\tau^{cz})$ with respect to $\tau_z$ I have $\frac{dV(\tau^{cz})}{d\tau_z} = -\delta\tau_z(K-1)$. This is positive since $\tau_z$ is negative. Hence the sign of $\frac{\partial M}{\partial \tau^x}$ depends on the magnitudes of the these values, and can be shown to be negative because of the direct impact on the current cherry-picking tariff vector and the compromise payoff. From before $\frac{\partial M}{\partial (\tau_k^{t-1})^*}$ is negative, so I have that the lower bound on the coalition member's status quo tariff is decreasing in the minimum tariff.■

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